# FALL UNDERGRADUATE RESEARCH EXPO

## November 19-26, 2024

## Purdue University

### West Lafayette, Indiana

# SCHEDULE OF EVENTS

## NOVEMBER 19, 2024 | PMU BALLROOMS

**9:00AM-10:00AM** Poster Session 1

**10:30AM-11:30AM** Poster Session 2

**12:00PM-1:00PM** Poster Session 3

**1:30PM-2:30PM** Poster Session 4

## NOVEMBER 20, 2024 | STEW 214

**9:00AM-5:00PM** Research Talks

## NOVEMBER 19-26, 2024 | ONLINE

**Virtual presentations viewable at**
***purdue.edu/undergrad-research/conferences/fall***

We encourage those with a Purdue account to provide feedback.
**To submit feedback, please scan this QR code with your device.**

# POSTER SYMPOSIUM

*Posters are delivered in the Purdue Memorial Union North and South Ballrooms on November 19, 2024.*
*Posters sorted by first author's last name each session.*

## POSTER SESSION 1 | 9:00AM-10:00AM

1000 *Magdalena Irene Alvis†; McLayne Houin‡; Ian Alford‡*
Mentor(s): Conrrad Makea Rupe Nicholls; Jeffery J H Nielsen

1001 *Teagan Ames-Majeski†*
Mentor(s): Matthew Louis Scarpelli

1002 *Shreem Bhavesh Amin†; Jose Augusto Heighes Claux†; Max Elliott Matteucci†; Swati Raj Rajasekaran†*
Mentor(s): Matthew Lanham

1003 *Niklas Eric Anderson†*
Mentor(s): Ryan B Wagner

1004 *Lillian M Andis†*
Mentor(s): Jonathan Pasternak; Alyssa Smith

1005 *Ana Cristal Andrade Castaneda†; Dalena Mary Renee Matthews†; Emma Carosone†*
Mentor(s): Sarah Eason; Siqi Zhang

1006 *Alex Jameson Appiah†*
Mentor(s): Carla B Rosell

1007 *Megan Grace Ashby†; Evan James Campbell*; Delaney Alexandra Doncer**
Mentor(s): Jonathan Pasternak; Sarah M Innis; Alyssa Smith; Dayeon Jeon

1008 *Megan Grace Ashley†; Abigail Joy Benham†; Sabrina Ann Blount†; Ashleigh P Thompson†; Dane' van Ghunt†*
Mentor(s): Casie S Bass

1009 *Shrivardhan Atluri†*
Mentor(s): Lisa B Bosman

1011 *Cristian Marcos Barinaga†*
Mentor(s): Juan Camilo Mesa Agudelo

1012 *Makaela Marie Bennett†; Grace Makenna Gonzalez†; Anthony John Gruber†; Mary Elizabeth Reeder†; Mackenzie Joy Shea†*
Mentor(s): Casie S Bass

1013 *Dishan Bhattacharya†*
Mentor(s): Tyler Poore

1014 *Cole Emerson Blocher†; Elian David Coyotl Garcia†; Chanwoo Lim†; Cassius Samuel Sampson†; Ria Sinha†*
Mentor(s): Jesus Adrian Meza Galvan; Anthony G Cofer; Steven M Pugia; Alina Alexeenko

1015 *Katelyn Emily Bottando†; Grace Rentfro**
Mentor(s): Sa Liu

1016 *Catherine Therese Nicole Bradley†; Gianna Marie Arnone‡*
Mentor(s): Diane Collard

1017 *Zachary V Bryant†*
Mentor(s): Riley Bradley Barta; Yash Shantilal Parmar

1018 *Dawn Elaine Burch†; Georgia Jones†; Bodhi Alan Kuiper†; Kylie Shea Soniak†*
Mentor(s): Casie S Bass

1019 *Madison Nicole Butz†; Sydnee Noelle Culp†; Allison Grace Schimpf†; Connor J Smith†; Devin Brianna Thomas†*
Mentor(s): Casie S Bass

1020 *Ethan Joseph Chace†; Yuet Ching Jolie Lai†; Kailey Christina Dvorak†; Marvel Jiaxiang Zheng†*
Mentor(s): Niall Patrick Moloney

1021 *Christopher Timothy Chan†; Justin Song†; Niril Jestus†; Jacob Adam Clark†; Sabrina Louise Gray†; Mihika Sharma†*
Mentor(s): David Michael Barbarash

1022 *Shaan Jitesh Chanchani†; Aryan Amol Khanolkar†; Claire Seol Kim†; Joshua C Mansky†; Medhashree Parhy†; Armaan Arshad Sayyad†; Parth Thakre†*
Mentor(s): Amy R Reibman; Haoyu Chen

1023 *Maximilian Judah Chandra†; Mia Iwasa**
Mentor(s): Kunming Shao

1024 *Aditya Chattopadhyay†*
Mentor(s): Carla B Rosell

1025 *Chengyu Chiu†; Pin-Chen Su†; Yoshiki Takeuchi†; Qiming Chai†*
Mentor(s): Peter Bermel; Saeed Mohammadi; Frank Huang

1026 *Yashvi Choudhary†; Sadie A Poirier‡*
Mentor(s): Vanshika Gupta; Jeffrey Edward Dick

1027 *Vinicius da Paixao Fernandes†; Drew Christopher Lawler†; Viva Parmar†; Athan Shuen Yang†*
Mentor(s): Matthew Lanham

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgment

1028 *Caleb Dai†; Ethan Mathew Lebon†; Cooper William Springs†; Zixiang Xia†*
Mentor(s): Matthew Lanham

1029 *Carla D'Amato†*
Mentor(s): Ruben C Aguilar

1030 *Deborah Mercylin David†*
Mentor(s): Carla B Rosell

1031 *Joshua Armstrong Davis†*
Mentor(s): Thomas H Siegmund

1032 *Alice Nha Thy Dinh†; Thomas John Durkin†; Jenna Grace Hash†; Isabella Kidrian McGuire†*
Mentor(s): Matthew Lanham

1033 *Rhea Dutta†*
Mentor(s): Lisa B Bosman

1034 *Hanna Joy Dykema†*
Mentor(s): Krishna Nemali

1035 *Deniz Eksioglu†*
Mentor(s): Hyowon Lee; Jae Young Park

1036 *Abigail Elizabeth Farler†*
Mentor(s): Michael Douglas Johnson

1037 *Elizabeth Christine Farrell†*
Mentor(s): Tyler Renee Pikes

1038 *Daniyal Fazal†; Harmon Howse†; Nicholas Marshall Andry†; Jayden Chun-Hin Chow†; Oliver J Wang†*
Mentor(s): Santiago Torres Arias

1039 *Roy Michael Galazka†*
Mentor(s): Abigail Polin

1040 *Beatriz Gimenez Cerezo†; Ty Emerson Schafer†; Cooper Jacob Wylie†*
Mentor(s): Matthew Lanham

1041 *Philip Edward Godette†*
Mentor(s): Panayota Y Mantzicopoulos-James

1042 *Lillian Grace Gogel†*
Mentor(s): Tzu-Wen Cross; Anna R Clapp

1043 *Paul Bradley Greenberg†; Juan Duarte Quiros**
Mentor(s): Andy Jung

1044 *Aramia Gutierrez†*
Mentor(s): Michael Douglas Johnson

1045 *Michael Louis Harrigan†*
Mentor(s): Jeffrey Edward Dick; Saptarshi Paul

1046 *Audrey Jean Heckel†*
Mentor(s): Andrew DeWoody

1047 *Amanda Joan Holmes†; Jacob Harlow Ehman‡*
Mentor(s): Ali Bramson

1048 *Jacob Charles Humphrey†; Dilay Aygun†; Huan Wen Mao†; Rakhmatillokhon Avazkhon u Abdubaev†; Hsun-Ti Chiang†; Charlita Sinmak†; Hao Tian Pang†; Ryan Prado Bailey†*
Mentor(s): Zhihong Chen; Joerg Appenzeller

1049 *Amanda Nicole Ibarra†*
Mentor(s): Panayota Y Mantzicopoulos-James

1050 *Levi M Johnson†*
Mentor(s): Kyle Timothy Faivre

1051 *Animesh Divekar Joshi†*
Mentor(s): Romila Pradhan

1052 *Christina Joslin†*
Mentor(s): Nadia Gkritza; Bruno cesar Krause moras

1053 *Shreyes Kanumuru†*
Mentor(s): Christopher Aaron Rice; Chenyang Lu

1054 *Daniel Ethan Kelley†*
Mentor(s): Craig Goergen; Cortland Hannah Johns

1055 *Puthimet Kitjaruwankul†; Chewon Yu Park†; Shrienidhi Gopalakrishnan†*
Mentor(s): Mark Johnson; Cole Aaron Nelson

1056 *Koon Joseph Klieopatinon†*
Mentor(s): Carla B Rosell

1057 *Ashwin B Kokate†*
Mentor(s): Carla B Rosell

1058 *Raina Kunder†; Christian Alexander Leidholm†; Bao Chau Chau Nguyen†; Alec Michael Walter†*
Mentor(s): Matthew Lanham

1059 *Ying Yui Lai†; Sean Prue†; Jackson Kent Thompson†; Zijing Zhang†*
Mentor(s): Matthew Lanham

1060 *Claire Anne LaVoie†; Conrad Sebastian Lin†; Ethan Christopher Marks†; Benjamin Albert Westreich†*
Mentor(s): Matthew Lanham

1061 *Michael Li†; Yash Singh†*
Mentor(s): Cole Aaron Nelson; Mark Johnson

1062 *Jessica Serena Jiayue Li†; Jingyu Xiao**
Mentor(s): Jinha Jung

1063 *Alen Santiago Lizarazo Osorio†; Felipe Ramirez Franco*; Yovani Garcia Munera**
Mentor(s): Jose M Garcia Bravo

1064 *Santino Basilio Macaggi†*
Mentor(s): Patrick James Cavanaugh; Jan-Anders E Mansson

1065 *Antonios Maniatis†; Rongbo Hu†; Leo Pearson Malachowski†*
Mentor(s): Timothy Francis Hein; Conor James Green; Mark Johnson

1066 *Kayla Elizabeth Manley†; Tanvir Kaur†; Madison Paige Ward†; Nishtha Singh†*
Mentor(s): Riley Bradley Barta

1067 *Adina Ioana Margineantu†; Mitchell Drew Finley†; Michael Vic Paulson†; Jishnu Ghosh†*
Mentor(s): Santosh Bhandari; Andreas Jung

1068 *Silvia Nathalia Martinez Calderon†*
Mentor(s): Rui Zhu

1069 *Vinay Sai Meda†; Tanishaa Shah†; Samitha Ranasinghe†; Tiana Yi Jen Lin†; Samantha Sudhoff†*
Mentor(s): Yung-Hsiang Lu; Yeon Ji Yun

1070 *Grant Joseph Miller†; Joshua Decker Buss**
Mentor(s): Yubo Song

1071 *Andrew Evan Modin†*
Mentor(s): Shubhanshu Agarwal; Rakesh Agrawal

1072 *Viswanath Jay Nair†; Sahil Maurice†; Oliver Joo Sung Johnson†*
Mentor(s): Matthew Lanham

1073 *Jillian New†*
Mentor(s): Yuk Fai Leung; Beichen Wang

1074 *Ji Bing Ni†*
Mentor(s): Junfei Li

1075 *Owen T Odney†*
Mentor(s): Abigail Polin

1076 *Sidney Nicole Panaretos†; Megan Elizabeth Hines†; Sydney D Anderson†; Haley Marie Morgan†; Alexis Ann Evans†*
Mentor(s): Casie S Bass

1077 *Joon Hong Park†; Pranav Punuru‡*
Mentor(s): Daisuke Kihara

1078 *Allison Renee Peterson†; Gwyneth Wong*; Emelia Koester**
Mentor(s): Stephanie M Gardner; Jillian Cornell

1079 *Rachel Pfeifer†*
Mentor(s): Sudip Vhaduri

1080 *Maria Pundik†; Chelsea Tinsley*; Kendal ZaiSi Tinsley**
Mentor(s): Clark C Addis; Andres Arrieta Diaz

1081 *Sarah Pushparaj†*
Mentor(s): Wenzhuo Wu

1082 *Jonathan D Putman†; Jacob Henning Deahl†; Bocheng Wang†*
Mentor(s): Matthew Lanham

1083 *Lea Nikole Quiroa Lopez†; Juan Pablo Melgar Feregrino†*
Mentor(s): Garam Kim; Eduardo Barocio Vaca

1084 *Felipe Ramirez Franco†; Alen Santiago Lizarazo Osorio*; Yovani Garcia Munera**
Mentor(s): Vijay Gupta

1085 *Architha Rao†*
Mentor(s): Carla B Rosell

1086 *Ruby Catalina Rodriguez Diaz†*
Mentor(s): Stephen B Goodwin

1087 *Alejandro Sebastian Sanchez Garza†; Cameron J Hartsfield†; Luis Carlos Nino Cabello†*
Mentor(s): Eduardo Barocio Vaca

1088 *Maharsh Bhavesh Shah†*
Mentor(s): Carla B Rosell

1089 *Elliott Shi†*
Mentor(s): Michelle Marian Garrison

1090 *Devin Singh†; Vidisha Singhal†; Michael Jeffery Dick†; Luca Renato Simoni†; Andrew Michael Lykken†*
Mentor(s): Cole Aaron Nelson; Mark Johnson; Jacob Chappell; Conor James Green

1091 *Nora Jacques Siri†; Andrew Earl Medlyn†; Joseph Talon Vesco†; Muhammad Rifqi Priatama Sambodo†; Albertus Magnus Ethanael Nusawardhana*; Dylan Richard McCool*; Brandon William Davis*; Nathan Jaekun Lee**
Mentor(s): Niall Patrick Moloney

1092 *Lawrence Folsom Smith†; Hyeonwoo Heo†; Joshua Peter LeBlanc†; Nathanael Aou†; Rohan Chandra Mudugere‡; Kyle John Massie‡*
Mentor(s): James C Davis

1093 *Nathaniel A Smith†*
Mentor(s): Dali Lai

1094 *Rebekah Marie Spieth†; Ashlyn Nichole Ann Denny†*
Mentor(s): Daniel William Oesterle; Christopher I Eckhardt; Niamh Christie

1095 *Patrick Randall Spillman†; David Wesley Thoe†; Aditya Verma†; Richard Ye†; Samuel Elijah Nadol†*
Mentor(s): Shreya Ghosh

1096 *Nolan Cai Tai†*
Mentor(s): Carla B Rosell

1097 *Austin Robert Tanabe†; Daniel Russell Cline†; Collin Jayson Kao**
Mentor(s): Kari L Clase; Aaron J Gin; Amanda K Limiac

1098 *Eduard Filip Tanase†; Aiden Hughes Sexton†; Alexander Thomas Aylward†; Cecilie Zhang†; Alexander Raffaele Ciccarelli†; Khanh Nam Nguyen†*
Mentor(s): Cole Aaron Nelson; Mark Johnson

1099 *Benjamin Anderson Tofil†; Gangsan Lee†; Brian Martin Dodd†; Neha Saleha†; Alexandre Chan Tome†; Cheong Eun Kim†; Sang Soo Ha†*
Mentor(s): Feichi Huang

1100 *Dhruv Upreti†*
Mentor(s): Alex Ruichao Ma

1101 *Daniel Urdaneta Giraldo†*
Mentor(s): Samira Piltan; Andrea L Kasinski

1102 *Paula Andrea Vargas Carranza†*
Mentor(s): Anthony Joseph Murphy; Jason Hanna

1103 *Malachi Israel Vincent†*
Mentor(s): Panayota Y Mantzicopoulos-James

1104 *Amber Voigtschild†*
Mentor(s): Roland Conrad Wilhelm

1105 *Natalia Vujic†*
Mentor(s): Yihao Chen; Gaurav Chopra

1106 *William Samuel Walker†; Abiram S Gurijala‡*
Mentor(s): Nachiket Vatkar; Wenzhuo Wu

1107 *Michelle Wan†*
Mentor(s): Stewart C Chang Alexander

1108 *Madison Paige Ward†*
Mentor(s): Riley Bradley Barta

1109 *Bruce Daniel Ward†; Rachel Pinto†*
Mentor(s): Jeffrey R Lucas; Jonathan B Jenkins

1110 *Emma Warnock†*
Mentor(s): Panayota Y Mantzicopoulos-James

1111 *Renzhi Yongtian†; Rauf Emre Erkiletlioglu‡; Tei Okamoto*; Weijing Sebastian Chen*; Anika Bajpai*; Aditya S Hebbani**
Mentor(s): Mark Johnson; Matthew A Swabey

1112 *Radman Tor Zarbock†*
Mentor(s): Philippe Pastor

1113 *Quqi Zhang†*
Mentor(s): Tanner James Ballance

1114 *Daniel Felipe Zuniga Hurtado†; Camilo Delgado Burbano‡*
Mentor(s): Young-Jun Son

# POSTER SESSION 2 | 10:30AM-11:30AM

1200 *Addison Nicole Acree†*
Mentor(s): Beth Elly Baumgartner

1201 *Colby Ben Acton†; Gaetano Antonio Iannotta†; Aditi Anand†; Branton Ling‡; Evan Alexander Zhang‡; Gaurish Lakhanpal‡; Michael Suo‡; Apostolos Adam Cavounis‡; Purav Matlia‡; Rohini Pillai‡; Ruhaan Batta‡; Samarth Prashanth‡; Shih-Yao Sun‡*
Mentor(s): Qiang Qiu; Wei Zakharov; Zichen Miao

1202 *Maria Paula Armenta†*
Mentor(s): Sebastien Helie

1203 *Tina Atmani†; Lana Malek†; Xiuyu Shi†*
Mentor(s): Kari L Clase; Ruba Ahmad Qwai Alajlouni; Amanda K Limiac

1204 *Olivia Eugenia Avalos Villar†*
Mentor(s): Carla B Rosell

1205 *Catalina Bautista Parra†*
Mentor(s): Greg M Michalski

1206 *Alexis Lucille Ador Bernal†; Manya Devang Kadiwala†*
Mentor(s): Kari L Clase; Julia Ann Simler; Amanda K Limiac

1207 *Joel Nicholas Berringer†*
Mentor(s): Panayota Y Mantzicopoulos-James

1208 *Dillon Seamus Blair†; Gabriel L Ponsot†; Filippa Maria Rodriguez Pinzon†; Colin Lucas Wellington†*
Mentor(s): Matthew Lanham

1209 *Livia Marie Bogdan†*
Mentor(s): Angeline M Lyon; Kadidia Samassekou

1210 *Ryan L Bottini†; Manila Kunwar‡*
Mentor(s): Nien-hwa L Wang; Clayton C Gentilcore

1211 *Pranav Boyapati†*
Mentor(s): Carla B Rosell

1212 *Luke Anthony Braun†*
Mentor(s): Panayota Y Mantzicopoulos-James

1213 *Bernardo Cabral Alves da Costa†*
Mentor(s): Carla B Rosell

1214 *Juan Pablo Camacho Arias†*
Mentor(s): Randolph Duane Hubach

1215 *Juan Pablo Cantu Erhard†; Robert Pedro Chambers†; Michael Poliakov†; Tomas Turner†*
Mentor(s): Matthew Lanham

1216 *Daniel Michael Carrel†*
Mentor(s): Brady Robert Layman; Jeffrey Edward Dick; Megan Leigh Hill

1217 *Hannah Carreon†*
Mentor(s): Jennifer Lynn Brown

1218 *Samuel Castro Martinez†*
Mentor(s): Torsten Reimer

1219 *Caroline Grace Chandler†; Vincent Simon Knizka‡*
Mentor(s): Ketaki A Mahurkar; Angeline M Lyon

1220 *Kevin Ming Chang†; Aditya Krishnan Sivathanu†; Samyukta Balaji**
Mentor(s): James G Ogg; Aaron C Ault

1221 *Ojas Chaturvedi†; Kayshav Bhardwaj†; Vincent Wentao Zhao†; Max Yu Zhen Chen‡; Luke Jaehyeon Choi*; Parv Kumar*; Minh Le Vu*; Minh Binh Tran*; Tri Quang Vo*; Pranesh S Velmurugan*; Andrew J Achkar*; Bryan Christopher Yoo**
Mentor(s): Yung-Hsiang Lu; Yeon Ji Yun

1222 *Yi-Huan Chen†; Ching-Hsiang Huang†*
Mentor(s): Shreya Ghosh

1223 *Daniel Choi†; Hassan Al-alawi†; Hunter A Mccollough†; Abhiram Saridena†; Viet Khoi Pham Khac†; Akhilesh Prasad†; Abhijay Achukola†; Kshitij Miraj Shah†; Phone Myat Paing†; Jerry Ronald Chen†; Justin Yasuumi†; Charles Spencer Bowles†*
Mentor(s): Sooraj Chetput Venkataraghavan; Mark Johnson

1224 *Easton Ludeman Clark†; Aidan P Pender†; Anshuman Samanta†*
Mentor(s): Niall Patrick Moloney

1225 *William Rowan Cunningham†; Kathy Niu†*
Mentor(s): Cole Aaron Nelson; Mark Johnson

1226 *Ronald Anton Cutler†*
Mentor(s): Julia Laskin; Bethany Ana Phillips

1227 *Alexis Nicole Daigle†*
Mentor(s): Michael Douglas Johnson

1228 *Bianca de Paula Macedo†*
Mentor(s): Karthik Sankaranarayanan; Olga Costa Alves Souza

1229 *Delaney Alexandra Doncer†*
Mentor(s): Jonathan Pasternak; Sarah M Innis; Alyssa Smith; Dayeon Jeon

1230 *Jacob Harlow Ehman†; Amanda Joan Holmes‡*
Mentor(s): Ali Bramson

1231 *Mahsa Farahani†*
Mentor(s): Ruben C Aguilar

1232 *Maximillian Francis Farrell†; Arnav Naval†; Matthew Alvarez Hackett†; Shreya Laxmi Nagendra†; Genna Nicole Yavaraski†; Jason Dumaual Lyst†; Tanek Malhotra†; Parth Kapila†; Aniruddh Srivastava†*
Mentor(s): Matthew A Swabey; Jaeeun Kim

1233 *Aiden Michael Fernandes†; Erwin Trong Luu†*
Mentor(s): Anthony Gabriel Mena

1234 *Ethan Phillip Foster†*
Mentor(s): Cortland Hannah Johns; Craig Goergen

1235 *Ethan Burke Fox†; Alexander Stephen Haynes‡*
Mentor(s): Daniel B Raudabaugh; Mary Aime

1236 *Alaina Rose Gartner†*
Mentor(s): Leonor Maria de Fatima Chagas Boavida

1237 *Aaditya Gaur†; Zay Linn Htet†; Christina Zhang†*
Mentor(s): Zijian He

1238 *Angelica Sofia Gonzalez-Ng†; Maria Macias‡; Tatiana Zuluaga Vargas**
Mentor(s): Madison Mckensi Howard; Luis Solorio

1239 *Gabriel Goodwin†*
Mentor(s): David D Nolte

1240 *Kaitlyn Nicole Gregerson†*
Mentor(s): Bridgette Kelleher

1241 *Bobby Gu†; Alexander Jonathan Collins†; Neal Noel Lobo†; Pratham Patil†; Dean Michael La Point†; Jeet Brahmbhatt†*
Mentor(s): Shreya Ghosh

1242 *Sofia Guevara Montoya†*
Mentor(s): Dimitrios Giannios; Zhaofeng Wu

1243 *Anjali Devi Gupta†*
Mentor(s): Bryan J. Duarte

1244 *Priyam Gupta†*
Mentor(s): Jenna L Wise DiVincenzo

1245 *Charlotte Marian Harkins†*
Mentor(s): Panayota Y Mantzicopoulos-James

1246 *Augustus George Hayes†*
Mentor(s): Carla B Rosell

1247 *Aditya S Hebbani†; Rauf Emre Erkiletlioglu‡; Tei Okamoto*; Weijing Sebastian Chen*; Anika Bajpai*; Renzhi Yongtian**
Mentor(s): Mark Johnson; Matthew A Swabey

1248 *Natalie Chyrystine Hoffman†*
Mentor(s): Brent Benjamin Bachman; Kimberly Kinzig

1249 *Brogan John-Michael Holt†; Jayee Goh†; Kaylie Emerson Virkus†; Shashank Varamballi†; Patricia Ewa Leoniuk†; Olivia Chen†; Gowri Ravikumar Bajagur†; Saanvi Mahesh†; Marina Mercedes San Martin Rossano†; Pradyumn Malik†; Shrikar Hippargi†; Isaac Yan Shek Cheng†; Jijnasu Prakash Rout‡; Atandrila Chowdhury‡; Ashton Anthony Price‡; Joseph Chelliah‡; James Burrell Hewette‡*
Mentor(s): John W Sheffield

1250 *Cho-Yi Hsieh†; Ho Jun Lee†; Cecilie Reingaard Wiuff†; Aidan Iachini Broy†; Jou-Ting Lai†*
Mentor(s): Peter Bermel; Zhiyuan Wei; Saeed Mohammadi

1251 *Marielle G Jackson†*
Mentor(s): Hilkka I Kenttamaa; Grace Emma Greene

1252 *Ritwik Suresh Jayaraman†; Aman Katyal†; Azain Khalid†; Chiraag Shashi Kumar†*
Mentor(s): Andres Felipe Hoyos Moreno; Samuel Labi

1253 *Madison Sofia Kauling†*
Mentor(s): Carla B Rosell

1254 *Tanvir Kaur†*
Mentor(s): Riley Bradley Barta; Kyle Allen Shepard

1255 *Sirish Meher Reddy Kayam†*
Mentor(s): Vanshika Gupta; Jeffrey Edward Dick

1256 *Shashwath Keta†; Alacya Madison Lynch†; Colin R Nixon†; Qixue Zheng†*
Mentor(s): Matthew Lanham

1257 *Junyoung Kim†; Christian A Choi†*
Mentor(s): Samuel Labi; Andres Felipe Hoyos Moreno

1258 *Yumin Kim†; Ryan Matthew Yatco Wong†; Adam James Smith†; Alexander Thomas White†*
Mentor(s): Matthew Lanham

1259 *Alexander Kmetko†; Jonah P Lovitz†; Joseph John Forster†; Chase Nicholas Hamdan†*
Mentor(s): James Michael Goppert

1260 *Kylie M Lachapelle†; Saheli Minesh Parikh†; Aditya Ujwal‡; Simon Paul Mitchell‡; Megan E Power‡; Nithin Krishna Veeramasuneni‡*
Mentor(s): Kathryn Frances Dilworth

1261 *Ray Wai-Keung Lai†*
Mentor(s): Zhong-Yin Zhang; Jinmin Miao

1262 *Gabrielle Elizabeth Layman†; Shlok Rajesh Kulkarni†; Zachary Traina†*
Mentor(s): Jeffrey M Haddad

1263 *Declan Leaird†; William Isaiah Need**
Mentor(s): Hannah Elise Starr

1264 *Elliana Rose Lemberis†; Nadia Helen Whalen†*
Mentor(s): Somali Chaterji

1265 *Yinuo Liu†; Shreya Magantí†; Anisha Kumar†; Yash Handa†*
Mentor(s): Matthew Lanham

1266 *Anna Judy Lozen†*
Mentor(s): Ximena Bernal; Richa Singh

1267 *Nachiket Magesh†*
Mentor(s): Qi Dong; Abhirup Sen

1268 *Kayla Elizabeth Manley†; Tanvir Kaur*; Nishtha Singh*; Madison Paige Ward**
Mentor(s): Riley Bradley Barta; Kyle Allen Shepard; Ganesh Brammanayagam venkatesan

1269 *Stan Melkumian†*
Mentor(s): Jacob Robert Montrose; Garam Kim; Timothy D Ropp

1270 *Ivan Mateo Meneses Rivera†*
Mentor(s): Aishwarya Vijayan Menon; Julie C Liu

1271 *Andres Felipe Monsalve Arango†*
Mentor(s): Hannah M Woods

1272 *Mariana Moreano Acevedo†*
Mentor(s): Darcy E P Telenko

1273 *Thomas Munson†; Maxwell Christopher Sprague†; Nathan Alexander Kilmer†; Alec Chong Peng†*
Mentor(s): Timothy Francis Hein

1274 *Khanh Ha Nguyen†*
Mentor(s): Sandro Matosevic; Soumyajit Das

1275 *Ogechukwu Veronica Nnatubeugo†*
Mentor(s): Panayota Y Mantzicopoulos-James

1276 *Isis Atenea Ocegueda Medina†*
Mentor(s): Catherine L Searle

1277 *Rafael Obici de Oliveira†*
Mentor(s): Carla B Rosell

1278 *Mia Cynthia Pfeiffer†; Anne Flynn Campbell†; Collin Jayson Kao‡*
Mentor(s): Kari L Clase; Julia Ann Simler; Amanda K Limiac

1279 *Brooke Allison Pilkey†; Shreya Joshy‡*
Mentor(s): Rebecca Lynn Leuschen-kohl; Anjali Iyer-Pascuzzi; Stephen R Lindemann; Rwivoo Baruah

1280 *Katherine Alfreda Poirier†; Lauren Elizabeth Bhat†; Lauren Marie Schinker‡*
Mentor(s): Kari L Clase; Somali Chaterji; Julia Ann Simler; Amanda K Limiac

1281 *Aakarsh Nagendra Rai†; Donald Alexander Weintz†; Jianing Wang†; Aditya Mallepalli†; Preetham Reddy Yerragudi†*
Mentor(s): Edward J Delp; Carla Zoltowski

1282 *Ana Carolina Ramirez Gonzalez†*
Mentor(s): Greg M Michalski

1283 *Miranda Ramos Campos†*
Mentor(s): Thaisa M Cantu Jungles

1284 *alexander Ramsey†; Rachel Elizabeth Michaelis†*
Mentor(s): Karen A Hudson; Militza Carrero-Colon

1285 *Atharva S Rao†; Moeyad OmerAbdalla Omer†; Avanish Karlapudi†; Dogyu Ryu†*
Mentor(s): Om P Kotwal; Vishnu Chaithanya Lagudu; Isaac P Hagedorn

1286 *Utkarsh Rastogi†*
Mentor(s): Carla B Rosell

1287 *Partha Rathi†; Dat Hien Tieu†; Jason Zhengxuan Huang†; Cassandra Lobo Gonzalez†; Kai Ye†*
Mentor(s): Kevin T Lee

1288 *Collin Thomas Reagin†*
Mentor(s): Regan Michelle Honeycutt

1289 *Elizabeth G Ruckle†; Ceylon Michelle Wargo†*
Mentor(s): Inna Abramova

1290 *Adam Jair Selby†*
Mentor(s): Junfei Li

1291 *Ranav Sethi†; Robert M Rattray†; Rohit Kannan†; Ping-Hung Nick Ko†*
Mentor(s): Yeon Ji Yun; Yung-Hsiang Lu

1292 *Ace Setiawan†; Leila Nicole Yee†; Ethan Broderick Gartner†; Ryan Andrew Leighton†*
Mentor(s): Matthew Lanham

1293 *Aarav Singh†*
Mentor(s): Carla B Rosell

1294 *Thomas Anthony Slamecka†*
Mentor(s): Jeffrey Miles Gerber

1295 *Elizabeth Soller†; Priscilla Amaya Gallardo†*
Mentor(s): Bridgette Kelleher; Wei Siong Neo

1296 *Sara Thomason†; Zhiyuan Chen†*
Mentor(s): Kari L Clase; Julia Ann Simler; Amanda K Limiac

1297 *Gaurav Vermani†; Ryan Alexander Kubinski†*
Mentor(s): Aravind Machiry; Shashank Sharma; Ayushi Sharma

1298 *Jingyu Xiao†; Jessica Serena Jiayue Li‡*
Mentor(s): Jinha Jung; Fatemeh Azimi

1299 *Jeslyn Cheng Yang†; Brian Ross Ramos†; Angela Qian†; Jacob Ray Morales†; Ramsey Daniel†; Alessandra Rice†*
Mentor(s): Soudabeh Taghian Dinani; Carla Zoltowski; Zheyuan Zhang; Edward J Delp

1300 *Ryan Zhe-Wei Yang†*
Mentor(s): Carla B Rosell

1301 *Yao Yao†; Ramsey David Frederick Miller†*
Mentor(s): Jennifer Lynn Brown; Luis A Gomez; Stephen Allan Paul Beegle; McKalaih Elizabeth Legault

1302 *Vicky Zheng†*
Mentor(s): Suilan Zheng

## West Point Presentations (*in collaboration with the Purdue Military Research Institute*)

1303 *Isaac Folorunso†*
Mentor(s): John Borger

1304 *Bryan Frost†*
Mentor(s): John Borger; Andrew James Banko

1305 *Owen Hodges†; Keiko Yamamoto**
Mentor(s): Joseph Speight

1306 *Jacob Hyatt†*
Mentor(s): James Grymes

## SCALE Heterogeneous Integration and Advanced Packaging (HI-AP) Presentations

1307 *Caroline Marie Cameron†*
Mentor(s): Shubhra Bansal; Jakob Isaiah Ramos

1308 *Ethan Christian Christie†*
Mentor(s): Shubhra Bansal; Huilong Liu; Bijay Chhetri

1309 *Luke Joseph Fortner†*
Mentor(s): Muhammad A Alam; Md Asaduz Zaman Mamun

1310 *Siddharth Gaur†; Franco Harding Garcia†*
Mentor(s): Saeed Mohammadi

1311 *Parker Joseph Jeffrey†*
Mentor(s): Shubhra Bansal; Faharia Hasan Bhuiyan; Haohan Guo

1312 *Alexander Hanson Lam†*
Mentor(s): Ketankumar Jayantkuma Yogi

1313 *Ho Jun Lee†; Geetika Chitturi†*
Mentor(s): Haitong Li; Jun Cai

1314 *Colton Pierce Lennen†; Caleb Michael Braziel**
Mentor(s): Lijia Xie; John E Blendell

1315 *Ian Quan†*
Mentor(s): Tiwei Wei; Ketankumar Jayantkuma Yogi

1316 *Ethan Xinghan Tan†*
Mentor(s): Saeed Mohammadi

1317 *Mark Joseph Tereck†*
Mentor(s): Shubhra Bansal; Bijay Chhetri

# POSTER SESSION 3 | 12:00PM-1:00PM

1400 *Yaqeen Al Futaisi†; Peter Abernethy Krivacka†; Elijah Robert Windle†; Kuiyan Zhao†*
Mentor(s): Matthew Lanham

1401 *Omar Haytham Al Husseini†; Qeren Isabella-Nailah Blakey†; Olivia Francis Hojnicki†; Marshall Alex Prince†*
Mentor(s): Matthew Lanham

1402 *Achyuth Balram Ambady†; Harshini Malarvannan†; Arnav Singh†; John Martin Strabala†*
Mentor(s): Matthew Lanham

1403 *Kaitlyn Marie Annunziata†*
Mentor(s): Daniel B Raudabaugh; Mary Aime

1404 *Yash Rajendra Ashtekar†; Utkarsh Bali†*
Mentor(s): Pengyi Shi

1405 *Nihar Pushkar Atri†*
Mentor(s): Madhumathi Ponnusamy; Shan Zhou; Gaurav Nanda

1406 *Ekam Bhullar†*
Mentor(s): Carla B Rosell

1407 *Nicolo Roberto Chuapoco Biscocho†; Ryo Hasegawa†; Emeline Marie Papp†; Elliot Joseph Surnamer†*
Mentor(s): Matthew Lanham

1408 *Caleb Zachariah Brunton†; Nelson A Paguada†; Neha A Venkatraman†*
Mentor(s): Matthew Lanham

1409 *Jose Jorge Bueso†; Mia Claire Dunsmore†; Mitchell Louis Rittman†; Olivia Kylie Troy†*
Mentor(s): Matthew Lanham

1410 *Joshua Decker Buss†; Grant Joseph Miller**
Mentor(s): Tiwei Wei

1411 *Zhixin Cai†; Keith Meyers**
Mentor(s): Kristen Marie Bellisario; Christine Harrison Elliott

1412 *Gael Calderon Sermeno†; Reese Caroline Pinkley‡*
Mentor(s): Stewart C Chang Alexander

1413 *Evan James Campbell†; Delaney Alexandra Doncer*; Megan Grace Ashby**
Mentor(s): Jonathan Pasternak; Sarah M Innis; Dayeon Jeon; Alyssa Smith

1414 *Aniket Chatterjee†*
Mentor(s): Mark Johnson; Cole Aaron Nelson

1415 *Yu-Wei Cheng†*
Mentor(s): Ximena Bernal; Richa Singh

1416 *Arunima Chowdhury†; Marisa Jean Fredrickson†; Aryan Kaul†; Amber Kuoiwa Khauv†; Hridhay Monangi†; Dean Snyder†; Sophia Elizabeth Steele†; Taryn Celia Zakrzewski†; Matthew Dharma Kurniawan†; Mark Alexander Myers‡; Aaron Parihar‡; Kyle Patrick Fox‡; Daitian Zhao‡*
Mentor(s): Renee Murray; Frederick C Berry

1417 *Amiah Bailey Clevenger†*
Mentor(s): Wonki Lee; Nathan Mentzer; Andrew Jackson; Scott Ronald Bartholomew

1418 *Gisselle Cordoba†*
Mentor(s): Kathryn Jean LaRoche

1419 *Felipe da Paixao†*
Mentor(s): Shreya Ghosh

1420 *Aryan Daga†*
Mentor(s): Carla B Rosell

1421 *Leo Deng†; Chien Chou Ho†; Rishi Mantri†; Arjun Sandeep Gupte†*
Mentor(s): James C Davis; Huiyun Peng

1422 *Dhruv Vishal Dhawan†*
Mentor(s): Chao Cai

1423 *Abigail J Dressman†*
Mentor(s): Sunghee Park

1424 *Prakhar Droliа†*
Mentor(s): Carla B Rosell

1425 *Tatum Reese Ebbeskotte†; Sophie Kaitlyn Stahl**
Mentor(s): Leanne Nieforth

1426 *Kyle Steven Emgenbroich†; Marco Ryan Bravo†; Orion Matthew Barrett-Tzannes†; Hunter McCormick Danton†*
Mentor(s): Matthew Lanham

1427 *Keeley Vonne Farmer†*
Mentor(s): Jeffrey Edward Dick; Dane Christophe Wagner; Mobina Masdari

1428 *Evelyn Hanson Frank†; Jacoba Marlene Babin†*
Mentor(s): Bridgette Kelleher; Lyndsey Nicole Graham

1429 *Raul Hector Fuentes Hernandez†; Ivan Gregorio Vega Campas†*
Mentor(s): Eduardo Barocio Vaca; Jalil Francisco Francisco Chavez Galaviz

1430 *Anaelle Gackiere†*
Mentor(s): Christopher I Eckhardt; Daniel William Oesterle

1431 *Daniel Robert Gallagher†; Ronak Bhagia†; Mansi Shakalya†; Huei Syuan Chiang†*
Mentor(s): Matthew Lanham

1432 *Justin Zijie Gan†; Sahithi Gokavarapu†; Pranati Patchigolla†*
Mentor(s): Andres Felipe Hoyos Moreno; Samuel Labi; Richard Osita Ajagu

1433 *Arya Garg†; Yujie Huang†; Aryaa Madan†; Ethan Brian Kobylinski†*
Mentor(s): Matthew Lanham

1434 *Kush Gogia†; Christopher Michael Sigmund†; Ilhoon Lee†*
Mentor(s): James C Davis

1435 *Saloni Gupte†*
Mentor(s): Hayagreev Vadhiraj Sarma Keri; Scott R Pluta

1436 *Bek Hamelin†*
Mentor(s): Andrew T Flachs

1437 *Bennett Michael Hanan†; Margulan Mukhametkarim†; Benjamin Harris Cilibertо†; Ridge McCain Blankenship†; Alexander T Valdes‡; Nicholas Keir Wade‡; Andrew Joseph Shelley‡; Alexander Kmetkо‡; Liam M Mccormack‡*
Mentor(s): Brittany A Newell; Richard M Voyles; Samuel Labi

1438 *Mya E Hardin†; Ryan Michael Sagendorph†; Christina Wan†; Peregrine Zhang†*
Mentor(s): Matthew Lanham

1439 *Nolan Lee Hardman†; Jacob Henry Rikkola†; Adrienne Dale Torres Balahadia†; Bader Emad Abu-Shanab†; Zilan Patel†; James M Scanlan†; Aaditi Anupam Vaval†*
Mentor(s): Afshin Izadian; Christine Taylor; Arvind Krishna Radhakrishnan

1440 *Michaela Danielle Headlee†*
Mentor(s): Michael Douglas Johnson

1441 *Ian William Hedges†; Somin Yang†; Kyle Anthony Fernandez†; Mackenzie Elizabeth Arnish†*
Mentor(s): Matthew Lanham

1442 *Hailey Choi Hiatt†*
Mentor(s): Hannah Elise Starr

1443 *Katie Luo Hong†; Sierra Hunnicutt‡; Abigail Rose Malott‡; Antonia Christina Alexiou*; Sabrina Michelle Hardy*; Vaishnnavi Purram**
Mentor(s): Kristen Marie Bellisario

1444 *Sarah Elizabeth Kady†*
Mentor(s): Michael Douglas Johnson

1445 *Roma Nandan Kamat†*
Mentor(s): Daniel J Foti; Roslyn B Harold

1446 *Colin Francis Kelly†*
Mentor(s): Melanie M. Beasley

1447 *Azain Khalid†; Jack Harrison Reynolds†; Kushal Venkata Peddakotla†; Aiden M Hudson†; Bailey Marie Jones†*
Mentor(s): Robin Carpenter; Andy Jung

1448 *Devansh Khandelwal†; Dinh Huy Tuan Nhu†; Arnav Daryani†; Jeffrey Jingwei Wu†*
Mentor(s): Edward J Delp; Carla Zoltowski

1449 *Seeun Kim†*
Mentor(s): Dali Lai

1450 *Jolie Grace Klimczak†*
Mentor(s): Emma Maggart

1451 *Anna G. Klupshas†*
Mentor(s): Jan-Frederik Schulte

1452 *Tess Elaine Korte†*
Mentor(s): Michael Douglas Johnson

1453 *Linnaea Eileen Krupke†*
Mentor(s): Kimberly Kinzig

1454 *William Lee†*
Mentor(s): Junfei Li

1455 *Laurian Kate Lien†*
Mentor(s): Kurt Ristroph; Lucas Johnson

1456 *Wesley Matthew Lin†*
Mentor(s): Cody Juguilon

1457 *Emily Loiselle†; Joseph Huang†; Nandini Mukul Pande†; Rahul Sasi Menon†; Chaeeun Kim†*
Mentor(s): Edward J Delp; Carla Zoltowski; Fengqing Zhu

1458 *Alberto Lopez Martinez Rojas†; Anna Alysse Kavanaugh†*
Mentor(s): Mark R Christie

1459 *Adam Timothy Mack†*
Mentor(s): Muhammad A Alam

1460 *Elias Malak†; Taran Reddy Kamireddy†; Nicholas John Albrecht‡; Nadia Bailen Boluda‡; Samarth Bhat‡; Cooper Lee Cotton‡; Lara Nour Courgi‡; Luke Davis‡; Tamara Shakri Houran‡; Pratika Kumar‡; Jakob Eric Mikolajczyk‡; Gema Roselyn Parra‡*
Mentor(s): Ken Yoshida; Steve Higbee

1461 *Eleanore Margaret Malinowski†*
Mentor(s): Clint C S Chapple; Chase Taylor Hearn

1462 *Hannah Jordan Margulis†*
Mentor(s): Frederick Prete

1463 *Grayson Montgomery McCard†*
Mentor(s): Jennifer Lynn Brown; Luis A Gomez; Stephen Allan Paul Beegle

1464 *Mihir Menon†; Albert Joseph Burton†; Varun Anand†; Owen Kenneth Schafer†*
Mentor(s): Matthew Lanham

1465 *Leah Margaret Miles†; Jessica Susan Wallace†*
Mentor(s): Panayota Y Mantzicopoulos-James

1466 *Rafael Monteiro Martins Pinheiro†; Miguel Isrrael Teran†*
Mentor(s): Mark Johnson; Timothy Francis Hein

1467 *Ishita Mukadam†*
Mentor(s): Mrudula Mukadam

1468 *Iris Georgina Ocegueda Medina†*
Mentor(s): Vikki Marie Weake

1469 *Tovia Grace Owens†*
Mentor(s): Rose Prabin Kingsly Ambrose

1470 *Caroline Rhea Packee†; Emma Swanson†; Avery Grace Brubaker†; Evan Graham Coblentz‡*
Mentor(s): Monica Kasting; Shandey Derisa Malcolm; Samantha L. Ky

1471 *Aadya Pandey†*
Mentor(s): Andrea L Kasinski; Samira Piltan

1472 *Kiersten Mackenzie Penquite†*
Mentor(s): Lisa B Bosman

1473 *Marili Carmen Perez†; Aryan Pratik Kodial†; Cole Bushell†; James William Pope†*
Mentor(s): Matthew Lanham

1474 *Sophia Pirela†*
Mentor(s): Annabel Biruete

1475 *Sadie A Poirier†; Yashvi Choudhary‡*
Mentor(s): Vanshika Gupta; Jeffrey Edward Dick

1476 *Jeeranun Poopanead†*
Mentor(s): Lisa B Bosman

1477 *Sudarmadhi Rabindran†*
Mentor(s): Alexey Shashurin; Steven M Pugia; Keegan Franics Chavez

1478 *Ana Elena Pasion Rojas†*
Mentor(s): Stewart C Chang Alexander; Pamela Sari

1479 *Braxton J Schieler†*
Mentor(s): Leanne Nieforth

1480 *Sarah Schloff†*
Mentor(s): Dianne Little; Paula A Sarmiento Huertas

1481 *Sophia Isabella Schroer†*
Mentor(s): Tiwei Wei

1482 *Sofia Schumann†; Dia Dipen Jhaveri‡*
Mentor(s): Jason R Cannon; Reeya Tanwar; Fatema Mustafa Currim

1483 *Sydnie Alexandria Scozzaro†*
Mentor(s): Matthew Olson; Nicole L Anderson

1484 *Hallie Grace Seasor†*
Mentor(s): Carla B Rosell

1485 *Dylan Wade Seets†*
Mentor(s): Darrin M Karcher; Sara Elizabeth Cloft

1486 *Sarah Michelle Sewell†; Leo Chen†; Sun Hong H Park†; Ata Ulas Guler†; Rachel Wingyan Ho†*
Mentor(s): David Michael Barbarash

1487 *Samantha Marcelle Sima†*
Mentor(s): Joshua Michael Cox; Riley Bradley Barta

1488 *Tamir Sklansky†; Timber Michael Bionda†; Elijah Temesgen Ponds†; Ron Cheng Xuan Chay†; Robert Henry Walch†*
Mentor(s): Niall Patrick Moloney

1489 *Dhruv Soni†*
Mentor(s): Kristen Marie Bellisario

1490 *Robert Allan Soohey†*
Mentor(s): Michael Douglas Johnson

1491 *Anna Marie Sorg†*
Mentor(s): Alexander Baena; D. Marshall Porterfield

1492 *Christina Michelle Sowinski†*
Mentor(s): Ali Bramson; Santa Lucia Perez Cortes

1493 *Caroline Marie Sponhauer†; Brycen Jesse Baldwin†*
Mentor(s): Kathryn Seigfried-Spellar

1494 *Robert Patterson Stewart†; Isaiah Maningas†; Jason Jaesung Lew†*
Mentor(s): Eduardo Barocio Vaca

1495 *Amrit Subramanian†; Ariana Raquel Morton*; Luke Harrison Huff*; Nathan Joel Benjamin*; Eliana Raina Romero*; Mary Clare Schofield*; Ethan Thomas Stark**
Mentor(s): Christopher R Agnew

1496 *Meghna Swaminathan†; Juan Pablo Loaiza Ramirez‡*
Mentor(s): Torsten Reimer

1497 *Benjamin Thomas Sykes†; Rohin Rajesh Nair†; Emily Song†; Aroldo Fernando Lugo Quintanilla†; Alexander Popescu†; Shreya Shrikrushna Pulujkar†*
Mentor(s): Samuel Labi; Sashank Modali; Richard Osita Ajagu

1498 *Tatiana Varela†; Pranav Singh†; Ananya Prasad†; Lainie Jane Rapp†; Colby Strohl†; Bella Irma Schaetzle†; Clara Marie Anne Goffioul†; Simran Nadig†; Praneel Madhuvanesh‡; Nathanael Adrian Lorincz‡*
Mentor(s): Tyler N Tallman

1499 *Nathaniel Thomas Waninger†*
Mentor(s): Michael Douglas Johnson

1500 *Jack William Ev Weston†*
Mentor(s): Nielsen Pereira; Tugce Karatas

1501 *Gwyneth Wong†*
Mentor(s): Indranil Arun Mukherjee

1502 *Yun-Jen Wu†; Isabel Alejandra Arias Zambrano†; Jenna Marie Marquette†; Jack Valenti†; Henry Qin†*
Mentor(s): Saeed Mohammadi; Peter Bermel; Tiwei Wei; Rahim Rahimi

1503 *Yilin Xu†; Eshan Mathur†; Atharva Umesh Bhide†; Armaan Kanchan†*
Mentor(s): Johnathan Hong; Cole Aaron Nelson

1504 *Yage Zhang†*
Mentor(s): Panayota Y Mantzicopoulos-James

1505 *Francille Zhuang†*
Mentor(s): Jennifer Scheuer

## SCALE Heterogeneous Integration and Advanced Packaging (HI-AP) Presentations

1506 *Brendan Duffy†; Hannah Y Chun*; Rongkai Yu**
Mentor(s): Sean Yenyu Lai; Ganesh Subbarayan

1507 *Jack Rearden Ferlazzo†*
Mentor(s): Xianfan Xu; Ishat Raihan Jamil

1508 *Nolan Parker Gronowski†*
Mentor(s): Ritwik Vijaykumar Kulkarni; Amy M Marconnet

1509 *Remley Grace Hooker†*
Mentor(s): Peide Ye

1510 *Robert Scott Richards†*
Mentor(s): Liang Pan

1511 *Jonathan Samuel Ryan†*
Mentor(s): Justin Weibel

1512 *Allison Nobuko Scher†*
Mentor(s): Haiyan Wang; Benson Qun Tsai; Jialong Huang

1513 *Lindsay Kathryn Sutherland†*
Mentor(s): Amy M Marconnet; Shanmukhi Sripada

1514 *Bradon Rowan Timms†*
Mentor(s): Thomas Edwin Beechem; Walter J Smith

1515 *Kyle J Wiegand†*
Mentor(s): Shubhra Bansal

1516 *Noah James Willis†*
Mentor(s): Amy M Marconnet; Luz Sotelo

# POSTER SESSION 4 | 1:30PM-2:30PM

1600 *Jessica Josephine Adams†; Charis Abigail Armstrong†; Camden Jeffrey Love†*
Mentor(s): Aparajita Jaiswal; Devang Atul Patel

1601 *Ishaan Krishna Agrawal†; Aaron David Slamovich†; Elle S Case†; Maxim Nickolas Yamilov†*
Mentor(s): James Garrison; Jordan Joseph Alexander

1602 *Eva Catherine Albrecht†*
Mentor(s): Carla B Rosell

1603 *Alex James Alonzo†; Jennifer Caraballo‡*
Mentor(s): Shalini T Low-Nam; Joy Wu; Vinay K Menon

1604 *Jaden R Azar†; Darren Ng†; Jari L Warner†*
Mentor(s): Matthew Lanham

1605 *Amartya Bagchi†*
Mentor(s): Carla B Rosell

1606 *Ava Grace Barnes†*
Mentor(s): Leonor Maria de Fatima Chagas Boavida

1607 *Hannah Grace Barsoum†*
Mentor(s): Michael Douglas Johnson

1608 *Sarah M Bennett†*
Mentor(s): Qixin He; Pavel Borisovich Klimov

1609 *Leyton Drew Bostre†; Michael Robert Knaack†; Samyukta Balaji†; Aditya Krishnan Sivathanu‡; Kevin Ming Chang‡*
Mentor(s): James G Ogg; Aaron C Ault

1610 *Caleb Buening†*
Mentor(s): Leanne Nieforth

1611 *Ru Yi Cai†; Anurag Koripalli†; Christopher Raymond†*
Mentor(s): Matthew Lanham

1612 *Siddarth Balaji Calidas†*
Mentor(s): Vishnu Chaithanya Lagudu; Isaac P Hagedorn; Mark Johnson

1613 *Gabriel John Carlson†; Sanjay Kandadi†; Natasha Lynn Kiel†; Rixi Zeng†*
Mentor(s): Matthew Lanham

1614 *Wyatt Tristan Carter†*
Mentor(s): Jean A Chmielewski; Anna Pavlishchuk

1615 *Ana Victoria Castro Herrera†*
Mentor(s): Dutt Jagdish Thakkar

1616 *Harnoor Cheema†; Jacob Chappell‡*
Mentor(s): Mark Johnson; Timothy Francis Hein

1617 *Susan Chen†; Maddie Jo Musser†; Himanshu Niraj Sethia†; Shuoming Yu†*
Mentor(s): Matthew Lanham

1618 *Piyush Dnyaneshwar Chhallare†*
Mentor(s): Bishnu Prasad Belbase; Arnab Banerjee

1619 *Andres Carlos Corona†*
Mentor(s): Michael Douglas Johnson

1620 *Ashton Isaiah Cotton†*
Mentor(s): Taimoor Hasan Qazi

1621 *Tishia Talia Darmawan†*
Mentor(s): Olga Lyanda-Geller

1622 *Maria Fernanda Delgado Taboada†*
Mentor(s): Natalia Doudareva; Matthew Edward Bergman

1623 *Sarah Z Deniz†*
Mentor(s): Kendrick Clay Hardaway

1624 *Aryaman Dewan†; Malyka Ram†; Priyanshu Datta Roy†; Rishabh Kottakota**
Mentor(s): Uma K Aryal

1625 *Harman Kaur Dhillon†; Madison Taylor Beaudry†; Collin Hoffman†; Rohan Suraj Desai†; Aditya Sarwaikar‡; Alexander David Perry‡; Aryana Isabelle Deshpande‡; Christopher David Butler‡; Tryston Frederick Espiritu‡; Junhee Lim‡; Weijing Sebastian Chen‡; Logan Paul Hussein‡*
Mentor(s): James Michael Goppert

1626 *Sabina Kaur Dhindsa†*
Mentor(s): Panayota Y Mantzicopoulos-James

1627 *Brandon Michael Dries†; Yalan Mai†; Aidan Daniel Manickam†; Michelle Zi Jun Pan†*
Mentor(s): Matthew Lanham

1628 *Vatsal Sanjeevkumar Dudhaiya†; Tingyu Yin†*
Mentor(s): Marco Hadisurya

1629 *Alexandra Sophia Finlayson†*
Mentor(s): Kathryn Jean LaRoche

1630 *Isabella Marie Ford†; Elissa Maria Finnessy†*
Mentor(s): Kathryn Jean LaRoche

1631 *Natalia Brynn Gaffney†; Leilani Grace Agngarayngay†; Alexis Lucille Ador Bernal‡*
Mentor(s): Kari L Clase; Julia Ann Simler; Amanda K Limiac

1632 *Renato Mauricio Gardella†*
Mentor(s): Michael Douglas Johnson

1633 *Mahineer Ghosh†; Varun Rajesh†; Makeda Teshome Duey†; Ansh Alpesh Kothari†*
Mentor(s): Jesus Adrian Meza Galvan; Steven M Pugia; Anthony G Cofer; Alina Alexeenko

1634 *Sarah Elizabeth Grev†; Samantha Stebbings*; Jake Anthony Castro*; Nadia Hayes Wheeler**
Mentor(s): Craig Goergen; Elnaz Ghajar-Rahimi

1635 *Aakrit Gupta†*
Mentor(s): Carla B Rosell

1636 *Laura Evelyn Harriss†; Ian McGill†; Elizabeth Darlene Gray†*
Mentor(s): Aparajita Jaiswal

1637 *Abigail Marie Higgins†; Arshia Bhuvana Rama†; Lauren M Hopkins†*
Mentor(s): Lara Nicole Balian; Rebecca A Ziolkowski; Natalia Maria Rodriguez

1638 *Margaret Sarah Holcomb†*
Mentor(s): Matthew Olson

1639 *Julia Hopper†; Jack Rearden Ferlazzo†; Ashley Jo Schafer†; Vidya Reddy Madana‡*
Mentor(s): Aparajita Jaiswal

1640 *Sierra Hunnicutt†; Antonia Christina Alexiou†; Katie Luo Hong*; Abigail Rose Malott*; Sabrina Michelle Hardy**
Mentor(s): Kristen Marie Bellisario

1641 *Evan Mcpherson Hunt†; Jiwon Christopher Moon†; Christopher David Pontious†; Aochuan Shen†*
Mentor(s): Matthew Lanham

1642 *Rachel Marie Isaac†*
Mentor(s): Brian Patrick Ha Metzger

1643 *Rishi Krishnan Iyer†*
Mentor(s): Carla B Rosell

1644 *Lauren Elizabeth Johnson†; Bethany Ruth Remian‡; Nicholas Ryan Borders‡*
Mentor(s): Kenneth D Ridgway; Brandon Matthew Keough

1645 *Arnav Juneja†*
Mentor(s): Carla B Rosell

1646 *Akshith Karri†*
Mentor(s): Abigail Polin

1647 *Emma Frances Kay†; Ella Rose Deanne Chianis‡*
Mentor(s): Brittany Lee Allen-Petersen; Claire M Pfeffer; Brittany Nicole Heil

1648 *Alexander G Kelley†*
Mentor(s): Kaitlyn T. Hood

1649 *Robert Jake Kennedy†*
Mentor(s): Michael Douglas Johnson

1650 *Sreesha Vedavalli Kidambi†; Jamie Youngjin Cho†; Jason England Thiagarajan†*
Mentor(s): Kari L Clase; Ruba Ahmad Qwai Alajlouni

1651 *Seeun Kim†*
Mentor(s): Minh Nam hoang Nguyen; Junfei Li

1652 *Erik Kocinare†; Thomas Allen Greer†*
Mentor(s): Archana Dharanipragada

1653 *Yen-Hsi Lai†*
Mentor(s): Omobukola Otoise Usidame

1654 *Andrew James Larkins†; Connor Ethan Behrend†; Michael Lee†*
Mentor(s): Burkay Sahin; Jingbo Wang; Mark Johnson

1655 *Jordan Larson†; Vitor Limas Schein†; Justin Harrison Rothenberg†; Tyler Mitchell†; Aneesh Sai Katkam†*
Mentor(s): Andy Jung; David Alan Ruiter; Santosh Bhandari

1656 *Kyung Jun Lee†; Chun-Kang Huang†; Daeun Kim†; Tzu-Yun Liu†*
Mentor(s): Peter Bermel; Mukerrem Cakmak; Saeed Mohammadi

1657 *Chi Lin†; Aruneeth Ranjan Sil†; Sanjana Chinthalapalli Mohan†*
Mentor(s): Matthew Lanham

1658 *Leo Pearson Malachowski†; Bridget Katherine Heindl†; Ayden Timothy Fahey‡; Jennifer Lilian Yang‡*
Mentor(s): Jason Ware

1659 *Abigail Rose Malott†; Katie Luo Hong*; Sierra Hunnicutt*; Sabrina Michelle Hardy*; Lukas Benjamin Kraft**
Mentor(s): Kristen Marie Bellisario

1660 *Charles W Mann†; Ananyaa Chaitanya Baindur†*
Mentor(s): Philip S Low; Mahesh Kumar Rao Yelineni

1661 *Alex Mauricio Marin Villanueva†*
Mentor(s): Dutt Jagdish Thakkar

1662 *Anika Mathur†; Jiwon Seo†; Samskrithi Sivakumar†; Charles Chen†; Sein Kim†*
Mentor(s): Brett A Meyers; Pavlos Vlachos; Lauren Ann Metskas

1663 *Keith Meyers†; Zhixin Cai**
Mentor(s): Kristen Marie Bellisario; Christine Harrison Elliott

1664 *Maggie Brinn Miller†; Divya Tarika Durai†*
Mentor(s): Sarah Eason; Salvador Roberto Vazquez; Siqi Zhang

1665 *Ashley Zaira Mohammed†*
Mentor(s): Lavanya Reddivari; Heather R Milliron

1666 *Kamanda K Mosongo†*
Mentor(s): Caroline Kathure Marete

1667 *Piotr Stanislaw Nabrzyski†; Keegan Brenner Harris†; Shlok Ashish Sheth†; Joonyeoup Kim†; William Benjamin Tao†*
Mentor(s): Edward J Delp

1668 *Niharika Narra†*
Mentor(s): Cortland Hannah Johns

1669 *Jack Robert Nelson†; Katherine Josephine Cheh†; Akshat Garg†*
Mentor(s): Aparajita Jaiswal

1670 *Jillian G O'Flaherty†*
Mentor(s): Shih-chun Kao

1671 *Rio Ohtake†*
Mentor(s): Luying Chen

1672 *Jonathan Aimison Oppenheimer†; Henry Hengyi Tsay†; Lucas Tan†; Thanmaya Pattanashetty†; Shiva Sai Vummaji‡; Tim Nadolsky‡; Chiho Song‡; Liam Matthew Stonestreet‡; Haichang Li‡*
Mentor(s): Yeon Ji Yun; Yung-Hsiang Lu

1673 *Cadance William Lucas Ormsby†; Sri Krishna Teja Mannava†; Abhiansh Parwal†; Erlin Daniel Pineda Hernandez†*
Mentor(s): David Alan Ruiter

1674 *Nina Jo Parham†*
Mentor(s): Michael Douglas Johnson

1675 *Paul Kyu-Hwan Park†; Caden Cole Cowles‡*
Mentor(s): Garam Kim; Jacob Robert Montrose; Eduardo Barocio Vaca

1676 *Harshitha Pathania†*
Mentor(s): Beth Elly Baumgartner

1677 *Vishwajit Laxmanrao Patil†*
Mentor(s): Carla B Rosell

1678 *Mohammad Pehlari†; Carly Grace Booth*; Vineeth Surya Narra*; Grace Maria Moorman*; Lucy Pauline Murphy*; Jackson Tyler Wrubel*; Mary Aileen Jann**
Mentor(s): Thomas S Redick; Alexa Kristina Bushinski

1679 *Ricardo Andres Pena Rojas†; Matthew Mellor Pierce†; Bradley J White†; Lejia Zhou†*
Mentor(s): Matthew Lanham

1680 *Lillian Faith Pierce†*
Mentor(s): Brady Robert Layman; Megan Leigh Hill; Jeffrey Edward Dick

1681 *Aditya Pillai†*
Mentor(s): GuangJun Zhang; Dingxun Wang

1682 *Alana Powell†*
Mentor(s): Kathryn Jean LaRoche

1683 *Isyss Mystique Pranger†*
Mentor(s): Heather L Servaty-Seib; Panayota Y Mantzicopoulos-James

1684 *Mridu Prashanth†*
Mentor(s): Daniel G Aliaga; Aniket Bera

1685 *Reeya Ramasamy†*
Mentor(s): Kathryn Seigfried-Spellar; Tatiana Ringenberg

1686 *Emily Joy Reeves†; Ally Morgan Wigand†*
Mentor(s): Aaron J Gin

1687 *Alexander Repikov†; Robert Yida Zhang†; Nathan Nanchuen Yu†; Moe Wai Yan Myint†; Fatma Mohamed Ahmed Youssef Alagroudy†; Yara Ahmed Mohamed Abbas†; Khoi Anh Nguyen†*
Mentor(s): Timothy Francis Hein; Mark Johnson

1688 *Joshua Michael Ringler†; Matthew P Russell†; YoonJeong Choi†; Bocheng Wang†; Jonathan Damin Shi†; Sahil Maurice†*
Mentor(s): Xing Wang; Wenyong Xu

1689 *Mateus Rocha Ripari†; Paula Natalia Natalia Paez Monroy†; Erica Kaser*; Keila Aika Keikilani Jellings*; Elise Bennett**
Mentor(s): Abigail Keelin Rogers

1690 *Aishani Sakalabhaktula†*
Mentor(s): Lisa B Bosman

1691 *Justin Sanchez†; Duc Pham Minh†; Jain Iftesam†; Saandiya KPS Mohan†*
Mentor(s): Om P Kotwal; Cole Aaron Nelson

1692 *Sarah Sawhney†; Ian Tseng†; Chien Chou Ho†; Jiali Shi†; Taehoon Kim†; Yi-Huan Chen†; Ching-Hsiang Huang‡*
Mentor(s): Shreya Ghosh

1693 *Christian Paul Hardy Scott†*
Mentor(s): Babak Anasori; Anupma Thakur; Nithin Chandran Balachandran Sajitha

1694 *Amirali Sharifi Olounabadi†; Alaqmar Adnan Bohori†; Sagnik Ballabh†; Tiancheng Zhang†*
Mentor(s): Santosh Bhandari; Andy Jung

1695 *Ahmed Wael Sheblt; Zeyad Ayman El Afify†; Abdelrahman Hamdy Ghania†*
Mentor(s): Fengqing Zhu; Carla Zoltowski; Edward J Delp; Soudabeh Taghian Dinani

1696 *John Henry Slater†; Braden Thomas Callaway*; Natalia Zagata*; Blake Edward Neely*; Alexander Paul Kaufmann**
Mentor(s): James Michael Goppert; Worawis Sribunma; Chase Ja-ok Loeb

1697 *Brody Everett Snyder†; Elizabeth Reeves Cagle†; Yi Li†; Padmaja Sachin Khairnar†; Pranav Perumal†; Kevin Nathan Qu†*
Mentor(s): Robert Jose Ccorahua santo; Wenzhuo Wu

1698 *Lautaro Franco Soler†*
Mentor(s): Krishna Jayant; Saumitra Yadav; Austin Dennis Cronin

1699 *Vincent Cody Stavig†; Benjamin David Duttlinger†; Julius Coleton Thomas Jodway†; Hermes Heng-yu Fu†*
Mentor(s): David Alan Ruiter; Andy Jung

1700 *Trina Faith Tagamolila†*
Mentor(s): Sarah Lyn Karalunas; Mckenzie T. Figuracion

1701 *Nick Taha†; Rishikesh Reddy Bathina†; Pierce Yungjoon Johnson†; Argha Badhon Saha†*
Mentor(s): Anand Raghunathan; Mark Johnson

1702 *Evans Tang†; Olivia Anne Guptill†; Allyson Faith Miller†*
Mentor(s): Aparajita Jaiswal; Clara Elisa Hortua alvarado

1703 *Sidney Erin Tindell†; Megan Elizabeth Bechtlofft‡; Hailey Choi Hiatt‡; Caroline Sorrells‡*
Mentor(s): Hannah Elise Starr; Jeffrey A Turkstra

1704 *Elysia Marlena Uggen†; Joshua Paul Kaluf‡; Shelby Sliger‡*
Mentor(s): Joseph P Ogas; Jacob Ryan Fawley; Jiaxin Long

1705 *Andres Uzcategui†*
Mentor(s): Krishna Jayant

1706 *Pranav Wadhwa†; Kevin Luke Phlips†*
Mentor(s): Mark Johnson; Timothy Francis Hein; Anand Raghunathan

1707 *Charles James Wagner†; Vinay Pundith†*
Mentor(s): Mark Johnson; Anand Raghunathan; Malcolm Lloyd Seib McClymont

1708 *Andrew Hunter Walatka†; Carly Grace Booth*; Mary Aileen Jann*; Vineeth Surya Narra*; Grace Maria Moorman*; Lucy Pauline Murphy*; Jackson Tyler Wrubel**
Mentor(s): Thomas S Redick

1709 *Sam Brody Waymire†; Dean Patrick Shock†; Shawanwit Poomsa-ad†; Elijah Scott Forbes†*
Mentor(s): Santosh Bhandari; Andreas Jung

1710 *Robert Thomas Welp†*
Mentor(s): Joshua Michael Cox; Riley Bradley Barta

1711 *Caitlin Alexandra Williams†*
Mentor(s): Julia Chester

1712 *William Wong†; varun Vaidyanathan†; Yue Yin†*
Mentor(s): Mark Johnson; Anand Raghunathan; Sooraj Chetput Venkataraghavan

1713 *Jinhoo Yoon†; Brandt David Pierce†; Arnav Jadhav†; Christian Scheckel†; Aditya Gandhi†; Tylen Sean Fleming†; Nicholas James Detwiler‡; Omkar Ghodke‡; Warat Nathan Vijitbenjaronk‡; Keshav Shylesh‡; Tanvi Chukka‡; Truman Stephen Mohr‡*
Mentor(s): Thomas Edgar Roth; Samuel Theodore Elkin; Ghazi Khan

1714 *Bayan Yunis†*
Mentor(s): Lisa B Bosman; Angel Gabriel Ruiz Castro

1715 *Xinyi Zhang†; Maryam Shakil†; Jared Travis Richardson†*
Mentor(s): Matthew Lanham



† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgment

**Poster Presentation Abstract Number: 1000**
*Presentation Time: Session 1: 9:00am-10:00am*

# Developing a Dengue Antiviral

Life Sciences

Author(s):

Magdalena Irene Alvis† (Science|JMHC); McLayne Houin‡ (Agriculture|JMHC); Ian Alford‡ (Science)

Abstract:

Dengue is a mosquito-borne disease that infects around 400 million people every year, with 10-25% of these cases becoming severe and requiring hospitalization. Currently, 3.6 billion people are at risk for Dengue infections, but this number is predicted to rise to 6.1 billion in 2080 as climate change expands mosquito habitat. No effective treatments or vaccines exist for Dengue due to its unique pathophysiology involving antibody-dependent enhancement. Therefore, there is a substantial need to develop an antiviral that can treat Dengue. Previously, we have produced a novel, bifunctional small molecule capable of targeting and eliminating severe influenza infection via activation of the host's innate immune system with a single dose. We have adapted this platform technology to successfully target the Dengue Envelope (E) protein, a protein expressed on the exterior of the virus and highly conserved across all serotypes and several other flaviviruses, including Zika, Yellow Fever, West Nile, and Japanese Encephalitis. The E protein targeting ligand is linked to two distinct hapten molecules, each capable of binding to two different, naturally occurring human antibodies. Antibodies recruited to the virus engage the innate immune effector cells to kill the virus particles. Preclinical in vitro and in vivo experiments have been performed and show that binding of our compound is effective in stopping infection and reduces viremia in animals more effectively than any previous compounds when administered orally or subcutaneously. This dual targeting tactic is a novel approach for the rapid and effective treatment of severe Dengue and other flaviviruses.

Keywords: Dengue; Flaviviruses; Hapten; Antibodies; Small Molecule

Mentor(s):

Conrrad Makea Rupe Nicholls (Science); Jeffery J H Nielsen (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1001**
*Presentation Time: Session 1: 9:00am-10:00am*

# Investigating Ferumoxytol Dosage Effects on Tumor Macrophage Polarization and Survival in Glioblastoma

Life Sciences

Author(s):

Teagan Ames-Majeski† (HHS)

Abstract:

Glioblastoma (GBM) are an invasive form of brain cancer that promotes M2 tumor-associated macrophages (TAMs) to invade healthy tissue. Ferumoxytol is an FDA-approved iron oxide nanoparticle that transforms TAMs into tumor-suppressive M1 macrophages. M1 macrophages are recognized by their ability to stunt tumor growth and enhance anti-tumor immunity. This study investigates the combined effects of ferumoxytol and chemoradiotherapy on GBM, focusing on their potential synergistic effects on tumor response, progression, and patient survival. Eighteen mice were injected with GL-261 glioma cells and were subsequently assigned to five treatment groups to assess the effects of varying ferumoxytol doses alongside chemoradiotherapy. These groups included ferumoxytol, 20mg/kg ferumoxytol, 40mg/kg ferumoxytol, 60mg/kg ferumoxytol, and 100mg/kg ferumoxytol. Magnetic resonance imaging (MRI) was used at least once per week for the first five weeks following the glioma cell injection and was analyzed for tumor tissue size and brightness. Findings demonstrated that survival time decreases at lower doses of ferumoxytol, while higher doses significantly improved survival, with treated mice outliving those receiving no ferumoxytol. Results showed more ferumoxytol infiltrated the tumor tissue at higher doses. Future research will focus on determining the optimal ferumoxytol dosage to maximize survival time to as high as 300 mg/kg combined with chemoradiotherapy.

Keywords: Glioblastoma; Cancer; Iron Oxide; Magnetic Resonance Imaging (MRI)

Mentor(s):

Matthew Louis Scarpelli (HHS)

Other Acknowledgement(s):

Jessica Leigh Veenstra (HHS); Justin Bernard Geise (HHS)

**Poster Presentation Abstract Number: 1002**
*Presentation Time: Session 1: 9:00am-10:00am*

# Using Coding Applications to Predict and Analyze Stages of Grief

Innovative Technology / Entrepreneurship / Design

Author(s):

Shreem Bhavesh Amin† (DSB); Jose Augusto Heighes Claux† (DSB); Max Elliott Matteucci† (DSB|JMHC); Swati Raj Rajasekaran† (DSB)

Abstract:

[Abstract Redacted]

Keywords: Data Mining; AI; LLMs; Data for Good; Grief Journey

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1003**
*Presentation Time: Session 1: 9:00am-10:00am*

# Micro-scale Heat Transfer Modeling for a Sharp Silicon Tip on Varying Substrates

Physical Sciences

Author(s):

Niklas Eric Anderson† (Engineering)

Abstract:

The combined Atomic Force Microscopy-Mass Spectrometry (AFM-MS) measurement technique provides researchers with a tool for determining mechanical properties, topography, and chemical makeup of samples in ambient environments. Atomic force microscopy allows the mechanical and topographical measurements by contacting the surface with a sharp silicon tip. This tip can then be heated to ablate material from a substrate, which is then transferred to the mass spectrometry system. In this research I developed governing models for laser heated combined AFM-MS systems utilizing finite element simulations in COMSOL Multiphysics. Included are coupled thermal-fluid simulations utilizing non-isothermal flow to analyze both the flow dynamics of ablated material improving capture for mass spectrometry and cooling via convection. Thermal-structural simulations were also developed to provide insight into improving the design of specialty cantilevers for AFM-MS. This cantilever model helps to accurately describe the effects of the additional heat source on photothermally driven AFM structural dynamics, improving control of the AFM tip.

Keywords: Atomic Force Microscopy; Computational Modeling; Heat Transfer; Chemical Analysis; Materials Analysis

Mentor(s):

Ryan B Wagner (Engineering)

Other Acknowledgement(s):

Akshay Deolia (Engineering); Subham Das (Engineering)

**Poster Presentation Abstract Number: 1004**
*Presentation Time: Session 1: 9:00am-10:00am*

# Understanding Fetal Porcine Intestinal Ontogeny and Gene Expression in Mid to Late Gestation

Life Sciences

Author(s):

Lillian M Andis† (Agriculture)

Abstract:

Our previous work indicates that intestinal structure progressively develops though gestation, but little is known regarding the associated changes at the molecular level. Thus, the objective of this study is to investigate the temporal expression of genes critical to intestinal function and determine the impact of fetal endocrine status in this developmental program. Genes of interest include the Fc gamma receptor and transporter (FCGRT) and polymeric immunoglobulin receptor (PIGR), which transport IgG and IgA across the intestinal barrier, respectively. We will also examine solute carriers 2A2 and 5A1 (SLC2A2 and SLC5A1), responsible for transporting simple sugars through enterocytes. We hypothesize that expression of these genes will increase with gestational age in preparation for postnatal life, and that this process will be delayed by fetal hypothyroidism. To investigate this, intestinal samples were collected from N=96 porcine fetuses split evenly across days 55, 66, 76 and 86 of gestation, with half of the samples at each time point derived from gilts treated with methimazole for 21 days prior to sampling to induce fetal hypothyroidism. All N=96 tissue samples were cryogenically ground, and the RNA extracted. The resulting product was DNase treated, concentration and purity assessed spectroscopically, and integrity confirmed via a denaturing gel electrophoresis. High quality RNA will be reverse transcribed into complementary DNA for use in quantitative polymerase chain reaction (qPCR) to measure gene expression. When complete, this project will yield novel information on the on the regulation of prenatal intestinal development.

Keywords: Fetal Development; Swine; Reproductive Biology; Hypothyroidism

Mentor(s):

Jonathan Pasternak (Agriculture); Alyssa Smith (Agriculture)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1005**
*Presentation Time: Session 1: 9:00am-10:00am*

# How do parent's STEM-related careers relate to their math interactions with their children, and their overall value of math?

Social Sciences / Humanities / Education

Author(s):

Ana Cristal Andrade Castaneda† (HHS); Dalena Mary Renee Matthews† (HHS); Emma Carosone† (HHS)

Abstract:

Research indicates that children's early family-based math experiences predict their math performance (Eason et al., 2022). Having a parent with a STEM-related occupation positively informs the child's numerical learning environment, leading to better math performance (Mues et al., 2021). Additionally, parents' math perceptions significantly influence children's math accomplishments (Huntsinger et al., 1997). This study examines how parents' STEM-related careers correlate with frequency of families' mathematical interactions and overall value parents place on math. Parents (N=572) of children aged 3-5 in the United States participated in a survey via Prolific. They reported the relevance of STEM to both their college major and current occupation. To assess parents' general value of math, they rated the perceived utility of math in careers and everyday life. Parents indicated how frequently they engage with their preschoolers in daily math-related activities, such as talk, play, and practice. All items were measured on a 1-5 scale. STEM-related careers and frequency of math activities were positively correlated (r=.27), demonstrating that the more STEM-related a parent's occupation is, the more they engage in math with their preschooler. There was also a positive relation between STEM-related careers and parents' perceived math utility (r=.34), showing that the more STEM-related a parent's occupation is, the more they value math. Our findings suggest that children whose parents are less involved in STEM-related careers may need more support to increase the interactions and value of math in their lives.

Keywords: Parents' STEM Career; Home Math Environment; Parental Beliefs; Early Childhood Education

Mentor(s):

Sarah Eason (HHS); Siqi Zhang (HHS)

Other Acknowledgement(s):

Suzanne Christine Varnell (HHS); Salvador Roberto Vazquez (HHS)

**Poster Presentation Abstract Number: 1006**
*Presentation Time: Session 1: 9:00am-10:00am*

# A Critique on Space Exploration in Developed Nations

Social Sciences / Humanities / Education

Author(s):

Alex Jameson Appiah† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Carla B Rosell (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1007**
*Presentation Time: Session 1: 9:00am-10:00am*

# Regulation of Fetal Growth in Swine Via Insulin-Like Growth Factor

Life Sciences

Author(s):

Megan Grace Ashby† (Agriculture); Evan James Campbell* (Agriculture); Delaney Alexandra Doncer* (Agriculture)

Abstract:

Intrauterine growth restriction (IUGR) is characterized by asymmetric fetal organ growth, where brain growth is maintained at the expense of liver, and possibly heart, development. This condition, common in swine, negatively impacts postnatal survival and growth potential. The mechanisms driving these tissue-specific responses are unclear. This study aims to evaluate the expression of insulin-like growth factor 1 and 2 (IGF1 and IGF2), in the brain, heart, and liver of extreme IUGR and non-IUGR piglets. IGF1 and IGF2 play important roles in regulating cellular growth, differentiation, and survival. We hypothesize that IGF1 and IGF2 expression will be significantly reduced in the heart and liver of IUGR fetuses, but remain stable in the brain.

IUGR was induced by halving uterine size through unilateral hysterectomy and ovariectomy, causing fetal crowding. Non-IUGR fetuses were generated by halving ovulation rate through unilateral oviductal ligation, providing more space per fetus. Gilts were necropsied on day 95 of gestation, and brain, heart, and liver tissues were collected from fetuses. Z-scores for brain-to-liver weight ratios were used to categorize the fetuses, selecting the 12 most extreme IUGR and non-IUGR fetuses for analysis. RNA was extracted from tissue samples, reverse transcribed into cDNA and will be analyzed using quantitative real-time polymerase chain reaction (qPCR) to quantify IGF1 and IGF2 expression.

This study aims to enhance understanding of fetal growth regulation in swine and the pathophysiology of IUGR, potentially leading to strategies that mitigate its negative impacts on postnatal growth and survival in livestock.

Keywords: IUGR; Swine; IGF1; IGF2; Fetal Growth

Mentor(s):

Jonathan Pasternak (Agriculture); Sarah M Innis (Agriculture); Alyssa Smith (Agriculture); Dayeon Jeon (Agriculture)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1008**
*Presentation Time: Session 1: 9:00am-10:00am*

# Vitamin E Supplementation in Horses and Ponies

Life Sciences

Author(s):

Megan Grace Ashley† (Agriculture); Abigail Joy Benham† (Agriculture); Sabrina Ann Blount† (Agriculture); Ashleigh P Thompson† (Agriculture); Dane' van Ghunt† (Agriculture)

Abstract:

Vitamin E is a fat-soluble vitamin that is important for maintaining healthy immune systems and neuromuscular function in horses. Insufficient vitamin E blood concentrations in horses are often times associated with neuromuscular degenerative diseases. Vitamin E can be obtained by horses grazing good-quality pasture grasses; however, for many horse owners and boarding facilities, grazing areas are very limited. Additionally, about 70% of vitamin E contained within hay is lost within the first week post-cutting. Accepted adequate vitamin E blood concentrations for horses is >2?g/mL plasma/serum. The current research project is evaluating vitamin E plasma concentrations in three senior, stock-type gelding horses and two adult Ojibwe pony mares with or without vitamin E supplementation over 10 weeks. Blood collections occurred prior to supplementation (week 0), midway through treatment (week 5), and will occur at the end of supplementation (week 10). At week 0, vitamin E concentrations averaged 4.88 ppm for the supplemented group and averaged 5.25 ppm for the non-supplemented group. At week 5, vitamin E concentrations averaged 3.77 ppm for the supplemented group and averaged 3.34 ppm for the non-supplemented group. Previous and current grazing opportunities, as well as differences in breed, appear to influence plasma vitamin E concentrations, and future research to elucidate these influences would be beneficial to the equine community.

Keywords: Horse; Vitamin E; Equine; Pony

Mentor(s):

Casie S Bass (Agriculture)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1009**
*Presentation Time: Session 1: 9:00am-10:00am*

# Enhancing Education through Virtual Reality: A Comparative Study of VR and Traditional Learning Environments

Innovative Technology / Entrepreneurship / Design

Author(s):

Shrivardhan Atluri† (Science|JMHC)

Abstract:

This research investigates the comparative effectiveness of Virtual Reality (VR) learning environments versus traditional classroom settings in terms of student motivation, immersion, presence, and agency. Using a survey-based approach, data was collected from students who participated in both VR and traditional learning experiences. The results reveal that while VR significantly enhances student interest and provides a heightened sense of presence, it also introduces challenges, such as distractions from the visual display and increased cognitive load. In contrast, traditional learning methods were found to offer more consistent sensory feedback and better ease of concentration, particularly when manipulating objects or following instructions. Statistical analysis shows that while VR's immersive nature holds potential for increasing student engagement, it may hinder attention and focus due to its technological complexity. These findings suggest that although VR offers promising opportunities for interactive and immersive learning, further development is required to overcome its limitations and ensure it enhances, rather than detracts from, educational outcomes. The study provides valuable insights for educators, educational technology developers, and policymakers considering the integration of VR into modern educational practices. Ultimately, this research aims to guide the future implementation of VR as an effective learning tool by identifying both its strengths and areas for improvement.

Keywords: Immersion; Motivation; Presence; Agency

Mentor(s):

Lisa B Bosman (Polytechnic)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1011**
*Presentation Time: Session 1: 9:00am-10:00am*

# Analog Neural Network Architecture (ANNA)

Innovative Technology / Entrepreneurship / Design

Author(s):

Cristian Marcos Barinaga† (Engineering|JMHC)

Abstract:

Modern AI model creation requires ample computational power to process data in both predictive and learning phases. Due to memory and processing constraints, edge and IoT electronics using such models can be forced to outsource optimization and training to either the cloud or pre-deployment development. This poses issues when optimization and classification are required (or most optimal) from sensor and data-collection devices themselves, or when these devices are in stand-alone environments and cannot receive such external support. In response, analog neural nets have been explored to achieve rapid net input-output speeds; however, the optimization of these nets remains managed by digital means, continuing to strain microprocessors with the bulk of the computations. To overcome such constraints in these applications, the present project explores using analog electronics to develop the framework of a self-optimizing neural network in an idealized SPICE environment. More specifically, the design of an analog ReLU neuron is included and simulated in a fully-connected sample network. This design operates by optimizing with respect to time, accomplished by implementing an array of time differentiator and integrator Op-Amp circuits, along with mixed-signal derivative-sign identification using conventional XOR gates. The results of this inquiry suggest a future in real-time, stand-alone, self-optimizing neural nets using miniaturized low-power analog electronics. Included results in parameterization optimization also suggest the viability of training digital-domain AI models on embedded systems using built-in timers as a short-cut for optimization.

Keywords: Artificial Intelligence; Electrical Engineering; Circuits; Analog; Neural Network

Mentor(s):

Juan Camilo Mesa Agudelo (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1012**
*Presentation Time: Session 1: 9:00am-10:00am*

# Impact of Slow Versus Regular Hay Nets on Hay Consumption in Stalled Horses

Life Sciences

Author(s):

Makaela Marie Bennett† (Agriculture); Grace Makenna Gonzalez† (Agriculture); Anthony John Gruber† (Agriculture); Mary Elizabeth Reeder† (Agriculture); Mackenzie Joy Shea† (Agriculture)

Abstract:

Stall confinement in horses has been shown to negatively affect digestive health, due to limited movement and lack of continuous foraging opportunities. When stalled and not given continuous forages, the staunch variation between having no hay and getting all of it at once, can cause horses to consume hay too quickly. This is known as “bolting” and can increase issues like colic, choking, or gastric ulcers. To mitigate these issues, slow feeder hay nets have been used to extend consumption time and help mimic outdoor eating patterns compared to regular hay nets. Additionally, slow feeders will reduce hay waste and be more effective for horses stalled for extended periods, while normal feeders may be more efficient for shorter durations due to quicker consumption. The study evaluated the hay consumption of three horses and two ponies, from the Animal Science Research Education Center (ASREC), using a slow feeder hay net (1.1-1.5 in mesh holes) and a regular hay net (2.36 in mesh holes). Each horse was placed in a stall for a duration of 20 minutes with each type of net containing a fescue-grass mix. It was found that there was less consumed using the slow feeder nets, with an average of 6.92% hay consumed compared to an average of 31.92% with the regular nets. Findings from this study can inform handlers on how to make practical management decisions when stalling horses by providing certain hay nets.

Keywords: Horse; Hay Net; Hay Consumption; Equine

Mentor(s):

Casie S Bass (Agriculture)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1013**
*Presentation Time: Session 1: 9:00am-10:00am*

# Utilizing Base Machine Learning Models to Determine Key Factors of Success for Indian Tech Startups

Mathematical/Computation Sciences

Author(s):

Dishan Bhattacharya† (Science)

Abstract:

[Abstract Redacted]

Keywords: Machine Learning; Startups; Technology; Classification; India

Mentor(s):

Tyler Poore

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1014**
*Presentation Time: Session 1: 9:00am-10:00am*

# FEMTA Suborbital Environment Testing

Innovative Technology / Entrepreneurship / Design

Author(s):

Cole Emerson Blocher† (Engineering); Elian David Coyotl Garcia† (Engineering); Chanwoo Lim† (Engineering); Cassius Samuel Sampson† (Engineering); Ria Sinha† (Engineering)

Abstract:

Film-Evaporation MEMS Tunable Array (FEMTA) micropropulsion units use ultrapure water as a propellant. This research project's main objective is to test FEMTA thrusters and their propulsion management system in sub-orbital space to provide data on how the FEMTA units operate as an altitude control in microgravity. The results from testing will be valuable for future use on CubeSats. The manufacturing team developed protective components for the delicate thrust measurement sensor on the FEMTA experiment payload. In addition to development, the team subjected the payload to several environmental and functional tests before launching on Blue Origin's P-14 mission. The tests ensure that the payload can withstand the sub-orbital launch and perform as intended. Electromagnetic interference testing measured the electromagnetic emissions from the payload to ensure that it would not disrupt the booster's communication channels. The payload was successfully soaked in helium to ensure that it would not be affected by the helium purge before the launch. An enclosed chamber performed thermal and vacuum tests, which ensured that the payload would function under extreme conditions and not catastrophically fail, affecting the booster's operability. The vibration test simulated the heavy vibrations and gravitational forces that the rocket will experience during ascension and reentry. This test verified that no portion of the payload would be greatly damaged during launch. The results from these environmental and functional tests are pending review by Blue Origin before the FEMTA payload can be tested in sub-orbital space.

Keywords: FEMTA; Propulsion; Satellites; Environmental Testing; Experiment

Mentor(s):

Jesus Adrian Meza Galvan (Engineering); Anthony G Cofer (Engineering); Steven M Pugia (Engineering); Alina Alexeenko (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1015**
*Presentation Time: Session 1: 9:00am-10:00am*

# Addressing Tetrachloroethylene in an Impacted Community: Analysis of Exposure in Martinsville, IN

Physical Sciences

Author(s):

Katelyn Emily Bottando† (Agriculture); Grace Rentfro* (HHS)

Abstract:

The importance of this project is to interpret the biological and environmental impact of PCE at an EPA-listed Superfund site. Understanding the effects that PCE can have might aid in the redesign of exposure level limits and regulatory policies. Breath testing for primary contaminants (PCE and TCE) will be done to understand the level of exposure to residents in Martinsville. In addition, home air tests will be performed on homes near the toxic plume sites and the Superfund site. The breath studies will be done on adults voluntarily replying to a random sampling of flyers sent out in the mail and those who have confirmed interest in further testing through a Martinsville Environmental Community Action Project team member. Individual breath tests will be performed using tedlar bags with proper tubing attached to collect respiration to confirm exposure levels. For home testing, vapor intrusion of PCE will be examined through a plastic hose attached to the PCE exposure testing instrument. Cognitive tests will be performed on participants to test the potential neurotoxic effects of exposure to PCE. The results of these tests will potentially show the effects of living closer in proximity to PCE-contaminated sites as well as showing if there is a correlation between PCE exposure and cognitive abilities.

Keywords: Tetrachloroethylene (PCE); EPA Superfund Site; Vapor Intrusion; Breath Analysis Testing; Neurotoxic Effects

Mentor(s):

Sa Liu (HHS)

Other Acknowledgement(s):

Alexander Lee Gronkiewicz (HHS); Marwan MMT Alajlouni (HHS)

**Poster Presentation Abstract Number: 1016**
*Presentation Time: Session 1: 9:00am-10:00am*

# Additive Manufacturing of Tailored Metal/Fluoropolymer Reactive Cases for Enhanced Blast

Physical Sciences

Author(s):

Catherine Therese Nicole Bradley† (Engineering|JMHC); Gianna Marie Arnone‡ (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Enhanced Blast; Structured Reactives; Additive Manufacturing

Mentor(s):

Diane Collard (Engineering)

Other Acknowledgement(s):

Noah Joseph Cahill (Engineering); Robert Edwin Ferguson (Engineering); Rebekah Lynne Travis (Engineering); Steven F Son (Engineering)

**Poster Presentation Abstract Number: 1017**
*Presentation Time: Session 1: 9:00am-10:00am*

# Compressor Technology Development for Refrigerants <150 Global Warming Potential

Physical Sciences

Author(s):

Zachary V Bryant† (Engineering|JMHC)

Abstract:

[Abstract Redacted]

Keywords: Compressor; HVAC&R; Global Warming; Refergerents; Ozone Depletion Potential

Mentor(s):

Riley Bradley Barta (Engineering); Yash Shantilal Parmar (Engineering)

Other Acknowledgement(s):

Changkuan Liang (Engineering)

**Poster Presentation Abstract Number: 1018**
*Presentation Time: Session 1: 9:00am-10:00am*

# Introduction of Novel Stimulus on Horse and Pony Behaviors

Life Sciences

Author(s):

Dawn Elaine Burch† (Agriculture); Georgia Jones† (Agriculture); Bodhi Alan Kuiper† (Agriculture); Kylie Shea Soniak† (Agriculture)

Abstract:

The Equus genus, including horses and ponies, have evolved over 55 million years. During that time, they have developed strong startle and flee (reactive) behaviors in fear-eliciting situations. These behaviors allow the animals to adjust to sudden changes, including escaping from predators. Additionally, horses and ponies also exhibit investigative behaviors, which include inspecting new spaces, animals, or objects introduced to them. We wanted to observe whether or not differences between horse and pony reactive and investigative behaviors exist. The pony group (P) consisted of two Ojibwe pony mares and the horse group (H) consisted of three stock-type gelding horses. Both P and H were housed in adjacent pastures and were introduced separately to a novel stimulus (a 60 cm inflated ball) for ten minutes. All behaviors were recorded so that any behavior displayed could be observed and monitored on an equine-specific ethogram at a later time. Our team hypothesized that once the novel stimulus is introduced, the H and P groups will first display reactive then investigatory behaviors. We observed no reactive behaviors from either P or H. One individual from each P and H displayed investigative behaviors; after seven minutes for P and after two minutes for H, post-stimulus introduction. Additional research using larger testing groups with more diverse ages and breeds, as well as numerous stimulus types, are needed to better elucidate novel stimulus effects on various horses and ponies.

Keywords: Horse; Behavior; Pony; Stimulus; Equine

Mentor(s):

Casie S Bass (Agriculture)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1019**
*Presentation Time: Session 1: 9:00am-10:00am*

# Cutaneous metacarpal temperature changes due to protective boot use in equines pre- and post-exercise.

Life Sciences

Author(s):

Madison Nicole Butz† (Agriculture); Sydnee Noelle Culp† (Agriculture); Allison Grace Schimpf† (Agriculture); Connor J Smith† (Science); Devin Brianna Thomas† (Agriculture)

Abstract:

Various types and styles of exercise boots exist for horses today. Typically used for athletic purposes, exercise boots have long been considered protective gear used to reduce the risk of impact injury (Kicker et al., 2004). The purpose of the present study was to determine if exercise boots could also increase metacarpal temperature, as the temperature of a horse's leg has been shown to impact the likelihood of injury, specifically, with higher temperatures leading to increased risk (Daily et al., 2023). Three gelding horses and two mare ponies were utilized for data collection. Thermal cameras measured the cutaneous temperature of the metacarpal area for the front legs at rest and post-exercise with and without exercise boots. Initial results showed that wearing exercise boots increased the temperature despite the equines being at rest or post-exercise. The gelding's average at rest temperatures with the boots for the right leg was 31.2°C and for the left leg was 31.7°C. Post-exercise with boots the right leg average increased to 32.7°C and the left leg to 32.3°C. The ponies' results showed an increase in temperature while wearing the boots at rest but an average decreased temperature post-exercise with the boots. Prior to exercise the average right leg was 33.3°C and left leg was 32.7°C while post-exercise the right leg was 31.7°C and the left was 31.5°C. Future studies should be completed with larger, more diverse populations of equines to elucidate the potential ramifications of metacarpal temperature changes due to exercise boot use.

Keywords: Horse; Exercise Boots; Thermal Temperature; Metacarpus; Equine

Mentor(s):

Casie S Bass (Agriculture)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1020**
*Presentation Time: Session 1: 9:00am-10:00am*

# The Process of Designing and Creating of an Aerial Robot

Physical Sciences

Author(s):

Ethan Joseph Chace† (Engineering); Yuet Ching Jolie Lai† (Engineering); Kailey Christina Dvorak† (Engineering); Marvel Jiaxiang Zheng† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Plane; Robotics; Aerial; Fuselage; Wings

Mentor(s):

Niall Patrick Moloney (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1021**
*Presentation Time: Session 1: 9:00am-10:00am*

# How NPCs Simulate Human-like Social Interactions in Crowded Environments

Mathematical/Computation Sciences

Author(s):

Christopher Timothy Chan† (Engineering); Justin Song† (Engineering); Niril Jestus† (Engineering); Jacob Adam Clark† (Engineering); Sabrina Louise Gray† (Engineering); Mihika Sharma† (Science)

Abstract:

This project investigates how AI non-playable characters (NPCs) can be used to simulate human-like social interactions in crowded environments. Specifically, it focuses on how AI-driven NPCs dynamically adjust their movement and interactions based on crowd density, and various influencing factors. The goal is to understand how individual NPCs can exhibit realistic crowd behaviors, such as adjusting speed, choosing alternate paths, or initiating social interactions based on their surroundings.

Using Unreal Engine, NPCs are equipped with realistic senses that allow them to interact with their surroundings. In addition, the Environmental Query System (EQS) in Unreal can be used to measure the distance between NPCs and determine behaviors based on individual traits and personalities. The system calculates the density of a crowd, and NPCs will then react according to their personality traits and preferences. This mirrors real-life behavior where people adjust their movements based on density and comfort. The system is further enhanced by using behavior trees to govern hierarchical decision-making, allowing NPCs to prioritize actions based on environmental conditions.

This system will benefit anyone seeking to simulate human social interaction within a virtual environment, such as in game development where interactions between NPCs can be more realistic. It can also be used for real-world simulations such as urban design, reducing costly design errors and safety concerns. This newly developed crowd interaction system is able to replicate how humans will congregate and move within the environment. Changes to real-world environments can then be proposed based on the behaviors of the AI simulation.

Keywords: Environmental Query System (EQS); Non-Player Characters (NPCs); Unreal Engine; Artificial Intelligence

Mentor(s):

David Michael Barbarash (Agriculture)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1022**
*Presentation Time: Session 1: 9:00am-10:00am*

# Studying Keypoint Estimation on In-The-Wild Antelope Data

Mathematical/Computation Sciences

Author(s):

Shaan Jitesh Chanchani† (Engineering); Aryan Amol Khanolkar† (Science|JMHC); Claire Seol Kim† (Engineering); Joshua C Mansky† (Engineering); Medhashree Parhy† (Science); Armaan Arshad Sayyad† (Science); Parth Thakre† (Science)

Abstract:

Our research explores two major factors that impact the generalizability of keypoint estimation models to more difficult data. Specifically, we focus on in-the-wild antelope images captured from motion-triggered camera traps in Senegal, West Africa. The first major factor we will focus on is how our model's performance changes based on varied subsets of training data. To do so, we leverage the AP-10k dataset to explore different training strategies, such as whether training on a small subset of visually similar species helps the model generalize better. Our second area of exploration is testing our keypoint labeling scheme, which is more rigorous than the labeling scheme of the AP10k dataset. Using our data, we created keypoint labels based on several different definitions – some are visually distinct, while others are more biologically correct. By training and testing with these different keypoint definitions, we want to explore what kind of keypoint definition helps the model generalize better. Our results improve keypoint detection for animals and, in a broader sense, contribute to the abundance estimation of animals in the wild.

Keywords: Animals; Computer Vision; Keypoint; Pose-Estimation

Mentor(s):

Amy R Reibman (Engineering); Haoyu Chen (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1023**
*Presentation Time: Session 1: 9:00am-10:00am*

# Immortalization of murine neutrophil progenitor line through retroviral transfection with ER-HoxB8 System

Life Sciences

Author(s):

Maximilian Judah Chandra† (Science); Mia Iwasa* (Science)

Abstract:

[Abstract Redacted]

Keywords: Retroviral Transfection; Neutrophil Progenitors; HoxB8

Mentor(s):

Kunming Shao (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1024**
*Presentation Time: Session 1: 9:00am-10:00am*

# Facing the Future: Weighing the Use of Facial Recognition in Airport Security

Social Sciences / Humanities / Education

Author(s):

Aditya Chattopadhyay† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Carla B Rosell (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1025**
*Presentation Time: Session 1: 9:00am-10:00am*

# Methods for securing commercial dies into silicon substrates as heterogenous integration in low earth orbit applications

Innovative Technology / Entrepreneurship / Design

Author(s):

Chengyu Chiu† (Engineering); Pin-Chen Su† (Engineering); Yoshiki Takeuchi† (Engineering); Qiming Chai† (Engineering)

Abstract:

Heterogeneous Integration (HI) is a packaging approach that combines different chiplets—small, modular semiconductor units— onto a single substrate. Compact, planar 2.5D HI offers advantages like reduced interconnect lengths and power and improved signal integrity, essential for applications such as 5G/6G networks and low-Earth orbit systems. Our project focuses on a specialized process for embedding commercial chiplets, D-latch memory and photodiode, onto a silicon-based interposer. The process begins by etching cavities into the carrier substrate, where the chiplets are embedded. The chiplets are secured using Cu electroplating on a Cr-Au seed layer. Metallization, combined with liftoff techniques. Several elements of the process have proven successful for embedding commercial chiplets. Future work is needed to evaluate the electrical performance and reliability characteristics of the completed device.

Keywords: Heterogeneous Integration; 2.5D HI; Low-Earth Orbit Satellite; Semiconductors; Advanced Packaging

Mentor(s):

Peter Bermel (Engineering); Saeed Mohammadi (Engineering); Frank Huang (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1026**
*Presentation Time: Session 1: 9:00am-10:00am*

# Impact of Silver Ion Leakage from Electrochemical Sensors on Cell Heath: A Triple Negative Breast Cancer Study

Physical Sciences

Author(s):

Yashvi Choudhary† (Science); Sadie A Poirier‡ (Science|JMHC)

Abstract:

[Abstract Redacted]

Keywords: Electrochemical Sensors; Silver Ion Leakage; Cellular Study; Electrochemistry; Triple Negative Breast Cancer

Mentor(s):

Vanshika Gupta (Science); Jeffrey Edward Dick (Science)

Other Acknowledgement(s):

Dane Christophe Wagner (Science); Samuel Patrick Nortz (Science)

**Poster Presentation Abstract Number: 1027**
*Presentation Time: Session 1: 9:00am-10:00am*

# GriefMap AI

Innovative Technology / Entrepreneurship / Design

Author(s):

Vinicius da Paixao Fernandes† (DSB); Drew Christopher Lawler† (DSB); Viva Parmar† (DSB); Athan Shuen Yang† (DSB)

Abstract:

[Abstract Redacted]

Keywords: Data Mining; AI; LLMs; Data for Good; Grief Journey

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1028**
*Presentation Time: Session 1: 9:00am-10:00am*

# Transforming Survivor Support: Data-Driven Journey Mapping with R for TAPS

Innovative Technology / Entrepreneurship / Design

Author(s):

Caleb Dai† (DSB); Ethan Mathew Lebon† (DSB); Cooper William Springs† (DSB); Zixiang Xia† (DSB)

Abstract:

[Abstract Redacted]

Keywords: Data Mining; AI; LLMs; Data for Good; Grief Journey

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1029**
*Presentation Time: Session 1: 9:00am-10:00am*

# Characterization of Abnormal Aquaporin-9 Retention and its ties to Lowe Syndrome

Life Sciences

Author(s):

Carla D'Amato† (Science|JMHC)

Abstract:

[Abstract Redacted]

Keywords: Aquaporins; Lowe Syndrome; Co-localization Analysis; Vesicle Trafficking; Sorting Motifs

Mentor(s):

Ruben C Aguilar (Science)

Other Acknowledgement(s):

Shreya Santosh Ugale (Science)

**Poster Presentation Abstract Number: 1030**
*Presentation Time: Session 1: 9:00am-10:00am*

# Sportswashing and its implications: The human cost of the 2022 Qatar World cup

Social Sciences / Humanities / Education

Author(s):

Deborah Mercylin David† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Carla B Rosell (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1031**
*Presentation Time: Session 1: 9:00am-10:00am*

# Avian Bone Fracture Toughness

Mathematical/Computation Sciences

Author(s):

Joshua Armstrong Davis† (Engineering|JMHC)

Abstract:

[Abstract Redacted]

Keywords: Fracture Mechanics; Bone Density

Mentor(s):

Thomas H Siegmund (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1032**
*Presentation Time: Session 1: 9:00am-10:00am*

# Pathways of Grief: Bridging Survey Data to Grief Support with Data Mining

Innovative Technology / Entrepreneurship / Design

Author(s):

Alice Nha Thy Dinh† (DSB); Thomas John Durkin† (DSB); Jenna Grace Hash† (DSB); Isabella Kidrian McGuire† (DSB|JMHC)

Abstract:

[Abstract Redacted]

Keywords: Data Mining; AI; LLMs; Data for Good; Grief Journey

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1033**
*Presentation Time: Session 1: 9:00am-10:00am*

# Evaluating Student Perceptions of Virtual Reality in Place of Traditional Lectures

Innovative Technology / Entrepreneurship / Design

Author(s):

Rhea Dutta† (Engineering|JMHC)

Abstract:

Purpose: This study explored students' perceptions of virtual reality (VR) implementation in higher education classrooms, with respect to its role in driving motivation to learn.

Methods: First, 40 students participated in a three-week STEM intervention, with the analysis concentrating on data collected during the final week: "Gamification for Increased Quality and Productivity." To minimize bias, 20 students experienced a traditional lecture followed by a VR session, while the remaining students underwent the intervention in reverse order. Following the completion of the intervention, participants were asked to compare their experience with VR to traditional lectures. Responses were analyzed using NVivo qualitative analysis software, guided by Ambrose's Motivation to Learn framework. A systematic pattern analysis then yielded distinct themes and sub-themes.

Results: From the literature, the three comprehensive themes identified are: (1) Seeing Value, (2) Self-Efficacy, and (3) Supportive Environment. After an analysis of the photovoice-guided qualitative feedback from the student participants, the emerged subthemes for each of the previously mentioned categories, respectively, are: (1) Enhanced Collaboration, Potential Opportunities Exploration, Current Limitations, Beneficial Work Reduction; (2) Heightened Student Participation, Student Confidence, Existing Constrictions; (3) New Perspectives, Virtual Reality Accessibility, Technical Difficulties, Unfocused Learning Environment.

Implications: Higher education STEM instructors and instructional designers can benefit from this research by using its insights to determine when leveraging VR would be beneficial.

Keywords: Virtual Reality; Technology; Education; Learning Preferences

Mentor(s):

Lisa B Bosman (Polytechnic)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1034**
*Presentation Time: Session 1: 9:00am-10:00am*

# Comparing Plant Yield Between Pulse Width Modulation and LED Lights

Life Sciences

Author(s):

Hanna Joy Dykema† (Agriculture)

Abstract:

Environmental concerns associated with traditional agriculture (water consumption, land degradation, runoff, etc.) have led scientists and farmers to seek sustainable solutions while avoiding increased costs. Although indoor agriculture is a sustainable alternative, the expense and energy required for LED grow lights is a significant limiting factor. Pulse Width Modulation (PWM) light (HappyLeaf Inc. Oregon, IL) differs from traditional LED light in that it is designed to modulate on and off at a rapid pace. This means that for a portion of time, the light is turned off while appearing to emit a constant stream. This study seeks to understand what effect, if any, PWM light has on plant growth compared to regular LED grow lights. The first part of this study compared three treatments, 100% constant (regular LED), 75% PWM, and 50% PWM, over four replications in an indoor vertical farming system. After the growth period, plants were harvested and measured by their fresh and dry weights. This study found that plants grown under the 100% constant and 75% PWM produced similar growth results, while 50% led to reduced yields. The results from this study imply that growing with 75% PWM light can produce the same yield as regular LEDs while using 25% less light, a significant reduction in energy use and costs. The second part of our research will seek to understand how and why this technology affects plants on a physiological basis. Further comparison between PWM and LED will also be explored.

Keywords: Controlled Environment Agriculture; Sustainability; Agriculture; Hydroponics; Vertical Farming

Mentor(s):

Krishna Nemali (Agriculture)

Other Acknowledgement(s):

Sangrak Son (Agriculture); Victor Zaderej (Massachusetts Institute of Technology)

**Poster Presentation Abstract Number: 1035**
*Presentation Time: Session 1: 9:00am-10:00am*

# Towards reliable neural stimulation using an electroplated PEDOT: PSS-coated electrode

Innovative Technology / Entrepreneurship / Design

Author(s):

Deniz Eksioglu† (Engineering|JMHC)

Abstract:

[Abstract Redacted]

Keywords: Neuromodulation; PEDOT: PSS; Phase Separation; Platinum Grass Nanostructure

Mentor(s):

Hyowon Lee (Engineering); Jae Young Park (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1036**
*Presentation Time: Session 1: 9:00am-10:00am*

# Mental Health within Collegiate Athletes

Social Sciences / Humanities / Education

Author(s):

Abigail Elizabeth Farler† (HHS)

Abstract:

[Abstract Redacted]

Keywords: Mental Health; Student-Athlete; Purdue University; College; Athletes

Mentor(s):

Michael Douglas Johnson (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1037**
*Presentation Time: Session 1: 9:00am-10:00am*

# MicroRNA-31 Regulates Neutrophil Migration and Activation

Life Sciences

Author(s):

Elizabeth Christine Farrell† (Science)

Abstract:

[Abstract Redacted]

Keywords: Neutrophil; Immunity; microRNA; Efnb2b; Zebrafish

Mentor(s):

Tyler Renee Pikes (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1038**
*Presentation Time: Session 1: 9:00am-10:00am*

## ChainVisor: analyzing the security posture of IoT device software

Innovative Technology / Entrepreneurship / Design

Author(s):

Daniyal Fazal† (Engineering); Harmon Howse† (DSB|JMHC); Nicholas Marshall Andry† (Science); Jayden Chun-Hin Chow† (DSB|JMHC); Oliver J Wang† (Polytechnic)

Abstract:

[Abstract Redacted]

Keywords: Internet of Things; Security; Firmware; Hardware

Mentor(s):

Santiago Torres Arias (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1039**
*Presentation Time: Session 1: 9:00am-10:00am*

# Extracting supernova explosion anisotropies in the power spectra of the type Ia supernova remnant SN 1006 at late times

Physical Sciences

Author(s):

Roy Michael Galazka† (Science)

Abstract:

[Abstract Redacted]

Keywords: Supernovae; Molecular Clouds; Computational Astrophysics

Mentor(s):

Abigail Polin (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1040**
*Presentation Time: Session 1: 9:00am-10:00am*

# Automated Journey Mapping for Survivor Support: A Data-Driven Approach to Enhancing TAPS

Innovative Technology / Entrepreneurship / Design

Author(s):

Beatriz Gimenez Cerezo† (DSB); Ty Emerson Schafer† (DSB); Cooper Jacob Wylie† (DSB)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1041**
*Presentation Time: Session 1: 9:00am-10:00am*

# Effects of Sleeping Habits in Liberal Arts Students

Social Sciences / Humanities / Education

Author(s):

Philip Edward Godette† (Liberal Arts)

Abstract:

For students to excel in higher education, sleep is a necessary component to ensure that students may effectively learn and be engaged in their programs of study. Research however, documents that large numbers of College students lack the proper amount of sleep. Lack of sleep is known to have a negative effect on academic performance, memory, ability to concentrate, physical performance, and mental health. However, research is needed on student perspectives and beliefs about the factors that affect their sleep habits (SH). In this qualitative investigation I propose to address this issue. I conduct in-depth, semi-structured interviews with a small, purposively selected sample of students in Purdue's College of Liberal Arts. The interview format is intended to foster participants' engagement and to contribute rich data to questions that will ask students to : (a) share their SH; (b) explore their awareness of the consequences of sleep deprivation; (c) reflect on factors that contribute to poor SH, including major-specific requirements, disabilities, and extracurricular activities; and (d) share how poor SH may affect their education. Interview questions will also document students' perspectives related to common stereotypes around SH. I will use axial coding to comprehensively connect the causes and effects of SH and document how certain variables may interact with others. This study will provide insights into an already heavily researched topic by focusing on a smaller, purposively selected group of students and contributing rich data on their beliefs about their own sleeping trends.

Keywords: Sleep; College Student; Sleeping Habits

Mentor(s):

Panayota Y Mantzicopoulos-James (Education)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1042**
*Presentation Time: Session 1: 9:00am-10:00am*

# Identifying the Presence of Arylsulfatase A in Gut-Associated Bacteria: Implications for Sex Hormone Homeostasis

Life Sciences

Author(s):

Lillian Grace Gogel† (HHS)

Abstract:

Sex hormones can be conjugated with sulfate and glucuronide in the liver, followed by biliary excretion through the intestines. Some intestinal bacteria possess arylsulfatase, which deconjugates sulfate from sex hormones, allowing free hormones to be reabsorbed by the host. Our research team identified gut-associated bacterial taxa responsive to changes in sex hormone status, providing an opportunity to pinpoint specific bacterial species that contain sulfatase. This initial investigation focuses on identifying arylsulfatase A, as its activity has been found to elevate during the ovulatory phase and plays a crucial role in sulfate-ester hydrolysis.

METHOD: Protein sequences of bacterial arylsulfatase A were obtained from the SulfAtlas BLAST sequences database v1.0 and v 2.3.1. These sequences were used to determine whether arylsulfatase A is present in bacterial species within the families Turicibacteraceae, Oscillospiraceae, Erysipelotrichaceae, and Lachnospiraceae using BLASTp.

RESULT: Several bacterial arylsulfatase A protein sequences were identified in the database. However, only two sequences were found in the bacterial taxa we examined: one associated with Hungatella effluvia and another with an unidentified Lachnospiraceae bacterium. Among the bacterial families examined, 45 species had these protein sequences with both similarity and query coverage greater than 80%. Interestingly, all these species belong to the family Lachnospiraceae, with the highest matching query coverage and identity being Hungatella effluvia and Eisenbergiella Tyl.

Our findings identified Hungatella effluvia and Eisenbergiella Tyl as potential bacterial targets possessing arylsulfatase A protein. Understanding their specificity and function in influencing sex hormone homeostasis could aid in developing therapeutics for sex hormone-sensitive diseases.

Keywords: Arylsulfatase A; Gut Bacteria; Sex Hormones; Estrogen; Homeostasis

Mentor(s):

Tzu-Wen Cross (HHS); Anna R Clapp (HHS)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1043**
*Presentation Time: Session 1: 9:00am-10:00am*

# Measurements of quantum discord in generated top quark pairs at sqrt(s) = 13 TeV

Physical Sciences

Author(s):

Paul Bradley Greenberg† (Science); Juan Duarte Quiros* (Universidad EAFIT)

Abstract:

[Abstract Redacted]

Keywords: Top Quark Physics; High Energy Physics; Particle Physics; Quantum Mechanics

Mentor(s):

Andy Jung (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1044**
*Presentation Time: Session 1: 9:00am-10:00am*

# Retention Rates of Minority Students in PWIs

Social Sciences / Humanities / Education

Author(s):

Aramia Gutierrez† (HHS)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Michael Douglas Johnson (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1045**
*Presentation Time: Session 1: 9:00am-10:00am*

# Distinguishing Electrodeposition from Electroprecipitation at the Nanoscale: A Focus on Individual Nanoparticles

Physical Sciences

Author(s):

Michael Louis Harrigan† (Science)

Abstract:

[Abstract Redacted]

Keywords: Catalysis; Nanoparticles; Electrochemistry; Microstructure; Alloys

Mentor(s):

Jeffrey Edward Dick (Science); Saptarshi Paul (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1046**
*Presentation Time: Session 1: 9:00am-10:00am*

# Characterizing contemporary habitat conditions and distribution of the Montezuma Quail (Cyrtonyx montezumae) using ecological niche modeling

Life Sciences

Author(s):

Audrey Jean Heckel† (Engineering|JMHC)

Abstract:

The Montezuma Quail (Cyrtonyx montezumae) is a ground-dwelling bird that inhabits much of Mexico and the southwestern US, but is a species of concern in Texas due to habitat modification and fragmentation. This has led the state department to take interest in supplementation in the future. We developed a model that projects the distribution of suitable habitat across the entire range of the species using bioclimatic variables. Based on this model we characterized the species preferable habitat conditions and identified potential distribution. The outcome of this project will help identify vulnerable and potential habitats, which will inform conservation and management efforts, including potential translocations of individual birds for the long-term maintenance of genomic diversity. For future steps, we will identify regions where it will be endangered based on future predictions.

Keywords: Species Distribution Modeling; Realized Niche; Landscape Analysis; Geographic Information Systems; Species Conservation

Mentor(s):

Andrew DeWoody (Agriculture)

Other Acknowledgement(s):

Jong Yoon Jeon (Agriculture)

**Poster Presentation Abstract Number: 1047**
*Presentation Time: Session 1: 9:00am-10:00am*

# Mapping Buried Basalts on the Moon: Eastern Hemisphere

Physical Sciences

Author(s):

Amanda Joan Holmes† (Science); Jacob Harlow Ehman‡ (Engineering)

Abstract:

Cryptomaria are basaltic lava flows on the Moon that have been buried by ejecta from past basins and impacts on the Moon's surface. Identifying buried cryptomaria is important as it allows for a more accurate estimation of the volume of eruptions that have occurred on the Moon, which helps constrain the Moon's geological and thermal evolution. Ilmenite, an iron titanium oxide mineral in basaltic lava flows, strongly affects the backscatter of radar signals, causing more signal loss and lower backscatter resulting in darker, lower value pixels in a radar image. Depolarized radar data from the Arecibo Observatory and NASA's Lunar Reconnaissance Orbiter (LRO) were analyzed in ArcGIS Pro to identify areas of low radar backscatter that are associated with cryptomaria on the near side of the Moon. To discern areas with significant low backscatter that could be cryptomaria, multiple methods of analysis were performed on the radar images in ArcGIS Pro. Techniques included extracting and removing areas of high and low backscatter associated with problematic signal return, extracting areas of pixels with backscatter values lower than the average mean of pixels in mapped surface basalts, calculating the point density of the extracted low backscatter pixels, and converting the point data to quantile polygons to illustrate regions of potential cryptomaria. Significant amounts of cryptomaria were identified in proximity to previously mapped surface deposits and in new areas.

Keywords: Moon; Mapping; Geology; Cryptomeria; Remote Sensing

Mentor(s):

Ali Bramson (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1048**
*Presentation Time: Session 1: 9:00am-10:00am*

# Metal-Insulator-Metal Capacitor SPC Project

Innovative Technology / Entrepreneurship / Design

Author(s):

Jacob Charles Humphrey† (Engineering); Dilay Aygun† (Engineering); Huan Wen Mao† (Engineering); Rakhmatillokhon Avazkhon u Abdubaev† (Engineering); Hsun-Ti Chiang† (Engineering); Charlita Sinmak† (Engineering); Hao Tian Pang† (Engineering); Ryan Prado Bailey† (Engineering|JMHC)

Abstract:

[Abstract Redacted]

Keywords: MIM; SPC; Capacitor

Mentor(s):

Zhihong Chen (Centers & Institutes); Joerg Appenzeller (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1049**
*Presentation Time: Session 1: 9:00am-10:00am*

# The Unspoken Barriers of Immigrant Students in America

Social Sciences / Humanities / Education

Author(s):

Amanda Nicole Ibarra† (Education|JMHC)

Abstract:

In 1982, the U.S. Supreme Court ruled that all undocumented students have the right to a K-12 education (Plyler v. Doe case). Nonetheless, immigrant students continue to face significant barriers in their educational journey. Undocumented youth in particular face significant risks because they are directly impacted by immigration policies. Immigration and Customs Enforcement raids and the threat of deportation create an environment of intimidation and fear among immigrant families resulting in children's decreased attendance and engagement in school. Additionally, school choice is difficult for immigrant parents to navigate because of linguistic, cultural, and economic barriers. Evidence suggests that immigrant students in U.S. schools face unequal educational opportunities, as they tend to attend larger schools who serve higher proportions of low-income students. These schools have fewer resources and fewer qualified teachers.

It comes as no surprise that these barriers lead to achievement disparities between immigrant students and their non-immigrant peers. Over a decade ago, data from the 2012 PISA study documented significant gaps, and highlighted unspoken yet detrimental barriers that immigrant students face. In this project I review these findings and follow up with evidence from recent studies to document longitudinal trends in this gap. I conclude by proposing a framework that highlights multiple layers of influence on the education of immigrant students and that helps identify ineffective education policies. I suggest promising avenues for research and policy changes needed to address educational inequities that contribute to improved achievement outcomes for immigrant students.

Keywords: Immigrant Students; Undocumented Youth; Achievement Gaps; Educational Barriers; Undocumented Students

Mentor(s):

Panayota Y Mantzicopoulos-James (Education)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1050**
*Presentation Time: Session 1: 9:00am-10:00am*

# Toward New Supramolecular Approaches to Select Therapeutic Peptides

Physical Sciences

Author(s):

Levi M Johnson† (Science)

Abstract:

[Abstract Redacted]

Keywords: Peptide Therapeutics; Peptide Sequencing; Supramolecular; Molecular Cages

Mentor(s):

Kyle Timothy Faivre (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1051**
*Presentation Time: Session 1: 9:00am-10:00am*

# Debugging Machine Learning Pipelines for Model Fairness

Mathematical/Computation Sciences

Author(s):

Animesh Divekar Joshi† (Science)

Abstract:

Machine learning algorithms are increasingly being used in a wide range of domains. However, there have been multiple incidents of such systems resulting in biased decisions; this issue is especially concerning in high-stakes decision-making domains such as criminal justice, healthcare, and finance. Recent research has been successful attributing root causes of bias or unfairness to the underlying training data used to learn the models. Training data, however, undergoes several data preparation steps before being fed into the model. The purpose of this study is to determine the root causes of bias in such machine learning pipelines by identifying raw training data points that can be attributed to the bias. To solve this problem, we leverage the idea of data valuation that has recently been used in the field of explainable AI to compute the contribution of training data points toward model performance. We will consider representative ML pipelines consisting of data preparation steps and ML models deployed on standard datasets in the fair ML literature. Our approach will extend existing data valuation techniques, such as Shapley values and influence functions, to ML pipelines in the context of fairness. The outcomes of the project are expected to highlight problematic training data points in ML pipelines and provide recommendations for training data interventions as a potential way to mitigate system bias.

Keywords: Algorithmic Bias; Machine Learning; Debugging ML Pipelines

Mentor(s):

Romila Pradhan (Polytechnic)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1052**
*Presentation Time: Session 1: 9:00am-10:00am*

# How Does Experience Affect Perceptions of Electric Vehicle Characteristics? A Users vs. Non-Users Comparison

Mathematical/Computation Sciences

Author(s):

Christina Joslin† (Science|Graduate|JMHC)

Abstract:

While electric vehicle (EV) technology has seen notable advancements, Internal Combustion Engine Vehicles (ICEVs) remain the dominant choice among Indiana drivers. Understanding public perceptions of the characteristics of EVs compared to ICEVs is essential to comprehending this preference and promoting transportation electrification. This study is based on a survey of 1,217 Indiana adults, representative in age, gender, and income, to assess how perceptions about EV characteristics change with experience and to identify the main factors influencing these changes. Descriptive analysis and chi-squared tests were performed to identify statistically significant differences in opinions between EV users and non-EV users regarding 13 factors considered as benefits, drawbacks, or uncertainties. These characteristics included purchase price, maintenance cost, fuel cost, registration fee, life cycle cost, depreciation, refueling convenience, trip planning convenience, noise, driving comfort, driving range, reliability, and safety. The findings revealed that all characteristics statistically varied between EV users and non-EV users, with the largest gaps in maintenance costs, safety, and reliability. EV users tend to view their vehicles as safer and appreciate the lower long-term costs, such as reduced depreciation and maintenance. In contrast, non-EV users emphasize the higher upfront costs and remain concerned about reliability and ongoing maintenance. Noise and quieter operations were valued by both groups, with more EV users recognizing this benefit, while EV driving range emerged as a disadvantage for both, though EV users found it less limiting. This study presents targeted policy recommendations for stakeholders aiming to advance electrified transportation and promote greater EV adoption.

Keywords: Electric Vehicles; Perceptions; Experience; Characteristics; Statistical Tests

Mentor(s):

Nadia Gkritza (Engineering); Bruno cesar Krause moras (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1053**
*Presentation Time: Session 1: 9:00am-10:00am*

# The in vitro activity of repurposed drugs against different strains of Balamuthia mandrillaris

Life Sciences

Author(s):

Shreyes Kanumuru† (Science)

Abstract:

Balamuthia mandrillaris is a species of pathogenic free-living amoeba that can affect the central nervous system (CNS) and cause an infection known as Balamuthia amebic encephalitis (BAE). B. mandrillaris is more commonly isolated from soil and dust, it can infect humans via skin lesions or inhalation. The infection of B. mandrillaris is highly fatal, with only an ~8% survival rate. However, there are no effective and approved treatment options. In this study, we tested different B. mandrillaris strains for their sensitivity against 20 repurposed drugs including atorvastatin, flucytosine, sulfadiazine, ciprofloxacin, neomycin trisulfate, PHMB-HCl, simvastatin, chlorhexidine and various salts, nitroxoline, rifampicin, miltefosine, pentamidine and salts, alexidine, amphotericin B, propamidine, azithromycin, and fluconazole. We first optimized the parasite seeding density in 96-well plates and used the CellTiter-Glo 2.0 in vitro trophocidal assay to calculate the half maximal inhibitory concentration (IC50) value of each drug. For both N strain and V039, alexidine and chlorhexidine had IC50's <5 micromolar. Some drugs such as neomycin trisulfate and chlorhexidine HCl had the better anti-B. mandrillaris activity against N strain, but not against V039 strain. Our results provide novel strategies for suggested therapy, but further research is needed to determine translational use. Looking into the future, further drug development research against B. mandrillaris is essential to enhance the treatment options and standardize treatment protocols which may increase the cure rate, saving patient lives.

Keywords: Drug Screening; Balamuthia mandrillaris; Repurposed Drugs

Mentor(s):

Christopher Aaron Rice (Vet Med); Chenyang Lu (Vet Med)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1054**
*Presentation Time: Session 1: 9:00am-10:00am*

# Characterization of a Nonsurgical BAPN Murine Model for Thoracic Aortic Aneurysms

Life Sciences

Author(s):

Daniel Ethan Kelley† (Engineering)

Abstract:

Aortic aneurysms, which account for 10,000 deaths per year in the United States, are difficult to study in human subjects due to the medical emergency that occurs upon their discovery. Aortic aneurysm ruptures are fatal in most cases and are inconsistent and difficult to predict. Thus, there is a strong desire to create animal models representative of human pathology. Previous murine surgical models, which made use of elastase and beta-aminopropionitrile (BAPN), found success in creating abdominal aortic aneurysms, but applying such surgical methods to the thoracic cavity poses significant challenges. A newer noninvasive model, in which four-week-old C57BL/6J mice are provided 0.5% BAPN water, was evaluated in over forty mice. High frequency EKV and 4D (3D + time) ultrasound images were used to collect linear measurements of the aorta at consecutive time points up to 16 weeks. Thoracic aortic aneurysms (TAAs) of varying severity formed among the mice, with up to 200% linear diameter expansions observed. Aneurysm size, progression, location, and survivability within the model are characterized. This method provides a simpler, more reproducible TAA murine model, with potential applications to the study of pediatric aneurysms.

Keywords: Aneurysms; Ultrasound; Murine Model

Mentor(s):

Craig Goergen (Engineering); Cortland Hannah Johns (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1055**
*Presentation Time: Session 1: 9:00am-10:00am*

## L2 victim cache memory for RISC-V microprocessor with prefetching

Innovative Technology / Entrepreneurship / Design

Author(s):

Puthimet Kitjaruwankul† (Engineering); Chewon Yu Park† (Engineering); Shrienidhi Gopalakrishnan† (Engineering)

Abstract:

This project aims to enhance the performance of the AFTx07 RISC-V microcontroller, one of the VIP SoCET team's system on chip (SOC) designs, by implementing a shared L2 cache between the existing private L1 caches and the SRAM controller to address the high latency of off-chip external SRAM. Off-chip memory SRAM access currently operates at a slower speed compared to on-chip memory, significantly impacting system performance.

We propose an L2 victim cache, where the cache uses a no-read allocation policy which increases the write-back speed by storing the evicted write data from the?L1 cache faster than writing back directly from the L1 cache to the main memory SRAM. Prefetching is also used to anticipate future data access. It increases the cache performance by fetching nearby memory addresses, based on the CPU's request address, ensuring data is available in the cache before it is requested.

Our implementation will improve data access times, resulting in better overall system throughput. These advancements will be particularly beneficial for real-time and high-performance embedded systems with larger memory footprints.

Keywords: L2 cache; Victim Cache; Prefetching

Mentor(s):

Mark Johnson (Engineering); Cole Aaron Nelson (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1056**
*Presentation Time: Session 1: 9:00am-10:00am*

# To what extent are sin taxes more harmful than beneficial?

Social Sciences / Humanities / Education

Author(s):

Koon Joseph Klieopatinon† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Sin Taxes; Taxes; Alcohol; Tobacco; Soda Tax

Mentor(s):

Carla B Rosell (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1057**
*Presentation Time: Session 1: 9:00am-10:00am*

# We are much further away from self-driving taxis than you think

Social Sciences / Humanities / Education

Author(s):

Ashwin B Kokate† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Taxi; Self-Driving; Automative; Driverless; Vehicle

Mentor(s):

Carla B Rosell (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1058**
*Presentation Time: Session 1: 9:00am-10:00am*

# FastTrack to Recovery

Innovative Technology / Entrepreneurship / Design

Author(s):

Raina Kunder† (DSB); Christian Alexander Leidholm† (DSB); Bao Chau Chau Nguyen† (DSB); Alec Michael Walter† (DSB)

Abstract:

[Abstract Redacted]

Keywords: Data Mining; AI; LLMs; Data for Good; Grief Journey

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1059**
*Presentation Time: Session 1: 9:00am-10:00am*

# Machine Learning for the Tragedy Assistance Program for Survivors

Innovative Technology / Entrepreneurship / Design

Author(s):

Ying Yui Lai† (DSB); Sean Prue† (DSB); Jackson Kent Thompson† (DSB); Zijing Zhang† (DSB)

Abstract:

[Abstract Redacted]

Keywords: Data Mining; AI; Cloud; LLM; Predict

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1060**
*Presentation Time: Session 1: 9:00am-10:00am*

## Grief Stage Identification for Personalized Care in Military Survivors Using Data-Mining

Innovative Technology / Entrepreneurship / Design

Author(s):

Claire Anne LaVoie† (DSB|JMHC); Conrad Sebastian Lin† (DSB); Ethan Christopher Marks† (DSB); Benjamin Albert Westreich† (DSB)

Abstract:

[Abstract Redacted]

Keywords: Data Mining; AI; LLMs; Data for Good; Grief Journey

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1061**
*Presentation Time: Session 1: 9:00am-10:00am*

# UART Communication for System on Chip

Innovative Technology / Entrepreneurship / Design

Author(s):

Michael Li† (Engineering|JMHC); Yash Singh† (Engineering)

Abstract:

UART is a serial communication interface often utilized in embedded systems, microcontrollers, and computers for a wide variety of applications such as hardware diagnostics and connecting consumer electronics such as GPS systems and Bluetooth devices. This project's purpose is to modify an existing UART module to include hardware flow control, buffering, and programmable packet sizes. The existing UART is capable of 8-n-1 (eight bits of data, no parity bit for error checking, and 1 stop bit), but the project intends to implement the capability to handle different data formats such as different amounts of data bits (5-9 bits), a parity bit, and a second stop bit. This design will be created and tested using SystemVerilog. By the end of the year, the team plans to demo the design using FPGA boards to test and demonstrate the module's functionality to communicate with a host PC.

Keywords: UART; Hardware Design; Communication Protocol; System on Chip

Mentor(s):

Cole Aaron Nelson (Engineering); Mark Johnson (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1062**
*Presentation Time: Session 1: 9:00am-10:00am*

# Synthetic Aperture Radar Technology for Estimating Soil Moisture

Innovative Technology / Entrepreneurship / Design

Author(s):

Jessica Serena Jiayue Li† (Engineering|JMHC); Jingyu Xiao* (Engineeing|JMHC)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Jinha Jung (Engineering)

Other Acknowledgement(s):

Fatemeh Azimi (Interdisciplinary & Special Programs)

**Poster Presentation Abstract Number: 1063**
*Presentation Time: Session 1: 9:00am-10:00am*

# Impact of Water Hammer on Reverse Osmosis Systems

Innovative Technology / Entrepreneurship / Design

Author(s):

Alen Santiago Lizarazo Osorio† (Universidad de La Sabana, Columbia); Felipe Ramirez Franco* (Universidad Nacional de Colombia); Yovani Garcia Munera* (Universidad Nacional de Colombia)

Abstract:

[Abstract Redacted]

Keywords: Water Hammer; Reverse Osmosis; Cavitation; Hydraulic Transients

Mentor(s):

Jose M Garcia Bravo (Polytechnic)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1064**
*Presentation Time: Session 1: 9:00am-10:00am*

# Heart Rate Textile Sensing Project

Innovative Technology / Entrepreneurship / Design

Author(s):

Santino Basilio Macaggi† (Engineering)

Abstract:

This project addresses a key challenge faced by Purdue Athletics with heart rate monitor chest straps used by wrestlers and football players, which often led to discomfort and inaccurate readings due to improper placement during use. To solve this, the project developed heart rate monitoring electrodes for integration directly into athletic garments or practice jerseys, eliminating the need for separate chest straps. Preliminary research explored the functionality of electrodes and evaluated current products, patents, and research on integrating sensors into clothing. Notable designs, such as those developed by MIT and Rice University incorporating conductive materials like silver-coated fabric and carbon nanotube fibers, were used as reference designs for development. Experimental work included developing and testing different electrode designs or configurations to evaluate effectiveness in the final garment implementation. The experimental setup involved: 1. Constructing a custom EKG heart rate monitor circuit to establish a reference for accurate heart rate signals. 2. Validating the circuit with industry standard electrodes. 3. Testing and comparing electrode prototypes against the baseline signal to assess performance. Further work will focus on creating a prototype garment with integrated electrodes, with the aim of delivering a practical and effective solution for enhancing athlete monitoring during training and competitions.

Keywords: Electrodes; Heart Rate Monitors; Athletic Garments; EKG

Mentor(s):

Patrick James Cavanaugh (Engineering); Jan-Anders E Mansson (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1065**
*Presentation Time: Session 1: 9:00am-10:00am*

# SRAM

Innovative Technology / Entrepreneurship / Design

Author(s):

Antonios Maniatis† (Engineering); Rongbo Hu† (Engineering); Leo Pearson Malachowski† (Engineering|JMHC)

Abstract:

[Abstract Redacted]

Keywords: SRAM; Design Flow; SoCET

Mentor(s):

Timothy Francis Hein (Engineering); Conor James Green (Engineering); Mark Johnson (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1066**
*Presentation Time: Session 1: 9:00am-10:00am*

# Modelling Thermophysical properties of Refrigerant Mixtures

Physical Sciences

Author(s):

Kayla Elizabeth Manley† (Engineering); Tanvir Kaur† (Engineering); Madison Paige Ward† (Engineering); Nishtha Singh† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Thermophysical Properties; Refrigerant Mixtures; Intermolecular Forces; Modeling of IMFs

Mentor(s):

Riley Bradley Barta (Engineering)

Other Acknowledgement(s):

Kyle Allen Shepard (Engineering); Ganesh Brammanayagam venkatesan (Engineering)

**Poster Presentation Abstract Number: 1067**
*Presentation Time: Session 1: 9:00am-10:00am*

# Reconstructing the Higgs Boson from a Four Muon Decay Channel

Physical Sciences

Author(s):

Adina Ioana Margineantu† (Science); Mitchell Drew Finley† (Science); Michael Vic Paulson† (Science); Jishnu Ghosh† (Science)

Abstract:

In this study we discovered the Higgs Boson by analyzing events from proton-proton collisions where the Higgs Boson decayed into four leptons. We choose to look at the channels where the leptons decay into four muons because these channels are more stable and more easily reconstructed into the Higgs Boson compared to other methods, like quark and anti-quark decay. Based on event properties like transverse momentum and the angle from the scattering beam, we applied cuts to reduce the data to events that are likely to have made a Higgs Boson. A high transverse momentum and close-to perpendicular angle from the scattering beam means that the protons collided almost head-on and presumably made new particles. From these selected events, we reconstructed a pair of Z bosons and then the Higgs Boson. We plotted histograms of the signal and background simulated data to reach these conclusions. This discovery allows us to further research the Higgs Boson and its properties, like how many there are and how it complements the other fundamental particles. Furthermore, we can learn more about how particles interact with the Higgs field and how this affects their mass.

Keywords: Higgs Boson; Muon; High Energy; Particle Physics; Decay

Mentor(s):

Santosh Bhandari (Science); Andreas Jung (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1068**
*Presentation Time: Session 1: 9:00am-10:00am*

# The effects of sucrose and heat treatments on the gelatinization and pasting properties of tapioca starch

Physical Sciences

Author(s):

Silvia Nathalia Martinez Calderon† (Universidad Nacional de Colombia)

Abstract:

Tapioca starch is extracted from the starchy tuberous roots of the cassava plant, which is widely cultivated in tropical and subtropical regions for commerce. Tapioca starch is used as a food ingredient due to its effectiveness as a thickening agent and stabilizer, and its minimal impact on flavor. Formulation and thermal treatments are known to alter the structure and function of starch, which may be advantageous for food applications. This study investigated how sucrose molecules and various controlled treatment conditions – such as temperature (40 and 60°C), heating and drying durations (24 and 48 hours), and sucrose concentration (0, 0.5, 1.0, 1.5, and 2.0M) – affected the functional properties of the tapioca starch. Gelatinization and pasting behaviors were evaluated using differential scanning calorimetry (DSC) and rapid visco analysis (RVA) techniques. Compared to the native tapioca starch, both sucrose and heat treatment conditions had significant effects on the gelatinization and pasting behaviors of the starch, with the largest effects noted in the pasting parameters. These findings are important in the context of tailoring and controlling starch functionality in foods.

Keywords: Tapioca Starch; Gelatinization; Pasting; Sucrose; Heat Treatment

Mentor(s):

Rui Zhu (Agriculture)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1069**
*Presentation Time: Session 1: 9:00am-10:00am*

## Studying Cello Bowing Performance through a Robotic Arm and Reinforcement Learning

Innovative Technology / Entrepreneurship / Design

Author(s):

Vinay Sai Meda† (Science); Tanishaa Shah† (Engineering); Samitha Ranasinghe† (Engineering); Tiana Yi Jen Lin† (Engineering); Samantha Sudhoff† (Science)

Abstract:

Our project aims to program a robotic arm capable of bowing a cello with human-like precision and expression. The primary goal is to create a system that replicates the performance of a human cellist, with the eventual aim of passing a musical Turing test, where observers cannot distinguish the robot's performance from that of a human musician. The development process involves an extensive literature review to identify the state-of-the-art in robotic musicianship, followed by utilizing a UR5e robotic arm. We utilize a simulator and motion capture data from the Envision Center to refine the robot's movements and achieve the necessary angles and bowing techniques.

The anticipated outcome for this semester is a fully functional robot musician capable of playing basic musical pieces, demonstrating smooth bowing movements synchronized with human-like dynamics. The project also explores reinforcement learning to improve the robot's performance, making its bowing style more organic and adaptable to various musical contexts.

This research has implications for both music education and human-robot interaction. In education, the robot musician can serve as a valuable teaching tool, allowing students to focus on left-hand fingering techniques while the robotic arm handles bowing. It could also provide insight into how robots and humans can better communicate and collaborate, as the project involves synchronizing the robot's bowing actions with a human musician's fingering hand. The project ultimately aims to push the boundaries of robot musicianship, exploring how technology can intersect with art to create innovative learning experiences.

Keywords: Human-Robot Interaction; Robot Musicianship; UR5e; Robotics

Mentor(s):

Yung-Hsiang Lu (Engineering); Yeon Ji Yun (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1070**
*Presentation Time: Session 1: 9:00am-10:00am*

# Particle Image Velocimetry Setup for Cooling Microstructure

Physical Sciences

Author(s):

Grant Joseph Miller† (Engineering|JMHC); Joshua Decker Buss* (Engineering|JMHC)

Abstract:

The purpose of this project is to create an experimental Particle Image Velocimetry (PIV) setup to visualize fluid flow through a specialized cooling microstructure used for computer chips. The primary challenge is to create a setup that allows for the observation of flow without significantly altering the flow itself. Key research activities include literature review on similar PIV projects, conducting optical analyses in order to determine lens specifications, and investigating technologies in order to design the camera and lighting setup essential for fluid visualization. Preliminary results have given pictures of the seeding particles while not yet submerged in flow, and some optical analysis was conducted in an effort to determine the lens specifications and other experimental factors. While the project is ongoing, successful visualization of the fluid flow is anticipated, providing valuable data on flow behavior and patterns. This work has potentially significant implications in the field of energy efficiency, as it could be used in cooling systems for data centers and servers, which have an increased need for better cooling technologies as the world becomes more and more computerized.

Keywords: Particle Image Velocimetry; Fluid Flow Visualization; Cooling Microstructures; Optical Analysis; Energy Efficiency

Mentor(s):

Yubo Song (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1071**
*Presentation Time: Session 1: 9:00am-10:00am*

# Rethinking tolerance factor analysis for selenide-based chalcogenide perovskites

Physical Sciences

Author(s):

Andrew Evan Modin† (Engineering)

Abstract:

Selenide-based chalcogenide perovskites are emerging as promising materials for photovoltaic and optoelectronic applications, yet accurately predicting this crystal structure remains challenging. Traditional tolerance factor analyzes have proven inadequate in predicting suitable compositions consistently, often failing to align with experimental outcomes. In this study we present an enhanced approach to perovskite crystal structure prediction by integrating geometric factors - specifically octahedral and tolerance factors - with a chemical factor of electronegativity difference. Utilizing data sourced from the Materials Project database, which employs density functional theory (DFT) to obtain precise crystal radii, we systematically assess the stability of various selenide perovskite compositions. Our revised framework allows for a more nuanced understanding of how increased covalency influences the radii, thereby refining the tolerance factor application for selenide-based compounds. We propose a multi-step screening process that incorporates both geometric and chemical factors to identify promising selenide perovskite candidates for further experimental investigation. This analysis not only aims to clarify the criteria for phase stability in selenide perovskites but also seeks to motivate new experimental effectors in this rapidly developing field, contributing to the advancement in high-efficiency materials.

Keywords: Perovskite; Tolerance Factor; Density Functional Theory

Mentor(s):

Shubhanshu Agarwal (Engineering); Rakesh Agrawal (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1072**
*Presentation Time: Session 1: 9:00am-10:00am*

# Data-Driven Emotional Recovery Stage Identification for Military Survivors

Innovative Technology / Entrepreneurship / Design

Author(s):

Viswanath Jay Nair† (DSB); Sahil Maurice† (DSB); Oliver Joo Sung Johnson† (DSB)

Abstract:

[Abstract Redacted]

Keywords: Data Mining; AI; LLMs; Data4Good; Grief Journey

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1073**
*Presentation Time: Session 1: 9:00am-10:00am*

# Investigating the Effects of FDA-Approved Drugs for Treating Inherited Night Blindness in a Zebrafish Model

Life Sciences

Author(s):

Jillian New† (Science)

Abstract:

Retinitis pigmentosa (RP) is the genetically inherited degeneration of the retina, affecting approximately 1 in 4,000 individuals. Characterized by the deterioration of rod photoreceptors over time, RP causes progressive vision loss and imposes a financial burden. Various gene mutations can cause RP, including ones in the phototransduction genes such as the Q344X mutation on RHODOPSIN. Unfortunately, there is no cure for the Q344X mutation of RP. To find treatment options, we adopted a Q344X RP zebrafish model also showing deterioration of rod photoreceptors. To facilitate drug screening, we aimed to repurpose a selection of FDA-approved drugs. This approach reduces the time and cost of drug development, making the product accessible and affordable. To this end, our lab employed a functional visual behavior assay, revealing that Q344X RP zebrafish exhibited reduced visual behavior compared to normal fish. Utilizing this difference, we screened 1,239 drugs and identified 24 candidates that improved visual behavior in Q344X zebrafish. From these candidates, I focused on five drugs to assess their impact on rod photoreceptor deterioration. The drugs were administered 5 days post-fertilization (dpf) to 7 dpf, the same time as the functional screening. On 7 dpf, I collected retinal slices to quantify the rods. Statistical analysis revealed no improvement in rod numbers. Therefore, we hypothesize that these five candidates increased the physiological function of the remaining rods, sufficient to increase visual behavior. Moving forward, we aim to validate this hypothesis and investigate additional FDA-approved candidates from our initial visual behavioral screening.

Keywords: Drug Discovery; Inherited Retinal Degeneration; Zebrafish; Histology; Photoreceptor

Mentor(s):

Yuk Fai Leung (Science); Beichen Wang (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1074**
*Presentation Time: Session 1: 9:00am-10:00am*

# Future-Proofing ECELabs.io: Accessibility, Engagement, and Growth

Innovative Technology / Entrepreneurship / Design

Author(s):

Ji Bing Ni† (Science)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Junfei Li (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1075**
*Presentation Time: Session 1: 9:00am-10:00am*

# Application of Abundance Tomography to Anomalous Type Ia Supernova Events

Physical Sciences

Author(s):

Owen T Odney† (Science)

Abstract:

The explosions of white dwarf stars, commonly called Type Ia supernovae (SNe), display many uniformities that allow them to be used as “standardizable candles” for cosmological studies. However, there are some Type Ia SNe that show significantly different characteristics, warranting further study about their progenitor system and explosion process. While the elemental makeup of Type Ia SNe can be found from analyzing spectra taken at a specific time, there are likely significant asymmetries and mixing of elements within the supernova process. One method to analyze this mixing of elemental abundances is called abundance tomography. Using the Monte Carlo radiative transfer code TARDIS, a model is developed to fit synthetic spectra to various anomalous Type Ia events at different observation times. These spectra are then used to calculate the abundances for each shell of ejecta velocity. Utilizing this method, the experiment will attempt to ascertain if the elemental abundances match expected levels for typical Type Ia SNe, or if there are significant differences that hint at the asymmetries present in the explosion. This will allow future work to delve deeper into the processes and causes behind the apparent asymmetries in anomalous Type Ia SNe as well as the classification of new explosion mechanisms.

Keywords: Supernovae; Radiative Transport

Mentor(s):

Abigail Polin (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1076**
*Presentation Time: Session 1: 9:00am-10:00am*

# Horse Treat Preferences Based on Flavor

Life Sciences

Author(s):

Sidney Nicole Panaretos† (Agriculture); Megan Elizabeth Hines† (Agriculture|JMHC); Sydney D Anderson† (Agriculture); Haley Marie Morgan† (Agriculture); Alexis Ann Evans† (Agriculture)

Abstract:

According to the American Pet Product Association, equine owners spend four times more money on horse treats when compared to dog treats, spending an average of $261 per year on horse treats. It's been previously established that the palatability (odor and taste) of feed plays a role in horse feed acceptance. The aim of this study was to investigate treat flavor preferences of three horses and two ponies between seven and twenty-three years old. Treat flavors evaluated included a) baked apples and honey (A), b) baked molasses (M), c) baked peppermint (PE), and d) sweet potato, kelp, and turmeric (SP). During trials, each flavored treat was offered twice to each horse/pony; it was offered once from the left side and once from the right side. Horses and ponies were allowed to freely choose which flavor they consumed first and were allowed to freely move back and forth between treat flavors. First treat consumed and total number of treats per flavor consumed within 15 seconds was documented for each horse/pony. The SP treat was most preferred at 67 total treats consumed, 52 total PE treats were consumed, 47 total A treats were consumed, and M treats were the least consumed at 36 total. There were no observable effects on headshaking or spitting out treats; however, one pony had no preference for any treats as she consumed none during her trials. In conclusion, the horses consumed multiple flavors of treats provided, but preferred the sweet potato, kelp, and turmeric.

Keywords: Horse; Treats; Flavor; Equine; Palatability

Mentor(s):

Casie S Bass (Agriculture)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1077**
*Presentation Time: Session 1: 9:00am-10:00am*

# User-friendly web-server for cryo-EM structure modeling and validation

Mathematical/Computation Sciences

Author(s):

Joon Hong Park† (Science); Pranav Punuru‡ (Science)

Abstract:

Cryo-electron microscopy (cryo-EM) is a recent experimental method for determining molecular structures, providing critical insights into their functions and mechanisms. However, accurate interpretation of these maps requires sophisticated computational tools to model accurate atomic structures. The EMSuite Server, available at https://em.kiharalab.org, incorporates advanced algorithms developed at Kihara Lab, providing researchers with an efficient and user-friendly solution for processing cryo-EM data. This prsentation highlights the server's key functionalities and demonstrates how its algorithms can be effectively utilized to generate accurate structural models with multiple examples. By leveraging these tools, researchers can generate high-quality structural models that enhance the understanding of molecular functions and mechanisms.

Keywords: Cryo-EM; Computational Biology; Web Server; Protein Structure Modeling; Deep Learning

Mentor(s):

Daisuke Kihara (Science)

Other Acknowledgement(s):

Han Zhu (Science); Javad Baghirov (Science); Xiao Wang (Science); Genki Terashi (Science); Yuki Kagaya (Science); Kai Ling (Science); Shu Li (Science); Yuanyuan Zhang (Science)

**Poster Presentation Abstract Number: 1078**
*Presentation Time: Session 1: 9:00am-10:00am*

# Impact of Structured Revision Intervention During the Peer Review Process on Scientific Writing Self-Efficacy in Undergraduate Biology Students

Life Sciences

Author(s):

Allison Renee Peterson† (Education|Science); Gwyneth Wong* (Science); Emelia Koester* (Pharmacy|JMHC)

Abstract:

[Abstract Redacted]

Keywords: Structured Revision; Biology Education; Peer Review Process; Scientific Writing Self-Efficacy; Undergraduate Biology Laboratory

Mentor(s):

Stephanie M Gardner (Science); Jillian Cornell (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1079**
*Presentation Time: Session 1: 9:00am-10:00am*

# Opportunities and Risks of Biometric Security in the Age of Generative AI

Mathematical/Computation Sciences

Author(s):

Rachel Pfeifer† (Science)

Abstract:

[Abstract Redacted]

Keywords: AI; Biometric; Security; NLP

Mentor(s):

Sudip Vhaduri (Polytechnic)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1080**
*Presentation Time: Session 1: 9:00am-10:00am*

# Design and Manufacturing of Rigid Origami Structures

Innovative Technology / Entrepreneurship / Design

Author(s):

Maria Pundik† (Engineering|JMHC); Chelsea Tinsley*; Kendal ZaiSi Tinsley*

Abstract:

Origami design algorithms assume rigid facets with perfectly frictionless hinges. While we have developed, in the Programmable Structures Lab, a method of near frictionless hinge manufacturing that relies on cone-like geometry, we still need to develop methods of creating rigid facets. We are determining if there exist in the literature methods for achieving this, and if not, develop it. Also, we are determining how effective our rigid facets and frictionless hinges perform at matching idealized origami systems. This will be achieved by developing 3D printing parameters by printing with carbon fiber and PLA, using a starting point parameter developed by the lab. Additionally, we are assembling a structure resulting from our in-house origami design algorithm, testing the friction of 3D printed joints against the friction in ball bearing joints, and validating the rigid paneling.

Keywords: Origami; Rigid Facets; 3D Printing; Solid Mechanics

Mentor(s):

Clark C Addis (Engineering); Andres Arrieta Diaz (Engineering)

Other Acknowledgement(s):

Patrick Longman (Engineering)

**Poster Presentation Abstract Number: 1081**
*Presentation Time: Session 1: 9:00am-10:00am*

# Non-Enzymatic Wearable Glucose Sensor Based on a Biomimetic, Noble-Metal Nanoparticle-Decorated Laser-Induced Graphene

Physical Sciences

Author(s):

Sarah Pushparaj† (Science|JMHC)

Abstract:

[Abstract Redacted]

Keywords: Glucose Monitoring; Electrochemical Sensors; Laser-Induced Graphene; Nanoparticles; Wearable Sensors

Mentor(s):

Wenzhuo Wu (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1082**
*Presentation Time: Session 1: 9:00am-10:00am*

# From Data to Compassion: An AI-Powered Model for Survivor Support in Military Communities

Innovative Technology / Entrepreneurship / Design

Author(s):

Jonathan D Putman† (DSB|JMHC); Jacob Henning Deahl† (DSB); Bocheng Wang† (DSB)

Abstract:

[Abstract Redacted]

Keywords: Data Mining; AI; LLMs; Data for Good; Grief Journey

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1083**
*Presentation Time: Session 1: 9:00am-10:00am*

# Influence of Surface Sealing and Release Agent on Surface Characteristics of Additively Manufactured Fiber-Reinforced Thermoplastic Composite Tools

Innovative Technology / Entrepreneurship / Design

Author(s):

Lea Nikole Quiroa Lopez†; Juan Pablo Melgar Feregrino†

Abstract:

Fiber-reinforced composite additive manufacturing has emerged as a promising technology for producing composite tooling due to its ability to enable rapid tool fabrication, design flexibility, and reductions in material waste and labor. However, the quality and durability of the additively manufactured tool surfaces after post-machining remain concerns. The heterogeneous nature of fiber reinforcement and polymer matrix, which are intermixed on the surface, may negatively impact surface finish quality, potentially affecting surface roughness, friction, and the required demolding force. The typical practice involves applying surface treatment agents, such as primers, sealers, and release agents, to improve surface finish quality and reduce required demolding force. However, there is limited quantitative data that clearly shows the specific effects of each agent. In this study, the influence of surface treatment agents; primers, sealers, and release agents, on the surface characteristics of composite tools was investigated. Test specimens were additively manufactured using polyethersulfone (PESU) reinforced with 25% carbon fiber by weight. Key surface properties required for tooling applications—such as hardness, wear resistance, surface roughness, and friction—were evaluated before and after the application of surface treatment agents. The results showed that surface treatment agents significantly improved surface roughness by reducing micro-voids and creating a more uniform texture. Additionally, a reduction in wear was observed between untreated and treated specimens, indicating enhanced surface durability. Scanning electron microscopy (SEM) analysis further confirmed that the treated surfaces exhibited improved morphology and purity, supporting the suitability of these surface agents for composite tooling applications.

Keywords: Additive Manufacturing; Fiber-Reinforced Thermoplastic Composites; Surface Characteristics; Composite Tooling; Surface Coating

Mentor(s):

Garam Kim (Polytechnic); Eduardo Barocio Vaca (Engineering)

Other Acknowledgement(s):

Rishabh Pammi (Polytechnic)

**Poster Presentation Abstract Number: 1084**
*Presentation Time: Session 1: 9:00am-10:00am*

# Designing Incentives for Customer Actions: Simulations about Incentivized-UCRL2 Learning Algorithm in Home Heating System

Mathematical/Computation Sciences

Author(s):

Felipe Ramirez Franco† (Universidad Nacional de Colombia); Alen Santiago Lizarazo Osorio* (Universidad de La Sabana, Columbia); Yovani Garcia Munera* (Universidad Nacional de Colombia)

Abstract:

[Abstract Redacted]

Keywords: UCRL (Upper Confidence Reinforcement Learning); Efficient; Learning Algorithm

Mentor(s):

Vijay Gupta (Engineering)

Other Acknowledgement(s):

Shivam Bajaj (Engineering)

**Poster Presentation Abstract Number: 1085**
*Presentation Time: Session 1: 9:00am-10:00am*

# Next-Generation Stealth: Advancements in Stealth Materials and Their Impacts on Modern Defence.

Social Sciences / Humanities / Education

Author(s):

Architha Rao† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Radar-Absorbing Materials (RAM); Composites; Stealth; Ceramic-Based Composites; Carbon Composites

Mentor(s):

Carla B Rosell (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1086**
*Presentation Time: Session 1: 9:00am-10:00am*

# Functional characterization of candidate effector proteins of the fungal pathogen Zymoseptoria tritici

Life Sciences

Author(s):

Ruby Catalina Rodriguez Diaz† (Universidad Nacional de Colombia)

Abstract:

Zymoseptoria tritici is a hemibiotrophic fungal pathogen that causes Septoria tritici blotch (STB) in wheat, a disease of significant global economic impact. However, the strategies employed by Z. tritici to evade plant immune responses remain poorly understood. Consequently, numerous studies have focused on characterizing Z. tritici effector proteins and their role in manipulating the plant's primary immune response. In previous research, 31 candidate effector proteins from Z. tritici without their signal peptides (SPs) were identified and characterized. For this study, we selected 6 of these effectors, now including their SPs, for functional characterization based on their expression levels and cellular localization data without the SPs. Using a Nicotiana benthamiana heterologous expression system, we conducted functional assays to assess the effect of these effectors on production of reactive oxygen species (ROS) and their potential re-entry into host cells after secretion to the apoplastic space. Preliminary results indicate that one effector, Mycrg9710, localizes to cytosolic elements, suggesting it can enter the cell from the apoplast. Although additional results are pending, we expect two effectors, Mycgr7904 and Mycgr4290, to attenuate the ROS production, as previously observed when tested without the SP. These findings would suggest that these two effectors may play dual roles in modulating immune responses in both the apoplastic and cytoplasmic environments. This research will provide insights into the molecular mechanisms of Z. tritici pathogenesis and could guide the development of disease-resistant wheat varieties.

Keywords: Effectors; Zymoseptoria tritici; Subcellular Localization; Reactive Oxygen Species; Septoria Tritici Blotch

Mentor(s):

Stephen B Goodwin (Agriculture)

Other Acknowledgement(s):

Sandra Victoria Gomez Gutierrez (Agriculture)

**Poster Presentation Abstract Number: 1087**
*Presentation Time: Session 1: 9:00am-10:00am*

# Development of a Multi Axis Extrusion Deposition Additive Manufacturing Research Platform for Non-Planar Printing.

Innovative Technology / Entrepreneurship / Design

Author(s):

Alejandro Sebastian Sanchez Garza†; Cameron J Hartsfield† (Engineering); Luis Carlos Nino Cabello†

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Eduardo Barocio Vaca (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1088**
*Presentation Time: Session 1: 9:00am-10:00am*

# Exploring the Impact of a Progressive Wealth Tax on Income Inequality in the United States

Social Sciences / Humanities / Education

Author(s):

Maharsh Bhavesh Shah† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Carla B Rosell (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1089**
*Presentation Time: Session 1: 9:00am-10:00am*

# Disparities in Elementary School Outcomes and Child Behavioral and Learning Outcomes

Social Sciences / Humanities / Education

Author(s):

Elliott Shi† (Science)

Abstract:

While much focus has been on the health and educational benefits of later school start times for adolescents, less research has explored how earlier start times affect elementary children. This is important, as many districts shift elementary schedules earlier to accommodate later high school starts without increasing costs. Data from the Early Childhood Longitudinal Study-Kindergarten (ECLS-K) 2011 cohort was analyzed to assess the impact of school start times on academic and behavioral outcomes. Descriptive statistics were calculated, and ANOVA and chi-square tests examined group differences. Linear regression, adjusted for confounders, accounted for non-independence at the school level. This analysis of 11,877 kindergarteners (mean age 6.1) found significant disparities in school start times ($p<0.001$), with earlier starts more common among Black children, those in Title I schools, low-income households, and rural areas. According to teacher reports, later start times were linked to better attentional focus (0.1 SD, $p=0.03$) and fewer behavior problems (0.2 SD, $p=0.01$). However, start times after 8:45 AM were associated with lower math and reading scores (0.1 SD, $p=0.02$ for both). These findings highlight the impact of school start times on learning and behavior, especially for children already facing educational inequities. Since behavioral differences persist even after adjusting for confounders, further research is needed to ensure equity and optimize outcomes when setting elementary start times.

Keywords: School Start Times; Equity; Child Development; Early Learning

Mentor(s):

Michelle Marian Garrison (HHS)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1090**
*Presentation Time: Session 1: 9:00am-10:00am*

# Designing a Chiplet Communication Protocol for Post-Tapeout Heterogeneous Integration

Innovative Technology / Entrepreneurship / Design

Author(s):

Devin Singh† (Engineering); Vidisha Singhal† (Engineering); Michael Jeffery Dick† (Engineering); Luca Renato Simoni† (Engineering); Andrew Michael Lykken† (Engineering)

Abstract:

Traditional monolithic system-on-a-chip designs integrate CPU cores, hardware accelerators, and memory subsystems onto a single large chip. However, larger chips are more complex from both a design and manufacturing perspective. Conversely, chiplet designs separate groups of compute units and accelerators into multiple smaller, interconnected chips. To enable chiplet tapeouts for Purdue System-on-a-Chip Extension Technologies (SoCET) designs, we develop a lightweight networking stack intended for chiplet communication. While most chiplet designs communicate through fast silicon communication channels called a silicon interposer, we target printed circuit boards due to their low manufacturing cost and ease of prototyping. The networking stack consists of packet formats dictating how data is communicated between devices, a data link layer which controls the transport of packets, and a physical layer which transmits packets. The network switches will support configurable static routing tables to enable flexible post-tapeout topology decisions. When a message is received or can be sent, a Direct Memory Access controller will copy data between memory and endpoint. This enables more efficient data transfers without the involvement of the processor. To facilitate the router initialization and memory transfers, reusable software libraries will be written to configure router tables, initialize endpoint configurations, and construct data packets. A packet sniffer will be constructed using consumer microcontrollers to track packet communication between chiplets to aid in debugging and demonstration. These components will ensure traceable, efficient, and reliable communication between chiplets. This networking infrastructure will allow SoCET to have more rapid tapeouts and greater post-tapeout heterogeneous integration of disparate designs.

Keywords: System-on-a-Chip; Chiplet; Digital Design

Mentor(s):

Cole Aaron Nelson (Engineering); Mark Johnson (Engineering); Jacob Chappell (Engineering); Conor James Green (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1091**
*Presentation Time: Session 1: 9:00am-10:00am*

# Purdue Aerial Robotics Team's Research and Development Mechanisms Devision

Innovative Technology / Entrepreneurship / Design

Author(s):

Nora Jacques Siri† (Engineering); Andrew Earl Medlyn† (Engineering); Joseph Talon Vesco† (Engineering); Muhammad Rifqi Priatama Sambodo† (Engineering); Albertus Magnus Ethanael Nusawardhana* (Engineering); Dylan Richard McCool* (Engineering); Brandon William Davis* (Engineering); Nathan Jaekun Lee* (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Mechanisms; Research; Development; Robotics; Aerial

Mentor(s):

Niall Patrick Moloney (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1092**
*Presentation Time: Session 1: 9:00am-10:00am*

# Optimizing Pre-Trained Model Selection for Resource-Constrained Applications

Mathematical/Computation Sciences

Author(s):

Lawrence Folsom Smith† (Engineering); Hyeonwoo Heo† (Engineering); Joshua Peter LeBlanc† (Engineering); Nathanael Aou† (Science); Rohan Chandra Mudugere‡ (Engineering); Kyle John Massie‡ (Engineering)

Abstract:

The rapid success of Pre-Trained Models (PTMs) has revolutionized various domains by offering ready-to-use models that eliminate the need for resource-intensive training from scratch. Model zoos, which are a collection of PTMs such as Hugging Face, often contain hundreds to thousands of PTMs to choose from. Selecting the most appropriate PTM for a specific task poses significant challenges due to the vast number of available models, the complexity of tasks, and the resources needed to ensure the best model is used. We first explore the limitations of current PTM selection methods, which often involve exhaustive evaluations followed by the hardware constraints of fine-tuning the models. We focus on two promising selection methods: Model-Spider and LogME. Furthermore, we identify the energy constraints of large models and propose future research directions, emphasizing the importance of developing hardware-conscious solutions to PTM selection.

Keywords: Pre-Trained Models; Model Zoo; Model Spider; LogME

Mentor(s):

James C Davis (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1093**
*Presentation Time: Session 1: 9:00am-10:00am*

# Design and Integration of an 8-Bit Segmented R-2R Current-Mode DAC with Thermometer Decoding for System-on-Chip Applications

Mathematical/Computation Sciences

Author(s):

Nathaniel A Smith† (Engineering)

Abstract:

This project presents the design and integration of an 8-bit Digital-to-Analog Converter (DAC) using a wide-swing current-mode segmented R-2R topology within a System-on-Chip (SoC) environment. The DAC supports a binary input format and employs a thermometer decoder to enhance accuracy and linearity. The primary objective is to develop a DAC that can be seamlessly implemented within a microcontroller by the entire team, ensuring compatibility with SoC constraints and facilitating ease of integration. The chosen topology offers benefits such as improved linearity, reduced component count, and efficient use of silicon area, making it suitable for SoC applications. Essential components like operational amplifiers (op-amps), current sources, and resistive ladder networks are utilized to achieve the desired performance. Through comprehensive simulation and testing, the design aims to validate output fidelity and spectral performance, focusing on achieving a compact and efficient layout. This research also explores potential improvements for future applications in systems requiring precise analog signal generation within limited space and power budgets.

Keywords: Digital-to-Analog Converter (DAC); Segmented R-2R Ladder; System-on-Chip (SoC); Current-Mode; Analog Signal Generation

Mentor(s):

Dali Lai (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1094**
*Presentation Time: Session 1: 9:00am-10:00am*

# Sexual Intimate Partner Violence Victimization and Perpetration Among Couples: Examining the Moderating Effect of Trait Anger

Social Sciences / Humanities / Education

Author(s):

Rebekah Marie Spieth† (HHS); Ashlyn Nichole Ann Denny† (HHS)

Abstract:

Intimate partner violence (IPV) is common, with 41% of women and 26% of men experiencing abuse or aggression within the context of a romantic relationship. While researchers have disproportionately emphasized physical and psychological forms of IPV, far less is known about sexual IPV (S-IPV), including risk factors for this form of violence. Although sexual violence victimization is one of the most robust prospective risk factors for sexual violence perpetration broadly, little is known about the effect of this association among those within romantic relationships. Despite evidence positioning trait anger as an important moderating risk factor for various forms of IPV, few studies have examined the moderating effect of anger on S-IPV, specifically. Therefore, the current study aims to examine if the effect of S-IPV victimization on S-IPV perpetration is moderated by trait anger, as well as if this effect is different for men versus women. This study used data from N = 675 participants who reported experiencing past-year IPV from a larger investigation on the effects of acute alcohol intoxication on IPV. The effect of S-IPV victimization for both men and women ($p < .001$) significantly predicted S-IPV perpetration; however, the interaction between S-IPV victimization and trait anger ($p = .017$) significantly predicted S-IPV perpetration for women only. These findings highlight the unique interplay of risk factors for men and women who report perpetrating S-IPV. Potential implications for interventions seeking to programmatic efforts seeking to prevent S-IPV will also be discussed.

Keywords: Intimate Partner Violence; Sexual Aggression; Anger; Romantic Relationships

Mentor(s):

Daniel William Oesterle (HHS); Christopher I Eckhardt (HHS); Niamh Christie (HHS)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1095**
*Presentation Time: Session 1: 9:00am-10:00am*

# Autonomous Motorsports Purdue - Electrical Subteam

Innovative Technology / Entrepreneurship / Design

Author(s):

Patrick Randall Spillman† (Engineering|JMHC); David Wesley Thoe† (Engineering); Aditya Verma† (Engineering); Richard Ye† (Engineering); Samuel Elijah Nadol† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: AMP; Anti-Spark; Battery Temperature System; STM32 Microcontroller; Autonomous Motorsports Purdue

Mentor(s):

Shreya Ghosh (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1096**
*Presentation Time: Session 1: 9:00am-10:00am*

# Causes, Effects, and Solutions of Antibiotic Resistance

Social Sciences / Humanities / Education

Author(s):

Nolan Cai Tai† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Carla B Rosell (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1097**
*Presentation Time: Session 1: 9:00am-10:00am*

# Isolation and Characterization of Bacteriophage Goblin19: Expanding the Phage Database Targeting Arthrobacter globiformis

Life Sciences

Author(s):

Austin Robert Tanabe† (Agriculture|Engineering|JMHC); Daniel Russell Cline† (Agriculture|Engineering); Collin Jayson Kao* (Agriculture|Engineering)

Abstract:

Bacteriophages are viruses that selectively infect and replicate only in specific bacterial hosts by hijacking the bacterium's cellular machinery to produce viral replicates. Given the rise in antibiotic-resistant bacteria, phage therapy has been gaining increasing attention as a precise treatment that could change how we manage antibiotic-resistant infections. Phage therapy against antibiotic-resistant bacteria requires a repository that will allow scientists to be able to access phage-host specificity for future therapeutic applications. In this study, we isolated and characterized a novel bacteriophage Goblin19, which specifically targets the bacterium Arthrobacter globiformis. We first isolated our bacteriophage from a soil sample that was collected locally, where we enriched our sample with A. globiformis. Allowing the phage to multiply in the presence of A. globiformis, we performed an amplification that included a serial dilution followed by a full plate titer ensuring a high titer concentration of  5×10^9  pfu/mL for archiving, transmission electron microscopy, and characterization. In order to analyze the genetic information about Goblin19, DNA extraction was performed followed by a restriction digestion to cut the genome into multiple fragments. The resulting DNA fragments were separated and visualized on a gel electrophoresis which allowed us to compare them with other characterized phages. This comprehensive methodology provides insights into the genetic characteristics of Goblin19 and contributes to the overall broader phage database. Looking into future, further phages will need to be discovered and archived, which will aid in the development of phage therapies against antibiotic-resistant bacteria.

Keywords: Antibiotic-Resistant Bacteria; Arthrobacter globiformis; Phage Therapy; Phage Database; Bacteriophages

Mentor(s):

Kari L Clase (Engineering); Aaron J Gin (Purdue University); Amanda K Limiac (Engineering)

Other Acknowledgement(s):

Julia Ann Simler (Agriculture); Ruba Ahmad Qwai Alajlouni (Agriculture)

**Poster Presentation Abstract Number: 1098**
*Presentation Time: Session 1: 9:00am-10:00am*

# A Standard C Library Implementation on an In-House Designed RISC-V Microcontroller

Innovative Technology / Entrepreneurship / Design

Author(s):

Eduard Filip Tanase† (Engineering|JMHC); Aiden Hughes Sexton† (Engineering); Alexander Thomas Aylward† (Engineering|JMHC); Cecilie Zhang† (Engineering); Alexander Raffaele Ciccarelli† (Engineering); Khanh Nam Nguyen† (Engineering)

Abstract:

The C standard library is a critical component of almost all modern software. This project focuses on porting Picolibc as the C standard library on the AFTx08, a student-designed custom 32-bit RISC-V microcontroller, with the goal of establishing an environment that can support more complex software applications in future semesters.

As AFTx08 is still in the pre-silicon phase, the development of the port will be carried out using the simulation on Verilator or emulation using a FPGA. Picolibc is an ideal candidate for developing a standard library due to its size optimizations. The implementation process involves two key phases: Adapting picolibc's system specific functions to our system and creating a reusable tool chain that will allow future developers to use the port in their applications. A demonstration of this port would be to use the microcontroller to run software like DOOM, a classic PC game, demonstrating the system's capabilities for real-time graphics rendering and input/output processing. Programs like DOOM, while system portable, require an array of standard library functions for processes including memory allocation and file I/O, which will be implemented through our port of Picolibc.

Keywords: System-on-Chip; Microcontroller; Software; RISC-V; Hardware

Mentor(s):

Cole Aaron Nelson (Engineering); Mark Johnson (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1099**
*Presentation Time: Session 1: 9:00am-10:00am*

# Statistical Process Control for Photolithography and Metal Deposition

Physical Sciences

Author(s):

Benjamin Anderson Tofil† (Engineering); Gangsan Lee† (Engineering); Brian Martin Dodd† (Engineering); Neha Saleha† (Engineering); Alexandre Chan Tome† (Engineering); Cheong Eun Kim† (Engineering); Sang Soo Ha† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Semiconductors; Statistical Process Control; Nanoelectronics; Device Fabrication; VIP

Mentor(s):

Feichi Huang (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1100**
*Presentation Time: Session 1: 9:00am-10:00am*

# IoT Server for Quantum Information Lab

Physical Sciences

Author(s):

Dhruv Upreti† (Science)

Abstract:

Maintaining a centralized location for physical parameters of laboratory equipment and environmental variables, such as localized temperature and humidity of different regions of a lab, is necessary for optimizing the overall operational efficiency of a laboratory environment. Additionally, these variables should be easily accessed in a simple graphical user interface for personnel to examine, and conveniently alert users through a variety of different means when values of parameters surpass certain thresholds. This project reports on an IoT server that was created within the Ma Group's laboratory that achieves the expectations outlined above. Devices that are connected to the internet can relay data to a Raspberry Pi which hosts the server. The data was stored locally on the Raspberry Pi with the time series database, Influx DB, and it was displayed via the graphical user interface Grafana. Within Grafana, alerts were configured to provide thresholds when parameters surpassed certain values, and a python-requests-based API was created to configure alerts and display their state directly within the dashboard. Integrating this server in the laboratory environment and implementing it as an open-source project on GitHub allows our and other Quantum Information laboratories to create a more streamlined research process.

Keywords: Internet of Things; Laboratory Server; Quantum Information Science

Mentor(s):

Alex Ruichao Ma (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1101**
*Presentation Time: Session 1: 9:00am-10:00am*

# Role of Cancer-Derived Extracellular Vesicles and Oncogenic miRNAs in Promoting Invasive Phenotypes in Lung Cancer

Life Sciences

Author(s):

Daniel Urdaneta Giraldo† (Universidad de los Andes)

Abstract:

[Abstract Redacted]

Keywords: Extracellular Vesicles; Cancer; Micro RNA

Mentor(s):

Samira Piltan (Science); Andrea L Kasinski (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1102**
*Presentation Time: Session 1: 9:00am-10:00am*

# Role of Endothelial to Mesenchymal Transition (EndMT) in Aggressive Vascular Tumors

Life Sciences

Author(s):

Paula Andrea Vargas Carranza† (Universidad de los Andes)

Abstract:

[Abstract Redacted]

Keywords: Endothelial to Mesenchymal Transition (EndMT); Vascular Tumors; Angiosarcoma

Mentor(s):

Anthony Joseph Murphy (Science); Jason Hanna (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1103**
*Presentation Time: Session 1: 9:00am-10:00am*

# Long-Term Consequences of Concussions: A Review of Electrophysiological, Neuropsychiatric, Oxygenation, and Neuroimaging Impacts

Social Sciences / Humanities / Education

Author(s):

Malachi Israel Vincent† (HHS)

Abstract:

This literature review documents the long-term effects of concussions on brain function, with a focus on four main areas: electrophysiological changes, neuropsychiatric outcomes, prefrontal cortex oxygenation, and neuroimaging findings. Understanding the impact of concussions is particularly critical in fields where repeated head injuries are prevalent (i.e., sports, military, and healthcare). This review is essential for developing effective diagnostic and therapeutic strategies considering the increased risk for harmful, long-term consequences.

The objectives of this review are to examine current literature on the chronic effects of concussions across multiple domains of brain activity, identify gaps in the literature, and propose new directions for future investigation. Specifically, this review provides a synthesis of findings on how concussions affect brain electrophysiology, emotional and cognitive health, oxygenation regulation in the prefrontal cortex, and long-term structural and functional changes in the brain as revealed through neuroimaging techniques. Key findings indicate that individuals with a history of concussions often exhibit altered event-related potentials (i.e., measurement of the brain's electrical activity), including delayed P3 responses, and show compensatory neural mechanisms (i.e., cognitive & behavioral function), during cognitive tasks. Neuropsychiatric research highlights persistent cognitive deficits, mood disorders, and a heightened risk for neurodegenerative conditions. Studies on prefrontal cortex oxygenation reveal impaired neurovascular coupling, suggesting difficulties in oxygen regulation post-concussion. Neuroimaging data demonstrate structural brain changes, including hippocampal atrophy and white matter degradation, which persist years after the injury. These findings suggest the need for further research on the long-term consequences of concussions to guide treatment and preventive measures.

Keywords: Concussions; Neuropsychiatric; Electrophysiological; Neuroimaging; Neurodegenerative

Mentor(s):

Panayota Y Mantzicopoulos-James (Education)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1104**
*Presentation Time: Session 1: 9:00am-10:00am*

# The Influence of Roots and Rhizosphere on Phosphorus Cycling in Corn-Soy Rotations Managed with Low Phosphorus Inputs

Life Sciences

Author(s):

Amber Voigtschild† (Science|JMHC)

Abstract:

In fields where phosphorus (P) fertilization is reduced for the sake of soil health, corn and soy have been able to maintain or recover grain yield over time. Though somewhat uncommon, these cases show that cropping systems can leverage the soil's natural ability to provide plant-available P. On 27 corn and soybean fields across Indiana, we investigated how lowering P fertilization, along with other soil health management techniques, affected the microbiome composition and both total and extractable P levels near plant roots. We hypothesized that soils with low P content (as determined by agronomic recommendations) would trigger increased P-mining activity in the rhizosphere. We examined the effect of the rhizosphere by using mesh bags with different pore sizes: 1,000 µm to permit root access, 45 µm to block root entry, and 1 µm to limit mycorrhizal access. The bags were placed either in rows or between rows. These treatments allow us to differentiate P cycling activity influenced by plant roots from activity without root involvement and to identify which microbial populations thrive in areas where P fertilization was reduced. We will share initial findings on how bagging affects soil moisture and P availability, as microbiome data is continuing to be generated. The goal of this study is to identify patterns in soil microbiota that can predict the natural capacity for biological P fertilization. Knowledge of these patterns will be able to be used to inform efficient fertilizer use and justify the magnitude of fertilization needs for soil.

Keywords: Phosphorus; Rhizosphere; Microbiome

Mentor(s):

Roland Conrad Wilhelm (Agriculture)

Other Acknowledgement(s):

Eliazar Andonie Martinez Cruz (Agriculture)

**Poster Presentation Abstract Number: 1105**
*Presentation Time: Session 1: 9:00am-10:00am*

# Exploring Mechanisms of Lipid Droplet Accumulation in Microglia in Alzheimer

Life Sciences

Author(s):

Natalia Vujic† (HHS)

Abstract:

Alzheimer's Disease (AD) is a progressive neurological disorder that presents itself in memory loss, cognitive deterioration, and altered behavior. This disease impacts millions of individuals, and currently, there are no commercially available drugs that halt the disease's progression. Microglia, the primary immune cells responsible for maintaining brain health, play a crucial role in maintaining brain homeostasis by phagocytosing amyloid-beta (A?) plaques. However, in AD brains, our lab has found that A? plaques trigger the accumulation of lipid droplets (LDs)—cellular organelles that store lipids—within microglia, impairing their phagocytotic function and potentially contributing to the progression of the disease. In this study, we utilized si-RNA knockdown and quantitative PCR (qPCR) techniques to explore the sources of fatty acids needed for A?-induced LD accumulation and the specific signaling pathways involved in this process. By understanding this underlying mechanism of LD accumulation, we aim to identify therapeutic targets to restore microglial function and improve A? clearance. This could lead to novel strategies to slow AD's progression by enhancing microglial efficiency and reducing plaque buildup.

Keywords: Alzheimer; Microglia; Lipid Droplet; Amyloid-beta

Mentor(s):

Yihao Chen (Science); Gaurav Chopra (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1106**
*Presentation Time: Session 1: 9:00am-10:00am*

# Triboelectric Pulse Sensors Using Bio Derived Polymer Inks

Innovative Technology / Entrepreneurship / Design

Author(s):

William Samuel Walker† (Engineering|JMHC); Abiram S Gurijala‡ (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Triboelectric Nanogenerators; Material Sciences; Health Monitoring Devices; Wearable Electronics; Flexible Electronics

Mentor(s):

Nachiket Vatkar (Engineering); Wenzhuo Wu (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1107**
*Presentation Time: Session 1: 9:00am-10:00am*

# Increasing Resilience and Flourishing in Asian American Teens: The Cultural Identity Audio Biography (CIAB) Study

Life Sciences

Author(s):

Michelle Wan† (HHS)

Abstract:

Asian American adolescents are facing a mental health crisis.1 There are numerous reasons why: The Model Minority Myth2, ethnic identity pressure,3 social isolation,4 and resistance to traditional mental health counseling. Thus, novel counseling interventions are needed to help Asian American adolescents develop resilience and help them flourish as they explore and develop their identities. This mixed methods paper describes an innovative intervention that uses Music Therapy to help Asian American adolescents express their life stories through DJing. The intervention consists of three 1-hour sessions with a licensed Music Therapist. The focus was on having adolescents express their past, present, and future identities through DJing. The final product was a Cultural-IdentityAudio Biography (CIAB). Sixteen Indiana adolescents completed the study. Qualitatively, we analyzed adolescent CIABs with music analysis, where researchers who were not part of the therapy process, analyzed and recreated adolescent identities, which resulted in 16 Asian American adolescent Archetypes. These Archetypes were then categorized into high and low resilience and flourishment. The results of the qualitative analysis were verified by using the survey data, which was collected before beginning the CIAB process. Our results show that music analysis is consistent with survey data and can provide a fuller picture of the teen's identity.

Reference

1 = Huynh, J., Chien, J., Nguyen, A. T., Honda, D., Cho, E. E., Xiong, M., Doan, T. T., & Ngo, T. D. (2023). The Mental Health of Asian American adolescents and young adults amid the rise of anti-Asian racism. Frontiers in public health. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9880072/

2 = Harvard Law School Center on the Legal Profession. (2023). The model minority myth. The Model Minority Myth. https://clp.law.harvard.edu/knowledge-hub/magazine/issues/asian-americans-in-the-law/the-model-minority-myth/

3 = Cheon, Y. M., Niu, L., Ehrhardt, A., & Yip, T. (2020). Daily academic satisfaction and ethnic/racial identity of Asian American adolescents: The role of objective and subjective peer diversity at school. Asian American journal of psychology. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7989802/

4 = Jang Y, Park J, Choi EY, Cho YJ, Park NS, Chiriboga DA. Social isolation in Asian Americans: risks associated with socio-demographic, health, and immigration factors. Ethn Health. 2022 Aug;27(6):1428-1441. doi: 10.1080/13557858.202

Keywords: [no keywords provided]

Mentor(s):

Stewart C Chang Alexander (HHS)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1108**
*Presentation Time: Session 1: 9:00am-10:00am*

# Measurement of Low-GWP Refrigerant-Lubricant Mixture Properties

Physical Sciences

Author(s):

Madison Paige Ward† (Engineering)

Abstract:

Concerns over the environmental impact of current refrigerants highlight the need for new environmentally friendly refrigerant mixtures that have reduced environmental impact. Due to the transition to low global warming potential (GWP) refrigerants, experimental data of property measurements is necessary to develop accurate equations of state and to properly evaluate the performance of new refrigerants when mixed with compressor lubricants. This project focuses on designing and building a measurement system and environmental chamber to test thermophysical properties of A1, A2, A2L and A3 refrigerant-lubricant mixtures between -80 deg C and 200 deg C to develop an understanding of the properties of refrigerant mixtures with various lubricants as well as unique refrigerant mixtures with limited data. Five properties will be measured, including pressure, temperature, density, speed of sound, and viscosity. Pressure, temperature, and density will be measured across the full temperature range, viscosity from -40 deg C to 200 deg C and speed of sound from -25 deg C to 125 deg C. This is an ongoing project, and future work includes finalizing the setup to get measurements for these different mixtures.

Keywords: Thermodynamics; Thermophysical Properties; Low-Global Warming Potential; Property Measurements

Mentor(s):

Riley Bradley Barta (Engineering)

Other Acknowledgement(s):

Ganesh Brammanayagam venkatesan (Engineering)

**Poster Presentation Abstract Number: 1109**
*Presentation Time: Session 1: 9:00am-10:00am*

# Potential Roles of Transposition in Carolina Chickadee (Poecile carolinensis) Populations of Central Indiana

Life Sciences

Author(s):

Bruce Daniel Ward† (Other); Rachel Pinto† (Science)

Abstract:

Several species of songbirds have demonstrated an ability known as transposition. (singing songs that vary in average tonal frequency but with consistent ratios of frequency between notes.) Black Capped Chickadees have demonstrated transposition, while the closely related Carolina Chickadees, despite having relative pitch (capability to recognize and repeat tones heard from other individuals), have not previously demonstrated transposition.

We discovered that males in several central Indiana populations of Carolina Chickadees use transposition counter-singing with other males. Our aim is to investigate non-transposing and limited frequency-range populations (those that maintain note ratio among a limited range of frequencies), to learn more about the role transposition plays in territorial defense.

We are observing eight populations in west central Indiana, four which demonstrate transposition and four which do not. Through this comparison, we can identify patterns in interactions between transposing and non-transposing birds and song types. We are analyzing the responses of different populations to playbacks of transposed songs relative to responses to songs with a limited frequency and to songs with a broad frequency range that are not transposed. These playbacks should provide some index of the level of threat posed by song transposition.

Our results indicate that individuals seem to respond less to wide-frequency songs that do not transpose. This likely indicates that these birds view transposing and limited-frequency songs as more of a threat than broad-band non-transposed songs. These findings indicate that among Carolina Chickadees, transposition is crucial in enhancing their ability in defending territories and attracting mates.

Keywords: Transposition; Partial Connectivity; Relative Pitch; Chickadees

Mentor(s):

Jeffrey R Lucas (Science); Jonathan B Jenkins (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1110**
*Presentation Time: Session 1: 9:00am-10:00am*

# Radical Empathy as a Framework for Teaching in Higher Education

Social Sciences / Humanities / Education

Author(s):

Emma Warnock† (Liberal Arts|JMHC)

Abstract:

Radical empathy is the key to being more culturally aware, reflective, and situated in the world as a decolonizing ontology critical of racism, sexism, classism, ableism, and LGBTQIA-phobia. Radical empathy is rooted in feminist ethics, bottom-up grassroots mobilization, and cultural relativity, and is central to action that bridges divides. Thus, a dire need exists to integrate radical empathy in education, as education plays a pivotal role in the liberation of all marginalized peoples across intersectional identities and oppressions. In this project, I take steps to address this need. I use qualitative methodologies and begin with a purposively selected focus group of Purdue faculty to facilitate collaborative conversations that will: (a) define radical empathy, (b) discuss the positionality of the self and academic institutions, (c) consider radical empathy on Purdue's campus as a tool for students, and (d) create steps for enacting ideological change in our campus community. I will analyze this data using ethnographic methodology as a holistic and anthropological lens that highlights collaboration and multiculturalism. This study will lead to better understanding of Purdue as a capitalist institution and its oppressions by offering clear objectives for providing students with the skills to employ radical empathy in the classroom, the workplace, and their lives. This research will fill a gap in the current literature on radical empathy by providing an accessible guide and toolkit for college institutions. Next steps will be to create and share resources from this project as workshops for professors and educators.

Keywords: [no keywords provided]

Mentor(s):

Panayota Y Mantzicopoulos-James (Education)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1111**
*Presentation Time: Session 1: 9:00am-10:00am*

# Remote-Controlled Car Shield Design for AFTx06 System on Chip

Innovative Technology / Entrepreneurship / Design

Author(s):

Renzhi Yongtian† (Engineering); Rauf Emre Erkiletlioglu‡ (Engineering); Tei Okamoto* (Engineering); Weijing Sebastian Chen* (Engineering); Anika Bajpai* (Engineering); Aditya S Hebbani* (Engineering)

Abstract:

AFTx06 is a System on Chip designed by SoCET along with a printed circuit board (PCB) designed for testing of AFTx06. The aim of this project is to design a remote-controlled car shield PCB that can be plugged onto the AFTx06 PCB to extend its capabilities such that it can easily be turned into a remote-controlled car. A complete shield, when plugged into the AFTx06 PCB, will be able to drive four direct current motors and has bluetooth unit allowing remotely controlling the motors.

Keywords: Printed Circuit Board; Camera; Embedded System; Bluetooth; System on Chip

Mentor(s):

Mark Johnson (Engineering); Matthew A Swabey (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1112**
*Presentation Time: Session 1: 9:00am-10:00am*

# Application of Reinforcement Learning to Precision Aerial Delivery System Control in Adverse Wind Conditions

Innovative Technology / Entrepreneurship / Design

Author(s):

Radman Tor Zarbock† (Engineering|JMHC)

Abstract:

[Abstract Redacted]

Keywords: Reinforcement Learning; Guidance, Navigation, and Control; Machine Learning; Precision Aerial Delivery System; Artificial Intelligence

Mentor(s):

Philippe Pastor (Institut Supérieurde lAéronautique et de lEspace)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1113**
*Presentation Time: Session 1: 9:00am-10:00am*

# Investigating Mechanical Stress in Plant Cells

Life Sciences

Author(s):

Quqi Zhang† (Engineering)

Abstract:

During growth, plant cells undergo significant changes in size and shape. Being treated as a pressure vessel, the pressure inside a cell creates mechanical stress on the epidermal cell walls. It is proposed that the plant cell's adaptation during growth and its interlocking shapes with lobing structures provide an effective strategy to reduce stress in the cell wall. This study simulates plant cell growth patterns using Finite Element Analysis (FEA) to explore stress distribution, particularly near the cell center and lobed edges. FEA simulations were performed using a 3D shell structure, where each biological cell is enclosed with cell caps and walls. Both hexagonal and lobed cells were modeled with internal turgor pressure, with material properties assigned to reflect realistic growth conditions. Additionally, special cell types, including guard cells and the effects of lacerations, were also modeled to investigate variations in stress under different constraints and cell patterns. In the end, our findings highlight how boundary constraints, cell patterns, and special cell configurations influence stress distribution. These insights advance our understanding of plant cell interactions and the mechanisms regulating cellular stress during growth.

Keywords: Plant Cells; Finite Element Analysis; Stress Analysis

Mentor(s):

Tanner James Ballance (Agriculture)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1114**
*Presentation Time: Session 1: 9:00am-10:00am*

# Integrating Digital Twins and Federated Learning for UGV fleets

Innovative Technology / Entrepreneurship / Design

Author(s):

Daniel Felipe Zuniga Hurtado† (Universidad Nacional de Colombia); Camilo Delgado Burbano‡ (Pontificia Universidad Javeriana Bogotá)

Abstract:

This research project explores the application of digital twin technologies to enhance the capabilities of a fleet of Unmanned Ground Vehicles (UGVs). By creating a detailed digital replica of the physical UGVs, we aim to establish a robust platform for testing federated learning techniques, which facilitate decentralized model training across multiple agents. Our current progress includes the construction of the UGV fleet itself, followed by the successful synchronization of the physical and digital models using Nvidia Omniverse, ensuring real-time data exchange and accurate representation of UGV behavior. The next phase of our project focuses on developing self-driving capabilities for the UGV fleet, enabling them to operate autonomously. This will create a testing ground for evaluating federated learning algorithms, ultimately advancing the field of autonomous systems. Our findings aim to contribute to the understanding of how digital twins can optimize the deployment and performance of UGVs in areas such as smart factories, disaster relief and robot deliver.

Keywords: Digital Twin; UGV; Federated Learning

Mentor(s):

Young-Jun Son (Engineering)

Other Acknowledgement(s):

Md tariqul Islam (Engineering)

**Poster Presentation Abstract Number: 1200**
*Presentation Time: Session 2: 10:30am-11:30am*

# Nurses Need Care Too

Physical Sciences

Author(s):

Addison Nicole Acree† (HHS)

Abstract:

[Abstract Redacted]

Keywords: Nursing; Sleep Habits; Burnout

Mentor(s):

Beth Elly Baumgartner (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1201**
*Presentation Time: Session 2: 10:30am-11:30am*

# Mini Tutor Through Retrieval-Augmented Generation

Mathematical/Computation Sciences

Author(s):

Colby Ben Acton† (Engineering); Gaetano Antonio Iannotta† (Engineering); Aditi Anand† (Engineering); Branton Ling‡ (Science); Evan Alexander Zhang‡ (Engineering); Gaurish Lakhanpal‡ (Science); Michael Suo‡ (Engineering); Apostolos Adam Cavounis‡ (Engineering); Purav Matlia‡ (Science|Graduate); Rohini Pillai‡ (Science); Ruhaan Batta‡ (Engineering); Samarth Prashanth‡ (Engineering); Shih-Yao Sun‡ (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Machine Learning; LLM; Education; NLP; Personalize

Mentor(s):

Qiang Qiu (Engineering); Wei Zakharov (Libraries); Zichen Miao (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1202**
*Presentation Time: Session 2: 10:30am-11:30am*

# Emotional Dynamics of Loss Aversion: The Impact of Frustration

Social Sciences / Humanities / Education

Author(s):

Maria Paula Armenta† (HHS)

Abstract:

This study examined how frustration impacts decision-making, specifically in relation to loss aversion, a key concept from Prospect Theory. Prospect Theory, developed by Kahneman and Tversky, shows that people experience the pain of losses more strongly than the pleasure of gains, a phenomenon known as the loss aversion effect. While this effect is well-documented, less is known about how frustration might amplify loss aversion and influence risk-taking behaviors. The study aims to fill this gap by investigating whether frustration leads individuals to take greater risks when faced with potential losses. One hundred sixty participants were assigned to either a gain group, where they could win points, or a loss group, where they could lose points. Each participant completed trials involving easy and difficult tasks requiring them to stop a stopwatch at three seconds. Feedback on task performance, along with points gained or lost, was provided after each trial. Frustration levels were recorded at the end of the experiment. We hypothesize that participants in the loss group will report higher frustration levels and choose the more difficult tasks more frequently, driven by a desire to avoid further losses. These findings could provide valuable information on how emotions such as frustration influence decision-making, especially in high-risk situations. Understanding this relationship can have broad implications for fields such as behavioral economics and psychology. Future research could explore the effects of other emotions, like anxiety, on decision-making under risk.

Keywords: Frustration; Loss Aversion; Monetary Rewards; Risk-Taking; Decision-Making

Mentor(s):

Sebastien Helie (HHS)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1203**
*Presentation Time: Session 2: 10:30am-11:30am*

# Isolation, purification, and characterization of Bacteriophage Tiziri from Arthrobacter globiformis

Life Sciences

Author(s):

Tina Atmani† (Agriculture|Engineering); Lana Malek† (Agriculture|Engineering); Xiuyu Shi† (Agriculture|Engineering)

Abstract:

Antibiotic resistance has been a growing threat to conventional treatments of bacterial infections ever since the initial overuse of antibiotics in healthcare. A potential alternative to antibiotics is treating bacterial infections with bacteriophages (phages). Phages are viruses that infect specific bacterial hosts. They use the host to reproduce and kill it in the process, making them harmless to humans. Phages can be isolated from samples collected in nature, such as from soil and water. In this research project, a unique bacteriophage, Tiziri, was isolated from a soil sample collected on Purdue University's campus and then populated a singular bacterial host, Arthrobacter globiformis. Following the isolation, Tiziri was then purified and amplified using different wet lab techniques. Furthermore, the DNA of the purified bacteriophage was extracted to perform its genome analysis and determine its characteristics. A transmission electron microscopy was performed to analyze the phage morphology in detail. Further research on Tiziri, its characteristics, and genomic sequencing will help provide a better understanding of its potential applications in real-life scenarios.

Keywords: [no keywords provided]

Mentor(s):

Kari L Clase (Engineering); Ruba Ahmad Qwai Alajlouni (Agriculture); Amanda K Limiac (Engineering)

Other Acknowledgement(s):

Aaron J Gin (Purdue University); Julia Ann Simler (Agriculture)

**Poster Presentation Abstract Number: 1204**
*Presentation Time: Session 2: 10:30am-11:30am*

# Wearable Technology in Sports: Balancing Performance Enhancement and Ethical Concerns

Social Sciences / Humanities / Education

Author(s):

Olivia Eugenia Avalos Villar† (Engineering)

Abstract:

Wearable technology has significantly transformed the sports industry by providing athletes and coaches with real-time data that enhances performance and reduces the risk of injury (Carey, 2023). However, the growing use of wearable devices has also sparked ethical concerns surrounding data privacy, security, and the role of artificial intelligence in processing athlete data (Ioannidou & Sklavos, 2021). In this exploratory research project, I investigate both the benefits and challenges created by wearable technology in sports, with a focus on its impact on performance enhancement and the potential risks of misuse of data. To explore this issue, I conducted a literature review, to analyse current studies on wearable technology's role in performance enhancement and injury prevention. Additionally, ethical concerns related to data privacy and AI integration were examined through case studies and analysis. Key sources include insights from professional athletes and organizations that employ wearable devices for data tracking and decision-making. Preliminary findings suggest how wearable technology is a double-edged sword because while it provides many benefits to athletes, it also raises ethical concerns about responsible use that must be addressed in order for this technology to be further integrated into competition. This research contributes to ongoing dialogue on the balance between innovation and ethics in the sports industry, highlighting the need for stricter regulations in data handling.

Keywords: Wearable Technology; Performance Enhancement; Ethical Concerns; Artificial Intelligence; Sports

Mentor(s):

Carla B Rosell (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1205**
*Presentation Time: Session 2: 10:30am-11:30am*

# Geochemical Analysis of Hyper-arid Soils in Pampas de la Joya, Peru: Insights into Mars Analog Environments

Physical Sciences

Author(s):

Catalina Bautista Parra† (Universidad Nacional de Colombia)

Abstract:

[Abstract Redacted]

Keywords: Analogous Environments; Mars; Soils; Ion Chromatography

Mentor(s):

Greg M Michalski (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1206**
*Presentation Time: Session 2: 10:30am-11:30am*

# Isolation, Extraction, and Characterization of the Novel Actinobacteriophage, Skitty, using the host Arthrobacter Globiformis for Potential Antimicrobial Applications

Life Sciences

Author(s):

Alexis Lucille Ador Bernal† (Agriculture|Engineering); Manya Devang Kadiwala† (Agriculture)

Abstract:

Actinobacteriophages are viruses that infect actinobacteria and can be isolated, researched, and used for phage therapy in humans and animals. Phage therapy can combat certain bacteria, such as antibiotic-resistant bacteria, and function as an alternative treatment for patients who are allergic to antibiotics. Our research centers around the discovery of a novel bacteriophage, Skitty, to advance the already extensive Actinobacteriophage Database. The isolation process begins with collecting a soil sample and using a buffer to extract the phages. The buffer is spread across a plate containing a host bacterium (Arthrobacter globiformis), which allows for the formation of plaques. The phage is then purified and amplified before being viewed under an electron microscope. Finally, the phage undergoes DNA extraction and sequencing. Electron microscopy will provide information about Skitty's morphology, or the structural form of the bacteriophage. Moreover, Skitty's sequenced DNA will be added to the Actinobacteriophage Database where it will be available to those researching phage therapies and will serve as the foundation of Biotechnology Lab II. Bacteriophages are extremely versatile, and hold promise for future human and animal medical treatments. The discovery and research of Skitty not only contributes to the world's knowledge of bacteriophages but may also the key in addressing the growing crisis of antibiotic-resistant bacteria.

Keywords: [no keywords provided]

Mentor(s):

Kari L Clase (Engineering); Julia Ann Simler (Agriculture); Amanda K Limiac (Engineering)

Other Acknowledgement(s):

Aaron J Gin (Purdue University); Ruba Ahmad Qwai Alajlouni (Agriculture)

**Poster Presentation Abstract Number: 1207**
*Presentation Time: Session 2: 10:30am-11:30am*

# The Intersection of Academics and Mental Health: A Comprehensive Model for Student Success

Social Sciences / Humanities / Education

Author(s):

Joel Nicholas Berringer† (Education)

Abstract:

Successful school-based interventions that provide appropriate mental health (MH) services can promote mindfulness, social, emotional, and behavioral learning and protect our youth through their educational journey. Further, effective school-based interventions for MH enhance connectedness among students, staff, and families. Collaborative efforts involving parents, mental health professionals, and community organizations are crucial for creating a comprehensive support system. Although promoting students' academic outcomes is one of schools' main goals, an equally important goal is how schools promote their students' mental well-being. In this project, I focus on the latter goal.

Existing evidence indicates that many schools around the United States include forms of school-based MH interventions. MH services when embedded within educational systems can lead to increased attendance, better relationships with friends, and improved academic performance. My goal is to conduct a comprehensive review of current interventions to develop a school-based MH model that effectively targets MH issues and promotes positive mental health outcomes in students. Specific goals that I highlight in this project include the importance of prioritizing mental health, trauma-informed care, advocating for the integration of mental health awareness into school curricula and demonstrating how this integration impacts students' well-being. My initial findings suggest that cognitive behavioral techniques (CBT), social/emotional skills training, and establishing collaborative structures with classroom teachers are crucial elements of effective school-based MH interventions with benefits extending to staff, students and their parents. I hypothesize that successfully implemented programs contribute not only to mental health outcomes but also increase overall student achievement.

Keywords: Mental Health (MH); School-Based Interventions; Social-Emotional Skills; Trauma-Informed Care; Positive Mental Health Outcomes

Mentor(s):

Panayota Y Mantzicopoulos-James (Education)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1208**
*Presentation Time: Session 2: 10:30am-11:30am*

# Supporting Survivor Families with Data-Driven Insights

Innovative Technology / Entrepreneurship / Design

Author(s):

Dillon Seamus Blair† (DSB); Gabriel L Ponsot† (DSB); Filippa Maria Rodriguez Pinzon† (DSB); Colin Lucas Wellington† (DSB|JMHC)

Abstract:

[Abstract Redacted]

Keywords: Data Mining; AI; LLMs; Data for Good; Grief Journey

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1209**
*Presentation Time: Session 2: 10:30am-11:30am*

# Investigating the GEF activity of Phospholipase Ce

Life Sciences

Author(s):

Livia Marie Bogdan† (Science)

Abstract:

[Abstract Redacted]

Keywords: Phospholipase C Epsilon; Cardiovascular Disease; Rap1A; Guanine Nucleotide Exchange Factor

Mentor(s):

Angeline M Lyon (Science); Kadidia Samassekou (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1210**
*Presentation Time: Session 2: 10:30am-11:30am*

# Low-Pressure Hydrothermal Processing Methods for Conversion of Acrylonitrile-Butadiene-Styrene to Oils

Innovative Technology / Entrepreneurship / Design

Author(s):

Ryan L Bottini† (Engineering); Manila Kunwar‡ (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Low Pressure; Hydrothermal Processing; Acrylonitrile-Butadiene Styrene

Mentor(s):

Nien-hwa L Wang (Engineering); Clayton C Gentilcore (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1211**
*Presentation Time: Session 2: 10:30am-11:30am*

# Computer Vision in Autonomous Vehicles

Social Sciences / Humanities / Education

Author(s):

Pranav Boyapati† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Carla B Rosell (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1212**
*Presentation Time: Session 2: 10:30am-11:30am*

# The Impact of Short Video Content on Teen Attention Spans: A Literature Review

Social Sciences / Humanities / Education

Author(s):

Luke Anthony Braun† (HHS)

Abstract:

In this review, I provide a systematic examination of the effects that short video content has on American teens' attention spans. Short videos have rapidly become one of the most popular forms of viewing social media content among teens with companies such as TikTok and YouTube capitalizing on this new form of media. These companies have changed how teens interact with digital content as short videos are designed to grab and keep viewers' attention through quick dopamine hits and this addictive behavior is related to a less efficient cognitive control system during adolescence (Marciano, Camerini, & Morese, 2021).

Although scientific evidence is still emerging, studies suggest that the attention grabbing and dopamine hits that make short videos popular may be linked to a decrease in adolescents' attention spans, a trend that is inconsistent with typical developmental expectations for this age group. Because there is no clear consensus on the mechanisms of influence, this review will analyze recent studies on the effects of short video content on teens' attention spans. Additionally, considering the emergent and evolving nature of this research, this review will also highlight key gaps and questions that warrant further research. This study will also recommend interventions to prevent potentially damaging effects to attention span development. Understanding the implications of this research is crucial for both educators and parents as the proper controls over short video content and changes in curriculum can have major implications on teen's attention spans and consequently, their academic success.?

Keywords: Short Video Content; Attention Spans

Mentor(s):

Panayota Y Mantzicopoulos-James (Education)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1213**
*Presentation Time: Session 2: 10:30am-11:30am*

# Asteroid Mining: Technological Advancements and Global Implications

Social Sciences / Humanities / Education

Author(s):

Bernardo Cabral Alves da Costa† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Asteroid Mining; Technological Advancements; Global Impact; Environment; Aerospace Technology

Mentor(s):

Carla B Rosell (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1214**
*Presentation Time: Session 2: 10:30am-11:30am*

# Latent Transition Analysis of Suicide Risk in Sexual Minority Population: The Protective Role of Age

Social Sciences / Humanities / Education

Author(s):

Juan Pablo Camacho Arias† (Universidad Nacional de Colombia)

Abstract:

Abundant studies have documented higher risk levels of suicide among sexual minority populations compared to heterosexual populations. However, few studies have explored the latent classes of suicide risk within this marginalized population and examined their developmental patterns across time, as well as the impact of age on these transitions. The purpose of this study was to examine the role of age on the transition patterns of suicide risk latent classes among the sexual minority population over time. Using a longitudinal survey with 616 sexual minority participants across two-timepoints three years apart, this study measured five suicide-related items (suicide ideation, intention, planning, attempt, and self-harm) to assess suicide risk. Three latent classes of suicide risk were identified within the population: High-Risk, Mild-Risk, and Low-Risk groups. Results from the latent transition analysis showed positive transitions from both High-Risk and Mild-Risk groups to the Low-Risk group, while most individuals in the Low-Risk group remained stable over time. Moreover, age was found to be a protective factor because older individuals were more likely to be involved in the Low-Risk group and exhibit positive transition patterns across time. The present study contributes to the current understanding of longitudinal transition patterns of suicide risk within vulnerable sexual minority populations and highlights age as a protector from suicidal outcomes.

Keywords: Sexual Minority Population; Suicide Risk; Latent Class Analysis; Latent Transition Analysis

Mentor(s):

Randolph Duane Hubach (HHS)

Other Acknowledgement(s):

Ying Zhang (HHS); Karen S Beck (HHS)

**Poster Presentation Abstract Number: 1215**
*Presentation Time: Session 2: 10:30am-11:30am*

# Tragedy Assistance Program for Survivor (TAPS) Grief Stage Prediction Model

Innovative Technology / Entrepreneurship / Design

Author(s):

Juan Pablo Cantu Erhard† (DSB); Robert Pedro Chambers† (DSB); Michael Poliakov† (DSB); Tomas Turner† (DSB)

Abstract:

[Abstract Redacted]

Keywords: Data Mining; AI; LLMs; Data for Good; Grief Journey

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1216**
*Presentation Time: Session 2: 10:30am-11:30am*

# Electroless Through-Space Electrochemiluminescence

Physical Sciences

Author(s):

Daniel Michael Carrel† (Science)

Abstract:

[Abstract Redacted]

Keywords: Electrochemiluminescence; Microscopy; Crystals; Radicals; Precipitation

Mentor(s):

Brady Robert Layman (Science); Jeffrey Edward Dick (Science); Megan Leigh Hill (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1217**
*Presentation Time: Session 2: 10:30am-11:30am*

# The Association Between Self-Concept Clarity, Self-Esteem, and Neuroticism and Differences by Biological Sex

Social Sciences / Humanities / Education

Author(s):

Hannah Carreon† (HHS|JMHC)

Abstract:

[Abstract Redacted]

Keywords: Self-Esteem; Self-Concept Clarity; Neuroticism; Differences by Biological Sex

Mentor(s):

Jennifer Lynn Brown (HHS)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1218**
*Presentation Time: Session 2: 10:30am-11:30am*

# Foraging Behavior and Social Influence in Virtual Environments: A Study of Electric Vehicle Users and Charging Stations

Social Sciences / Humanities / Education

Author(s):

Samuel Castro Martinez† (Universidad Nacional de Colombia)

Abstract:

[Abstract Redacted]

Keywords: Foraging Behavior; Social Influence; Decision-Making; Electric Vehicles; Virtual Environment

Mentor(s):

Torsten Reimer (Liberal Arts)

Other Acknowledgement(s):

Juan Pablo Loaiza Ramirez (Liberal Arts); Thomas Eagan Gorman (Liberal Arts)

**Poster Presentation Abstract Number: 1219**
*Presentation Time: Session 2: 10:30am-11:30am*

# Purifying a DAG Biosensor to Quantify PLC Activity at the Membrane

Life Sciences

Author(s):

Caroline Grace Chandler† (Agriculture|JMHC); Vincent Simon Knizka‡ (Pharmacy)

Abstract:

Studying phospholipase C (PLC) enzymes is important because it can help us understand cardiovascular disease, the leading cause of death worldwide. PLC interacts with the inner leaflet of the plasma membranes in cells, where it hydrolyzes the lipid phosphatidylinositol bisphosphate (PIP2) into two molecules: diacylglycerol (DAG) and inositol trisphosphate (IP3). IP3 initiates the release of intracellular calcium while DAG activates another enzyme called protein kinase C (PKC). The dysregulation of intracellular calcium and PKC is associated with cardiovascular disease. We are studying PLC using a model membrane system that allows us to monitor the enzyme at a single molecule level, and control all other aspects of the system in order to understand the behavior of PLC on the membrane surface. Currently, we can detect PLC at the membrane, but we have no way to quantify its activity. Our goal is to measure PLC activity with a biosensor that will detect DAG. In order to create this DAG biosensor, we are using the PKCdelta C1 domain, which is known to bind DAG, and a HaloTag7 which can be conjugated to a fluorescent ligand. The sensor will be expressed in bacteria and purified using affinity chromatography. The purified protein will be incorporated into our single molecule experiments, allowing us to measure PLC activity using fluorescence. These experiments will provide us with new insights into behavior and regulation of PLC on model membranes, and aid in future experiments to modulate its activity and prevent cardiovascular disease.

Keywords: [no keywords provided]

Mentor(s):

Ketaki A Mahurkar (Science); Angeline M Lyon (Science)

Other Acknowledgement(s):

Elisabeth E Garland (Science)

**Poster Presentation Abstract Number: 1220**
*Presentation Time: Session 2: 10:30am-11:30am*

# Complete Online Database of Invertebrate Fossil Genera

Physical Sciences

Author(s):

Kevin Ming Chang† (Engineering); Aditya Krishnan Sivathanu† (Engineering); Samyukta Balaji* (Engineering)

Abstract:

The Treatise on Invertebrate Paleontology is a comprehensive collection of approximately fifty volumes, covering nearly 100,000 genera of fossils. These volumes are progressively being digitized by the University of Kansas, in collaboration with Purdue University. Our team is responsible for developing and maintaining the online database infrastructure, while also adding enhanced functionality. This online database is designed to support paleontologists, educators, and researchers by providing easy access to detailed fossil information, enhancing their understanding of the diverse life forms that have inhabited out planet throughout history.

Currently, the online databases contain fossil data for the following phyla: Brachiopods (ca. 4000 genera), Echinoderms (ca. 350), Porifera (ca. 2000) and Graptolites (ca. 400). Each phylum is organized within its own dedicated subdomain (e.g., brachiopod.treatise.geolex.org); and users can search for the fossils that existed at different stages of geologic time scale or by specific dates. Clicking on the fossil names yields details on their classification, age range and geological distribution, and will soon have images for each one of the thousands of genera. The Treatise sites also offer interactive plots displaying the diversity of genera across geologic time. These plots can be exported in a format compatible with the TimeScale Creator Program, enabling integration with other data packs on Earth history for further analysis.

With its user-friendly interface and continuously updated/enhanced content and imagery, the cloud-based Treatise is a valuable tool for specialists and anyone else interested in paleontology.

Keywords: Database; Paleontology; Vertically Integrated Projects; Cloud; Earth History Visualization

Mentor(s):

James G Ogg (Science); Aaron C Ault (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1221**
*Presentation Time: Session 2: 10:30am-11:30am*

# Automatic Music Transcription - AI for Music

Mathematical/Computation Sciences

Author(s):

Ojas Chaturvedi† (Science|JMHC); Kayshav Bhardwaj† (Science); Vincent Wentao Zhao† (Science); Max Yu Zhen Chen‡ (Science); Luke Jaehyeon Choi* (Science|JMHC); Parv Kumar* (Engineering); Minh Le Vu* (Science); Minh Binh Tran* (Science); Tri Quang Vo* (Science); Pranesh S Velmurugan* (Science); Andrew J Achkar* (Engineering); Bryan Christopher Yoo* (Science)

Abstract:

Automatic Music Transcription (AMT) is a process in which audio is notated in symbolic representations, namely sheet music or MIDI. Normally time-intensive for human transcribers, AMT has the potential to accelerate the transcription process, streamlining music creation, education, and research while saving time and enhancing accessibility. Beyond music, AMT's potential extends to assistive hearing technologies, addressing the "cocktail party problem" by isolating individual sound sources from multiple instruments. Techniques used to distinguish instruments by their acoustic traits could be adapted to separate human voices, improving hearing aids, speech recognition systems, and communication in complex auditory environments. Building on this, we are conducting an extensive literature review surveying existing automatic music transcription software, with one of the most promising being Google's MT3 model. Most transcription software we explored had several key issues. For instance, many suffer from the inability to transcribe multi-instrumental or polyphonic music. Additionally, many hallucinate instruments originally absent from the audio or cannot isolate the melody from the accompaniment. In response to these limitations, we are preparing an AMT competition in April 2025. Participants will submit computer programs to convert audio recordings in classical music styles to MIDI. A submitted computer program has 10 minutes to convert 100 recordings, each containing at most three musical instruments. Submissions, as Github repositories storing the transcription models, will be ranked on multiple factors, including accuracy of instruments, pitches, onset, offset, and dynamics. Future work will involve creating a baseline solution for the competition, allowing competitors to take and improve the baseline model.

Keywords: Automatic Music Transcription; Artificial Intelligence; Music; MIDI

Mentor(s):

Yung-Hsiang Lu (Engineering); Yeon Ji Yun (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1222**
*Presentation Time: Session 2: 10:30am-11:30am*

# A WEIGHTED BRANCH AGGREGATION BASED DEEP LEARNING MODEL FOR TRACK DETECTION IN AUTONOMOUS RACING

Innovative Technology / Entrepreneurship / Design

Author(s):

Yi-Huan Chen† (Engineering); Ching-Hsiang Huang† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: ML; AI; Lane Detection

Mentor(s):

Shreya Ghosh (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1223**
*Presentation Time: Session 2: 10:30am-11:30am*

# Integrating SIMT and Scalar Cores to Manage Control Flow Divergence

Mathematical/Computation Sciences

Author(s):

Daniel Choi† (Engineering); Hassan Al-alawi† (Engineering); Hunter A Mccollough† (Engineering); Abhiram Saridena† (Engineering); Viet Khoi Pham Khac† (Engineering); Akhilesh Prasad†; Abhijay Achukola† (Engineering); Kshitij Miraj Shah† (Engineering); Phone Myat Paing† (Engineering); Jerry Ronald Chen† (Engineering); Justin Yasuumi† (Engineering); Charles Spencer Bowles† (Engineering|JMHC)

Abstract:

GPUs, designed with SIMT (single-instruction multiple-data) cores, struggle with efficiently handling MIMD (multiple-instruction multiple-data) workloads due to control flow and memory access divergence. When threads take different execution paths or have non-cohesive memory access patterns, performance drops because the threads are serialized. In this project, we focus primarily on handling control flow divergence with tightly coupled SIMT and scalar cores.

We propose 3 architectures to test the viability of this approach. The first two rely on software-defined thread prioritization to classify threads as highly divergent or less divergent. The first architecture sends highly divergent threads directly to the scalar core and less divergent directly to the SIMT core, while the second architecture includes a mechanism to transfer threads from the SIMT to the scalar core during runtime. Since threads are classified at compile time, software is forced to make static decisions about thread assignment without understanding the dynamic control flow, which can lead to inefficient execution paths during unpredicted thread divergence.

The third architecture fixes this by enabling the hardware to make the decision of booting a thread from the SIMT core during run-time. This way, we can use branch history tracking and other heuristics to make smart decisions on whether threads will diverge.

Lastly, to test these architectures, we describe the implementation of test workloads, such as the Smith-Waterman algorithm, a workload which has control flow divergence.

Keywords: GPU; SIMT Core; Control Flow Divergence; Scalar Core

Mentor(s):

Sooraj Chetput Venkataraghavan (Engineering); Mark Johnson (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1224**
*Presentation Time: Session 2: 10:30am-11:30am*

# Purdue Aerial Robotics Team - Mechanisms

Innovative Technology / Entrepreneurship / Design

Author(s):

Easton Ludeman Clark† (Engineering); Aidan P Pender† (Engineering); Anshuman Samanta† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Niall Patrick Moloney (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1225**
*Presentation Time: Session 2: 10:30am-11:30am*

# Supervisor for Embedded Systems

Innovative Technology / Entrepreneurship / Design

Author(s):

William Rowan Cunningham† (Engineering); Kathy Niu† (Engineering|JMHC)

Abstract:

Modern computers execute multiple processes with different levels of privilege to keep processes isolated from each other through memory virtualization which provides protection and isolation of different processes, ensuring that they cannot interfere with each other or compromise the underlying system. The kernel or operating system is responsible for managing these processes and providing a proper environment for their execution. The AFTx08 RISC-V embedded platform currently supports Machine mode (M-mode) and User mode (U-mode) in Register-Transfer Level (RTL) simulation. The implementation of the RISC-V privileged specification's Supervisor mode (S-mode) will permit a middle layer of software between M-mode firmware which interfaces directly with hardware and user-mode processes. The full S-mode specification will be implemented along with a supporting translation lookaside buffer (TLB) and page walker hardware that performs two-level address translation. The S-mode software (OS) will be built on top of OpenSBI, an open-source implementation of the RISC-V Supervisor Binary Interface (SBI) specification that permits portability of kernels over a unified M-mode firmware layer. The project will produce a multitasking OS that will run on the AFTx08 processor with full S-mode implementation, memory virtualization, and execution-context switching for U-mode processes. Benchmarks in terms of memory overhead, counting TLB hits and misses, and other performance metrics will be taken to determine the effects of implementation on the overall performance of the AFTx08 platform.

Keywords: Embedded Systems; RISC-V; Operating System; Embedded Software

Mentor(s):

Cole Aaron Nelson (Engineering); Mark Johnson (Engineering)

Other Acknowledgement(s):

William Milne (Engineering)

**Poster Presentation Abstract Number: 1226**
*Presentation Time: Session 2: 10:30am-11:30am*

# Measuring the Reaction Kinetics of Iron and Nickel Centered Metal Complexes

Physical Sciences

Author(s):

Ronald Anton Cutler† (Science)

Abstract:

Transition metal complexes are widely used in energy production, catalysis, and sensing. Metal complexes are compounds in which metal ion centers are surrounded by coordinating ligands. Neutral or anionic species coordinate with the transition metal ions stabilizing them in solution. The formation of a metal-ligand complex is influenced by its formation constant, making some complexes more thermochemically favorable than others. When more than one ligating molecule is present in solution, a complex equilibrium is established which is affected by the stability of multiple complexes formed through ligand loss or partial ligand exchange. Mass spectrometry is ideally suited for examining the composition of such complex equilibria in real-time. In this work, we used well-studied model systems to evaluate the performance of a newly developed direct reaction monitoring system based on electrospray ionization mass spectrometry (ESI-MS). Specifically, we examined the ligand exchange kinetics of nickel and iron c

Keywords: Mass Spectrometry; Transition Metal Complexes; Reaction Kinetics

Mentor(s):

Julia Laskin (Science); Bethany Ana Phillips (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1227**
*Presentation Time: Session 2: 10:30am-11:30am*

# Effects of Mental Health in College Students from Sleep Schedule

Social Sciences / Humanities / Education

Author(s):

Alexis Nicole Daigle† (Exploratory Studies)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Michael Douglas Johnson (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1228**
*Presentation Time: Session 2: 10:30am-11:30am*

# Computational planning and experimental implementation of enzyme-catalyzed pathways for sustainable synthesis of target molecules

Mathematical/Computation Sciences

Author(s):

Bianca de Paula Macedo† (Universidade Federal do Rio de Janeiro)

Abstract:

Biocatalytic processes represent a greener, more sustainable alternative to conventional organic synthesis, with significant potential for reducing both the environmental impact and the costs associated with chemical manufacturing. This work presents an integrated computational and experimental approach to address the challenge of identifying enzymatic routes for synthesizing complex target molecules. Our computational tools predict enzymatic and chemo-enzymatic pathways, generalizing known reactions to propose feasible synthetic routes. Despite advances in this area, there remains a strong need for user-friendly tools capable of generating realistic and scalable synthetic routes. Once promising pathways are identified, we experimentally validate the proposed routes through enzyme screening, purification, and in vitro reconstitution. To support this experimental validation, we are establishing key laboratory protocols, including enzyme purification, PCR (Polymerase chain reaction) amplification, and cloning, to ensure accuracy and reproducibility. This holistic approach enables us to test computational predictions and plan routes to relevant targets, confirming the viability of the synthetic routes. Our work highlights the critical importance of combining computational synthesis planning with experimental validation to develop innovative, sustainable solutions for the chemical manufacturing industry.

Keywords: Enzymology; Computational Tools; Green Chemistry; Sustainable Synthesis; Experimental Implementation

Mentor(s):

Karthik Sankaranarayanan (Engineering); Olga Costa Alves Souza (Interdisciplinary & Special Programs)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1229**
*Presentation Time: Session 2: 10:30am-11:30am*

# Effect of Intrauterine Growth Restriction on the Expression of the Solute Carrier 2A Family Across Three Fetal Tissues

Life Sciences

Author(s):

Delaney Alexandra Doncer† (Agriculture)

Abstract:

Intrauterine growth restriction (IUGR) is naturally occurring in swine and has become one of the most significant non-pathogenic issues facing the American swine industry. Fetuses affected by IUGR display a distinguished brain-sparing effect that increases the brain-to-liver weight ratio. The objective of this study was to evaluate the effects of IUGR on the expression of a select group of solute carrier family 2A (SLC2A) genes, which transport the simple carbohydrates necessary for energy production. Given the increased brain-to-liver ratio, we hypothesized that IUGR will substantially increase the expression of the SLC2A family genes in the brain, and to a lesser extent the heart. In contrast we expect expression of these transporters will decrease in the liver, starving it of vital resources. Unilateral hysterectomy-ovariectomy (UHO) was used to increase IUGR by limiting the space and nutrients available to fetuses. To produce non-IUGR fetuses, gilts underwent unilateral oviductal ligation (UOL), which increases space by limiting conceptus number. Gilts were necropsied 95 days into gestation, and the fetuses' brain, liver, and heart were taken as samples. From the whole fetal population, 12 extreme IUGR and 12 non-IUGR fetuses were identified using Z-scores for brain-to-liver weight ratio. Total RNA was extracted, and the purity and integrity confirmed. Extracted RNA will be used to generate cDNA libraries, which will be used to evaluate expression of candidate genes. The results of this study will provide further insight and understanding of IUGR in swine to hopefully lead to potential ways to eliminate the impacts of IUGR.

Keywords: IUGR; Solute Carriers; Swine; Brain-Sparing

Mentor(s):

Jonathan Pasternak (Agriculture); Sarah M Innis (Agriculture); Alyssa Smith (Agriculture); Dayeon Jeon (Agriculture)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1230**
*Presentation Time: Session 2: 10:30am-11:30am*

# Mapping Buried Basalts on the Moon: Western Hemisphere

Physical Sciences

Author(s):

Jacob Harlow Ehman† (Engineering); Amanda Joan Holmes‡ (Science)

Abstract:

[Abstract Redacted]

Keywords: Moon; Planetary Science

Mentor(s):

Ali Bramson (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1231**
*Presentation Time: Session 2: 10:30am-11:30am*

# Defining VIII Phenotype vs WT in Different Cell Lines

Life Sciences

Author(s):

Mahsa Farahani† (Science)

Abstract:

Epidermal Growth Factor Receptor Variant III (EGFRvIII) is a mutated Receptor Tyrosine Kinase associated with various malignancies, including glioblastoma, prostate, and breast cancer. We recently determined that this specific patient variant induces the assembly of aberrant intracellular compartments, which affect signaling and protein trafficking. This study further investigates the phenotypic differences between amplified expression of EGFRvIII and wild-type (WT) EGFR in various cell lines: HeLa, CHO-K1, anaplastic astrocytoma, and glioblastoma cells. Utilizing GFP-tagged constructs of EGFRvIII and EGFR WT, we analyzed the presence and localization of these receptors at different levels of protein expression. Additionally, we employed actin markers to examine cytoskeletal dynamics and cellular architecture in these samples. Our results demonstrate distinct morphological changes, including variations in cell size and membrane accumulation, between EGFRvIII-expressing cells and their WT counterparts. This research provides insights into the functional implications of EGFRvIII in cancers and highlights the importance of considering variant phenotypes in therapeutic strategies targeting EGFR pathways.

Keywords: EGFRvIII; Receptor Tyrosine Kinase; Phenotype Differences

Mentor(s):

Ruben C Aguilar (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1232**
*Presentation Time: Session 2: 10:30am-11:30am*

# Real-Time Hazard Detection using IoT

Mathematical/Computation Sciences

Author(s):

Maximillian Francis Farrell† (DSB); Arnav Naval† (Engineering); Matthew Alvarez Hackett† (Engineering); Shreya Laxmi Nagendra† (Science); Genna Nicole Yavaraski† (Science); Jason Dumaual Lyst† (Engineering); Tanek Malhotra† (Science); Parth Kapila† (Polytechnic); Aniruddh Srivastava† (Science)

Abstract:

The Bechtel Innovation and Design Center (BIDC) is Purdue's central makerspace and a creative hub for makers across campus. With facilities ranging from machine shops to electronics labs, 3D design studios, and more, the BIDC provides essential resources for all engineering projects. With numerous students utilizing this shared space simultaneously, ensuring safety is the highest priority. However, the BIDC lacks a robust and intelligent automated system that monitors the environment and alerts occupants before an incident occurs. We address this critical gap and ensure the safe operation of tools and machinery by monitoring signs of danger by building an array of sensors and working with our ML team. Our team has created sensor nodes with a Wi-Fi-enabled microcontroller that allows us to centralize ML classification to one Orange Pi. These cost-effective ESP32 microcontrollers use an ad-hoc mesh network called ESP-Mesh-Lite. An Orange Pi 5 receives and will eventually process the data. Our project includes a robust data pipeline to manage insights from our sensor network, integrating data into both local and offsite databases with redundancies. Data will soon be accessible via Grafana using InfluxDB as the database. Weekly updates will include labels generated by our ML subteam’s prediction system, designed to identify potential hazards like fires or air contaminants before they occur. By combining sensor data with these labels, we will enhance the capabilities of our system, enabling continuous model improvement through re-training.

Keywords: Air Quality; Anomaly Detection; Edge Processing; IoT; Safety

Mentor(s):

Matthew A Swabey (Engineering); Jaeeun Kim (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1233**
*Presentation Time: Session 2: 10:30am-11:30am*

# Development of Robust Precision Molecular Cages

Physical Sciences

Author(s):

Aiden Michael Fernandes† (Science); Erwin Trong Luu† (HHS)

Abstract:

The field of biomimetic nanomaterials has recently gained an increase in attention mainly due to the high potential of such systems to revolutionize health care. Well-defined, robust molecular cages, which do not incorporate weak links (which are, for example, formed in coordination cages with often highly dynamic metal-ligand bonds) provide good control over the overall molecular structure, which represents a significant advantage over alternative, more heterogeneous systems, especially in the healthcare field. Nevertheless, currently, most molecular cages are synthesized using self-assembly which generally leads to molecular cages with high symmetry and somewhat limited functionality. Thus, new synthetic methods need to be developed for the creation of asymmetrically functionalized systems. This presentation will provide an update of our research in this area, with a new covalent imprinting approach designed to lead to some of the first fully asymmetric, sequence-defined molecular cages with potential future applications in the healthcare field. For the characterization of our new molecular cages, we are primarily relying on the use of matrix-assisted laser desorption/ionization (MALDI) mass spectrometry as well as nuclear magnetic resonance (NMR) spectroscopy. The successful completion of this work will further our understanding of the functional capabilities and synthesis of robust functional molecular cages with sequence-defined, protein-mimetic cavities.

Keywords: Nanomaterials; Nanocages; Asymmetric Nanomaterials; Sequence Specific Nanomaterials

Mentor(s):

Anthony Gabriel Mena (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1234**
*Presentation Time: Session 2: 10:30am-11:30am*

# Photocurable Sealant Use in a Lung Puncture Mouse Model

Life Sciences

Author(s):

Ethan Phillip Foster† (Engineering)

Abstract:

Intraoperative air leaks are a pervasive challenge in thoracic surgery, affecting up to 58% of patients undergoing lung resections and contributing significantly to prolonged hospital stays, increased healthcare cost, and potential postoperative complications. While various surgical sealants exist, there remains a need for more effective solutions that can adhere to soft, elastic tissue in damp environments. This project aims to evaluate the efficacy of a novel photocurable sealant for reducing air leaks in thoracic surgical applications through a mouse model of penetrative pneumothorax. The model involves a survival surgery wherein, following the creation of a controlled lung puncture, the sealant will be applied and cured. The effectiveness of the sealant will be assessed through a combination of real-time and long-term evaluations. Wound closure and healing will be monitored using frequent ultrasound imaging at key timepoints corresponding to different stages of the inflammatory response. At study endpoints, tissue samples will be collected for histological analysis to evaluate biocompatibility and healing progression. The photocurable nature of the sealant offers potential advantages such as precise application and on-demand curing, which could improve ease of use in surgical settings. This approach could lead to the development of an advanced sealant for a variety of thoracic applications, potentially reducing the incidence of postoperative complications, shortening hospital stays, and improving patient outcomes.

Keywords: Pulmonary; Thoracic; Sealant; Biomedical Engineering; Mice

Mentor(s):

Cortland Hannah Johns (Engineering); Craig Goergen (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1235**
*Presentation Time: Session 2: 10:30am-11:30am*

# Evaluating the Tolerance of Aquatic Fungi to Major Components of Coal Ash and Antifungal Compounds.

Life Sciences

Author(s):

Ethan Burke Fox† (Agriculture); Alexander Stephen Haynes‡ (Science)

Abstract:

[Abstract Redacted]

Keywords: Tolerance Assay; Ecology; Toxicology

Mentor(s):

Daniel B Raudabaugh (Agriculture); Mary Aime (Agriculture)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1236**
*Presentation Time: Session 2: 10:30am-11:30am*

# Investigating the Function of Cellulose Synthase Genes in Double Fertilization

Life Sciences

Author(s):

Alaina Rose Gartner† (Agriculture|Engineering)

Abstract:

[Abstract Redacted]

Keywords: Cellulose Synthase; Polyspermy Block; Double Fertilization

Mentor(s):

Leonor Maria de Fatima Chagas Boavida (Agriculture)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1237**
*Presentation Time: Session 2: 10:30am-11:30am*

# Purdue Robomasters Algorithms Team Project

Innovative Technology / Entrepreneurship / Design

Author(s):

Aaditya Gaur† (Engineering); Zay Linn Htet† (Engineering); Christina Zhang† (Science|JMHC)

Abstract:

[Abstract Redacted]

Keywords: Autonomous; Robot; Decision-Making; Algorithm; Robust

Mentor(s):

Zijian He (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1238**
*Presentation Time: Session 2: 10:30am-11:30am*

# Investigating Breast Cancer Cell Response in Relation with Different Lung Respiration Rates Using a High-Throughput Magnetic Actuation Platform

Life Sciences

Author(s):

Angelica Sofia Gonzalez-Ng† (Engineering); Maria Macias‡ (Engineering); Tatiana Zuluaga Vargas* (Universidad Nacional de Colombia)

Abstract:

Breast cancer is the most common malignancy in women, and patient survival rate decreases with metastatic progression. Breast cancer metastasis mainly occurs in bones and lungs, where cancer cells experience higher mechanical forces, including from respiration. Previous studies have shown that underlying conditions that affect respiration rate, such as sleep apnea and dysphonia, also affect mortality rate of cancer patients. Existing in vitro platforms to study the effect of mechanical force on breast cancer cells use synthetic substrates to replicate tumor 3D microenvironment, yet none use physiologically relevant substrates. This project aims to simulate breathing cycles under different conditions to study the metabolic activity of breast cancer cells over a one-week period of cyclic stretching. This study will be using a magnetic actuation platform with a linear motor that has varying Pulse Width Modulation (PWM) and frequencies to simulate different breathing conditions. In this platform, a cancer cell line will be seeded on a suspended network of fibrillar Fibronectin, an extracellular matrix protein that promotes metastasis. Cells will be subjected to cyclic stretching or no stretching, then cell metabolic activity will be tracked using a colorimetric assay over a one-week period. It is expected that cyclic stretching of breast cancer cells at higher frequencies will result in a larger decrease of metabolic activity compared to the static control. The findings in this study will help better understand the cellular response of breast cancer cells under different mechanical conditions to potentially develop therapies that suppress breast cancer metastatic outgrowth.

Keywords: Actuation; Mechanotransduction; Cell Stretching; Breast Cancer; Tumor Microenvironment

Mentor(s):

Madison Mckensi Howard (Engineering); Luis Solorio (Engineering)

Other Acknowledgement(s):

Juan Camilo Mesa Agudelo (Engineering)

**Poster Presentation Abstract Number: 1239**
*Presentation Time: Session 2: 10:30am-11:30am*

# Fresnel Biprism Common-path Low-coherence Digital Holography for Dynamic Light Scattering Spectroscopy of Biological Materials

Physical Sciences

Author(s):

Gabriel Goodwin† (Engineering|JMHC)

Abstract:

[Abstract Redacted]

Keywords: Digital Holography; Fresnel Biprism; Optical Coherence Tomography; Doppler Fluctuation Spectroscopy

Mentor(s):

David D Nolte (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1240**
*Presentation Time: Session 2: 10:30am-11:30am*

# Association of FMR1 repeat size with depression, anxiety, and stress

Social Sciences / Humanities / Education

Author(s):

Kaitlyn Nicole Gregerson† (Science)

Abstract:

[Abstract Redacted]

Keywords: Fragile X; FMR1 Premutation; Fragile X Premutation; Caregivers

Mentor(s):

Bridgette Kelleher (HHS)

Other Acknowledgement(s):

Roslyn B Harold (HHS)

**Poster Presentation Abstract Number: 1241**
*Presentation Time: Session 2: 10:30am-11:30am*

# Integrating Autonomous Vehicles into Society: Applications, Legal Challenges, and Broader Impacts Across Key Sectors

Innovative Technology / Entrepreneurship / Design

Author(s):

Bobby Gu† (Engineering); Alexander Jonathan Collins† (DSB); Neal Noel Lobo† (Engineering); Pratham Patil† (Engineering); Dean Michael La Point† (DSB); Jeet Brahmbhatt† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Autonomous; Vehicles; Applications; Transportation; Infrastructure

Mentor(s):

Shreya Ghosh (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1242**
*Presentation Time: Session 2: 10:30am-11:30am*

# Jet break in gamma-ray bursts

Physical Sciences

Author(s):

Sofia Guevara Montoya† (Universidad Nacional de Colombia)

Abstract:

One of the most energetic events in the universe is the gamma-ray burst. These events originate from the death of massive stars or mergers of binary compact objects. When either of these progenitors occurs, a jet is launched along the rotational axis, where the matter density is lower. The energy released by the jet produces the gamma-ray burst which lasts for seconds in the gamma-rays. After the burst is over, the jet collides with the circumburst medium, and a gradual conversion of energy takes place, known as the afterglow.

The afterglow occurs when the jet decelerates. Initially, the jet moves at nearly the speed of light. As it collides with the medium, the Lorentz factor decreases. When the jet opening angle becomes comparable to the photon-beaming angle, the so-called jet break takes place, meaning that the light starts to fade faster with time.

The main objective of my project is to use the afterglow emission, specifically the jet break, to calculate the opening angle of the jet understanding how jets distribute their energy as a function of angle and their true energy. To do this, I will use a code described in Wang et al. (2024) and data from several most well-known gamma-ray bursts for which we have excellent observations. By analyzing the data and theoretical modeling, I aim to derive the relations needed to accurately predict the jet break's behavior. In the poster, I will show the process I have been doing and the preliminary results.

Keywords: Gamma-Ray Bursts; Jet Break; Angle; Energy; Universe

Mentor(s):

Dimitrios Giannios (Science); Zhaofeng Wu (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1243**
*Presentation Time: Session 2: 10:30am-11:30am*

# Tracking the Demographic Differences Between Traditional Public Schools and Sectors of Charter Schools in Indianapolis

Social Sciences / Humanities / Education

Author(s):

Anjali Devi Gupta† (Education|Science|JMHC)

Abstract:

The purpose of this study was to compare the racial and socioeconomic demographics of students enrolled in Indianapolis Public Schools (IPS) to those of charter schools in Indianapolis and relate these differences to the expansion of the school choice market in Indianapolis. Using enrollment data from the Department of Education, this study totaled the number of students in nine cohorts (White, Black, Latinx, Multiple Races, Asian, American Indian, Native Hawaiian/Pacific Islander, Free/Reduced Price Meals and Paid Meals) between IPS and charter Schools. T-tests were run to expose any statistically significant differences between IPS and charter schools regarding the population of each cohort. Black students were found to have a significantly higher percentage of students in charter schools, while Latinx students have a significantly higher percentage of students in IPS. Furthermore, a significantly higher percentage of students receiving Free/Reduced Price Meals was found in charter schools, while a significantly higher percentage of students receiving Paid Meals was found at IPS. More research is necessary to explore the inequitable distribution of Black and Latinx students in IPS and charter schools, as well as if IPS serves a more economically oppressed population.

Keywords: School Choice; Charter; Demographic

Mentor(s):

Bryan J. Duarte (Education)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1244**
*Presentation Time: Session 2: 10:30am-11:30am*

# Increasing the expressiveness of specifications for a gradual program verifier

Mathematical/Computation Sciences

Author(s):

Priyam Gupta† (Science|JMHC)

Abstract:

Software is prone to bugs that can be difficult to find and fix by running test cases alone. Static verification tools help programmers verify properties of their code by proving it always adheres to certain logical specifications. However, correctly writing such specifications is a complicated, all-or-nothing process which deters developers from using static verifiers. Gradual verification was introduced to allow users to incrementally specify and verify code, by optimistically assuming missing information during the static phase and confirming that information at run time. Gradual C0, the first practicable gradual verifier, can successfully verify all kinds of real-world programs. However, Gradual C0's specification language currently does not support all constructs supported by its underlying static verifier, Viper, which forces users to come up with round-a-bout ways of specifying their code. Viper's unfolding expressions allow making use of predicate information within specifications, which is essential for verifying properties of recursive data structures like trees, lists, etc. widely prevalent in real world programs. I designed and implemented an extension to Gradual C0 that supports Viper's unfolding expressions in Gradual C0's specification language. The design maintains Gradual C0's efficiency by preserving optimistically assumed information to the fullest extent when evaluating unfolding expressions in various contexts. Unfolding expressions are necessary to add support for pure functions that can perform evaluations over memory information within specifications, thereby further increasing expressiveness. Increased expressiveness of specifications in Gradual C0 will encourage software developers to adopt gradual verification in their workflow and improve their efficiency in writing correct code.

Keywords: Gradual Verification; Viper; Program Correctness

Mentor(s):

Jenna L Wise DiVincenzo (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1245**
*Presentation Time: Session 2: 10:30am-11:30am*

# Enhancing Academic Performance: The Role of Mental Health Resources in High Schools

Social Sciences / Humanities / Education

Author(s):

Charlotte Marian Harkins† (HHS)

Abstract:

As mental health issues become increasingly prevalent among adolescents, schools are positioned to address these challenges, making it imperative to understand the relationship between mental health support and educational outcomes. In this systematic literature review, I document the impact of mental health resources provided in high schools on student academic performance. Studies show that students with access to mental health resources improve emotional regulation, leading to better focus and motivation. Evidence also indicates a positive correlation between mental health support and academic success. Therefore, my goal will be to clarify the links between mental health services, emotional regulation, and achievement outcomes. I consider studies that emphasize the links between psychological well-being, social support, and academic achievement. I critically evaluate peer-reviewed articles accessed through the Purdue online library that have been conducted in high school settings over the past decade. My review will provide evidence that addresses the mechanisms through which mental health resources contribute to emotion regulation and promote academic achievement.

Evaluation of the studies will involve a synthesis of quantitative data on academic performance metrics. I will also highlight findings that provide qualitative insights into student experiences. The review will call attention to the importance of integrating mental health services into educational policy and practices. In conclusion, this systematic review will underscore the need for schools to prioritize mental health resources as a strategy to not only enhance student well-being but also improve academic outcomes, thereby contributing to a more holistic educational approach

Keywords: Mental Health; Adolescent Mental Health; High School Resources; Academic Performance; High School Mental Health

Mentor(s):

Panayota Y Mantzicopoulos-James (Education)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1246**
*Presentation Time: Session 2: 10:30am-11:30am*

# Is Polar Bear Capture and Recapture Ethical?

Social Sciences / Humanities / Education

Author(s):

Augustus George Hayes† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Ethics; Polar Bear; Ursus maritimus; Research

Mentor(s):

Carla B Rosell (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1247**
*Presentation Time: Session 2: 10:30am-11:30am*

# GSM modem shield for System on Chip

Innovative Technology / Entrepreneurship / Design

Author(s):

Aditya S Hebbani† (Engineering); Rauf Emre Erkiletlioglu‡ (Engineering); Tei Okamoto* (Engineering); Weijing Sebastian Chen* (Engineering); Anika Bajpai* (Engineering); Renzhi Yongtian* (Engineering)

Abstract:

The aim of this project is to create a GSM/GPRS shield for the AFTx06 System on Chip (SoC) using a sim900 module. It allows connecting to the GSM networks for voice, SMS, and GPRS. It will implement circuitry for powering the sim900 and include a sim card interface. This will serve as a demonstration application of the AFTx06 chip designed by the SoCET VIP team.

Keywords: [no keywords provided]

Mentor(s):

Mark Johnson (Engineering); Matthew A Swabey (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1248**
*Presentation Time: Session 2: 10:30am-11:30am*

# The Impact of Different Types of High Fat Diet on Energy Consumption and Weight Gain in Male and Female Rats

Social Sciences / Humanities / Education

Author(s):

Natalie Chyrystine Hoffman† (HHS)

Abstract:

[Abstract Redacted]

Keywords: Obesity; High Fat Diet; Sex Differences

Mentor(s):

Brent Benjamin Bachman (HHS); Kimberly Kinzig (HHS)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1249**
*Presentation Time: Session 2: 10:30am-11:30am*

# Lafayette CityBus Case Study on New Hydrogen Busses

Innovative Technology / Entrepreneurship / Design

Author(s):

Brogan John-Michael Holt† (DSB|JMHC); Jayee Goh† (Engineering); Kaylie Emerson Virkus† (Engineering); Shashank Varamballi† (Engineering); Patricia Ewa Leoniuk† (Engineering); Olivia Chen† (Engineering); Gowri Ravikumar Bajagur† (Engineering); Saanvi Mahesh† (Engineering); Marina Mercedes San Martin Rossano† (Engineering); Pradyumn Malik† (Engineering); Shrikar Hippargi† (Engineering); Isaac Yan Shek Cheng† (Engineering); Jijnasu Prakash Rout‡ (Engineering); Atandrila Chowdhury‡ (Engineering); Ashton Anthony Price‡ (DSB); Joseph Chelliah‡ (DSB); James Burrell Hewette‡ (Engineering)

Abstract:

[Abstract Redacted]

Keywords: CityBus; Hydrogen; Fuel; Fuel-Cell; Transportation

Mentor(s):

John W Sheffield (Polytechnic)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1250**
*Presentation Time: Session 2: 10:30am-11:30am*

# VIP Advanced Packaging Glass Substrate for Photonics and RF Applications

Innovative Technology / Entrepreneurship / Design

Author(s):

Cho-Yi Hsieh† (Engineering); Ho Jun Lee† (Engineering); Cecilie Reingaard Wiuff† (Engineering); Aidan Iachini Broy† (Engineering); Jou-Ting Lai† (Engineering)

Abstract:

As Moore's Law trends slow down, the semiconductor chip industry is adopting advanced approaches to packaging chiplets (chip components) to reduce size and power consumption for applications such as space. In early work, the semiconductor sector relied heavily on silicon and organic substrates. However, glass substrates present several advantages, including excellent thermal stability, mechanical strength, a low dielectric constant, and cost-effectiveness, making them potentially more suitable for high-density interconnects and diverse chiplet integration, particularly in high-frequency applications.

This research will further explore the fabrication process of advanced glass packaging using silica glass as a core substrate, integrating a HELIOS(Heterogeneously Integrated Low Earth Orbit Sensor) model by embedding photodiode and D-Latch chiplets. It focuses on the unique production techniques involved in etching/patterning, bonding, and creating interconnects between chiplets while maintaining the integrity of the glass substrate. By highlighting these fabrication processes, this work aims to provide insights into the challenges and advancements in advanced packaging with glass substrates, emphasizing their critical role in the performance and reliability of the next generation of microelectronic devices.

Keywords: Semiconductor; Advanced Packaging; Glass Substrate; APHI; Birck Nanotechnology Center

Mentor(s):

Peter Bermel (Engineering); Zhiyuan Wei; Saeed Mohammadi (Engineering)

Other Acknowledgement(s):

Feichi Huang (Engineering); Ye Yang (Engineering)

**Poster Presentation Abstract Number: 1251**
*Presentation Time: Session 2: 10:30am-11:30am*

# Developing a Solid Phase Extraction/High Resolution Mass Spectrometry Method for Biofuel Analysis

Physical Sciences

Author(s):

Marielle G Jackson† (Science|JMHC)

Abstract:

Biofuels generated from renewable feedstocks are of interest as a more sustainable alternative to fossil fuels. However, they are typically compositionally more complex, and contain a higher proportion of polar, heteroatom-containing compounds, as compared to traditional fuels. A comprehensive characterization of the chemical components of biofuels is essential for the prediction of fuel properties and for the improvement of fuel production processes and formulation. This research aims to develop a fractionation method using solid phase extraction (SPE) coupled with mass spectrometry for the analysis of biofuels. The SPE method will greatly simplify the complex fuel mixture and also will concentrate minor components. A reversed-phase SPE method was developed to fractionate the biofuel components based on their polarity. The resulting fractions were then introduced into a LTQ XL linear quadrupole ion trap/high-resolution orbitrap mass spectrometer and ionized by one of four ionization methods – positive- or negative-ion mode electrospray ionization (ESI) or positive- or negative-ion mode atmospheric chemical ionization (APCI). The fractionation process increased the number of detectable compounds and the combination of the different ionization methods provided a more complete molecular profile for the biofuel than using just one of the ionization methods. The results obtained using the different ionization methods are discussed. This approach allows for a more comprehensive analysis of biofuels, providing critical compositional information for both academic and industrial research.

Keywords: Biofuels; Solid Phase Extraction; Mass Spectrometry; Electrospray Ionization; Atmospheric Chemical Ionization

Mentor(s):

Hilkka I Kenttamaa (Science); Grace Emma Greene (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1252**
*Presentation Time: Session 2: 10:30am-11:30am*

# Raceline Optimization for Indy Cars Using Quantum-annealing

Mathematical/Computation Sciences

Author(s):

Ritwik Suresh Jayaraman† (Science); Aman Katyal† (Engineering); Azain Khalid† (Science); Chiraag Shashi Kumar† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Raceline Optimization; Autonomous Racing; Quantum-Annealing; Quadratic Unconstrained Binary Optimization (QUBO); Racetrack Discretization

Mentor(s):

Andres Felipe Hoyos Moreno (Engineering); Samuel Labi (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1253**
*Presentation Time: Session 2: 10:30am-11:30am*

# CAR T-cell Therapy Effectiveness

Social Sciences / Humanities / Education

Author(s):

Madison Sofia Kauling† (HHS)

Abstract:

[Abstract Redacted]

Keywords: Car T-Cell; Effective

Mentor(s):

Carla B Rosell (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1254**
*Presentation Time: Session 2: 10:30am-11:30am*

# Chemical Reactivity of Refrigerants

Physical Sciences

Author(s):

Tanvir Kaur† (Engineering)

Abstract:

The direct and indirect emissions of thermal systems needs to be considered simultaneously in order to decrease environmental impact. In particular, thermal systems, such as heat pumps or organic Rankine cycles (ORCs) need to utilize low-Global Warming Potential working fluids (direct emissions) without compromising on efficiency (indirect emissions). In order to realize this goal, the behavior of such working fluids and mixtures needs to be predicted numerically, which poses a significant challenge. This project explores the chemical solubility and reactivity of refrigerants to assess their external characteristics and interactions with other refrigerants and lubricants. By examining the solubility behavior and reactivity profiles, understanding of how these factors influence the overall performance and compatibility of refrigerants in various systems can be developed. The findings will provide insights into optimizing refrigerant-lubricant combinations for improved efficiency and system longevity.

Keywords: Thermodynamics; Thermophysical Properties; Low-Global Warming Potential; Molecular Simulation

Mentor(s):

Riley Bradley Barta (Engineering); Kyle Allen Shepard (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1255**
*Presentation Time: Session 2: 10:30am-11:30am*

# Towards Robust Electrochemical Aptamer-Based Sensors: Extending Sensor Lifespan Through Nanoparticle Deposition

Physical Sciences

Author(s):

Sirish Meher Reddy Kayam† (Science)

Abstract:

[Abstract Redacted]

Keywords: Aptamer-Based; Nanoparticle; Deposition; Electrochemical Sensor

Mentor(s):

Vanshika Gupta (Science); Jeffrey Edward Dick (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1256**
*Presentation Time: Session 2: 10:30am-11:30am*

# Mapping Grief Stages: A Data-driven Solution for TAPS Survivor Support

Innovative Technology / Entrepreneurship / Design

Author(s):

Shashwath Keta† (DSB); Alacya Madison Lynch† (DSB|JMHC); Colin R Nixon† (DSB); Qixue Zheng† (DSB)

Abstract:

[Abstract Redacted]

Keywords: Data Mining; AI; LLMs; Data for Good; Grief Journey

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1257**
*Presentation Time: Session 2: 10:30am-11:30am*

# Racing Line Optimization with Adoptive Grip Estimation

Mathematical/Computation Sciences

Author(s):

Junyoung Kim† (Engineering); Christian A Choi† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Autonomous Driving; Motion Planning; Vehicle Dynamics; Physics; Racing

Mentor(s):

Samuel Labi (Engineering); Andres Felipe Hoyos Moreno (Engineering)

Other Acknowledgement(s):

Richard Osita Ajagu (Engineering)

**Poster Presentation Abstract Number: 1258**
*Presentation Time: Session 2: 10:30am-11:30am*

# AI-Powered Journey Mapping: Enhancing Support for Military Survivors with Automated Grief Stage Identification

Innovative Technology / Entrepreneurship / Design

Author(s):

Yumin Kim† (DSB); Ryan Matthew Yatco Wong† (DSB); Adam James Smith† (DSB); Alexander Thomas White† (DSB)

Abstract:

[Abstract Redacted]

Keywords: Data Mining; AI; LLMs; Data for Good; Grief Journey

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1259**
*Presentation Time: Session 2: 10:30am-11:30am*

# CogniPilot

Innovative Technology / Entrepreneurship / Design

Author(s):

Alexander Kmetko† (Engineering); Jonah P Lovitz† (Engineering); Joseph John Forster† (Engineering); Chase Nicholas Hamdan† (Engineering)

Abstract:

CogniPilot is a project constructed to build a mathematically proven aerial autopilot from the ground up. Within the code base of this project, the source code should be as minimal as possible to allow for a more reliable, maintainable, and verifiable system. Further, the estimator and controller intends to minimize the amount of branch statements when compared to previous autopilots such as PX4, ArduPilot, and BetaFlight. These controllers have thousands of branches, making the verification process much more arduous. CogniPilot originated on a more simplistic system, a rover, and in the future intends to work on planes, quadcopters, and submersibles. This semester the team focused on localization in the autopilot. The controls and software team designed an attitude and position estimator for CogniPilot. This estimator uses an extended Kalman Filter and results from Lie Theory to allow for more accurate prediction of state and uncertainty. The hardware team worked on getting the DMA transferring data from the accelerometer to ensure faster output from the sensors for localization. Once this is complete, it is the team's intention to compare this to a more traditional Kalman Filter to verify that the Kalman filter using Lie theory is more accurate. The overall goal to end this semester is to run a racing drone across an indoor track with our firmware installed and running.

Keywords: UAV; Autopilot; ROS

Mentor(s):

James Michael Goppert (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1260**
*Presentation Time: Session 2: 10:30am-11:30am*

# AI Integrated Writing Model (QUIZ) for Higher Education

Social Sciences / Humanities / Education

Author(s):

Kylie M Lachapelle† (Agriculture|JMHC); Saheli Minesh Parikh† (Education|JMHC); Aditya Ujwal‡ (Science|JMHC); Simon Paul Mitchell‡ (Engineering|JMHC); Megan E Power‡ (DSB|JMHC); Nithin Krishna Veeramasuneni‡ (Polytechnic|JMHC)

Abstract:

This research assesses the effectiveness of a novel approach, the QUIZ model, in integrating AI within undergraduate writing instruction. QUIZ facilitates collaborative interactions between students and language models (LLMs), aiming to generate ethical, high-quality, authentic written work. The study's outcomes hold significance for the broader educational domain. Examination of student data reveals the model's impact on the advancement in AI utilization throughout a sixteen-week semester, correlating with enhanced writing proficiency. Moreover, it demonstrates understanding and adherence to ethical practices with this technology.

Keywords: Large Language Models (LLMs); Artificial Intelligence; Generative AI (GenAI); Higher Education; Writing Instruction

Mentor(s):

Kathryn Frances Dilworth (JMHC)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1261**
*Presentation Time: Session 2: 10:30am-11:30am*

# Discovery and Synthesis of the First-in class SHP1 Covalent Inhibitor for Cancer Immunotherapy

Life Sciences

Author(s):

Ray Wai-Keung Lai† (Science)

Abstract:

Modern cancer immunotherapies suffer from untoward effects, indiscriminate targeting, and limited response rates. This research focuses on M029: a novel first-in class and highly selective Src homology phosphatase-1 (SHP-1) covalent inhibitor. M029 has been shown to exhibit superior selectivity for SHP1 in cellulo and substantial uptake in T cell receptor signaling in both T and NK cells killing effects in vitro. As such, we aim to further explore the capabilities of M029 for its potential as a novel cancer immunotherapy approach and to experiment with the viability of upscaling the production of M029. SHP-1 is primarily seen in hematopoietic cells that deregulates T cell and NK cells immune responses— it is part of a set of enzymes known as protein tyrosine phosphatases (PTPs), responsible for the dephosphorylation of protein tyrosine residues. SHP-1 deletion has been shown to stimulate anti-tumor activity on the cellular level, with knockout demonstrating overt inhibition of tumor growth in vivo. These PTPs are of particular interest to our group for their inhibitory potential and latent ability, through inhibition, to alter the pathological manifestations of certain diseases such as diabetes mellitus and cancer with the latter of which being our primary focus. Through comprehensive medicinal chemistry including liquid chromatographic and mass spectrometric studies, we found M029 to be readily synthesized and isolable in larger quantities (3-5g+) than what had been previously established, paving the way for additional in-house studies to corroborate and validate the efficacy of M029 as a potent SHP1 inhibitor for plausible cancer immunotherapy approaches with the potential to extend beyond mice.

Keywords: SHP1; Cancer; Immunotherapy; In vivo

Mentor(s):

Zhong-Yin Zhang (Science); Jinmin Miao (Pharmacy)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1262**
*Presentation Time: Session 2: 10:30am-11:30am*

# The Effects of hearing loss when navigating in an outside environment

Life Sciences

Author(s):

Gabrielle Elizabeth Layman† (Engineering|JMHC); Shlok Rajesh Kulkarni† (Engineering|JMHC); Zachary Traina† (HHS)

Abstract:

[Abstract Redacted]

Keywords: Mobility; Locomotion; Hearing; Health Aging

Mentor(s):

Jeffrey M Haddad (HHS)

Other Acknowledgement(s):

Alexander L Francis (HHS); Satyajit S Ambike (HHS)

**Poster Presentation Abstract Number: 1263**
*Presentation Time: Session 2: 10:30am-11:30am*

# Degradation of a Blue Dye Using Peroxide and Bicarbonate

Physical Sciences

Author(s):

Declan Leaird† (Education|Science); William Isaiah Need* (Science)

Abstract:

[Abstract Redacted]

Keywords: Green Chemistry; Visible Spectroscopy; Kinetics; Catalytic Degradation

Mentor(s):

Hannah Elise Starr (Science)

Other Acknowledgement(s):

Ellis Lin (Science)

**Poster Presentation Abstract Number: 1264**
*Presentation Time: Session 2: 10:30am-11:30am*

# Research and Categorization of the Arthrobacter Phage Limberopulos

Life Sciences

Author(s):

Elliana Rose Lemberis† (Agriculture|Engineering); Nadia Helen Whalen† (Agriculture|Engineering)

Abstract:

[Abstract Redacted]

Keywords: Bacteriophage; Phage; SEA-Phages; Bacteria; Antibiotics

Mentor(s):

Somali Chaterji (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1265**
*Presentation Time: Session 2: 10:30am-11:30am*

# Data Alchemy

Innovative Technology / Entrepreneurship / Design

Author(s):

Yinuo Liu† (DSB); Shreya Maganti† (DSB); Anisha Kumar† (DSB); Yash Handa† (Science)

Abstract:

In this project, we create a machine learning solution to classify grief stages among military survivors based on their survey responses. Collaborating with the Tragedy Assistance Program for Survivors (TAPS), our goal is to automate the process of mapping survivors to grief stages, which allows TAPS to connect families with relevant resources more efficiently. By predicting where a survivor is in their grief journey, TAPS can provide personalized, timely support that aligns with their emotional and practical needs. Our methodology integrates data mining, AI language models, and predictive analytics to analyze survey data and assign each response to a grief stage within TAPS' journey map. This approach enables TAPS to optimize resource allocation and improve support outcomes. This AI-driven framework demonstrates a powerful process for transforming survey data into actionable insights, furthering TAPS' mission to deliver compassionate and effective care to military families. As part of the Data4Good case competition, this research illustrates how technology can foster social impact by addressing real-world challenges faced by nonprofit organizations.

Keywords: Data Mining; AI; LLMs; Data for Good; Grief Journey

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1266**
*Presentation Time: Session 2: 10:30am-11:30am*

# The role of multimodal cues in the host-seeking behavior of a frog-biting mosquito, Uranotaenia lowii

Life Sciences

Author(s):

Anna Judy Lozen† (Science|JMHC)

Abstract:

In nature, mosquitoes rely on a variety of cues from multiple sensory modalities to locate their host. In human-biting mosquitoes, for instance, the combined impact of using multiple host-emitted cues results in enhanced host localization. However, little is known about the role of diverse sensory cues in host-seeking behavior by mosquitoes who bite non-human animals, such as frog-biting mosquitoes. Species of mosquitoes specialized in frogs rely on the mating calls of their host for long-range detection. While other host-emitted cues are available, how non-acoustic sensory cues influence close-range host-seeking is unclear. In this study, we investigate the use of visual, auditory, and olfactory cues–individually and combined–on the host-seeking behavior of a frog-biting mosquito, Uranotaenia lowii. We hypothesize that Ur. lowii use a combination of sensory cues to enhance close-range host localization. We predict that after detecting a calling frog using acoustic cues, Ur. lowii females use olfactory and visual cues to fine-tune their approach to their target host. To investigate this phenomenon, we examined the host-seeking behavior of individual female mosquitoes exposed to visual cues using 3D frog models and to olfactory cues using the scents of six anuran host species. We also investigated the behavior of the mosquitoes in the presence of different combinations of visual, olfactory, and acoustic cues. Our preliminary results show that Ur. lowii exhibit shorter response latencies when exposed to visual, acoustic, and olfactory cues combined, indicating that these mosquitoes might utilize a multimodal approach to host-seeking. This study enhances our understanding of the crucial role that multimodal sensory integration plays in host recognition, while also revealing the broader strategies mosquitoes employ to accurately find their hosts.

Keywords: Multimodal Sensory Integration; Olfactory Cues; Visual Cues; Acoustic Cues; Close-Range Host-Seeking

Mentor(s):

Ximena Bernal (Science); Richa Singh (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1267**
*Presentation Time: Session 2: 10:30am-11:30am*

# Electrified Pyrolysis Approach for Lignocellulosic Biomass Upcycling

Physical Sciences

Author(s):

Nachiket Magesh† (Engineering|JMHC)

Abstract:

Biofuel research and manufacturing, including sustainable aviation fuel production, play a pivotal role towards attaining “net zero” greenhouse gas (GHG) emissions in the future energy landscape. The aviation industry is a significant and growing contributor of GHG emissions, making the development of clean-burning, biomass-based fuel increasingly critical. Moreover, current methods for obtaining value-added products from biomass, such as fuels and chemicals, are energy-intensive, slow, unselective, and costly. To address some of these issues while exploring more sustainable biomanufacturing pathways, our team aims to develop a programmable and electrified approach that can utilize renewable energy to efficiently upcycle lignocellulosic biomass into value-added chemicals. Our reactor design and operation protocols feature continuous mass flow and reactions, tuning of parameters, and in-operando temperature measurement. We plan to achieve unique reactivity during the pyrolysis (non-oxidative thermal decomposition) of lignocellulosic biomass through dynamic temperature control at transient timescales in milliseconds. We will apply microcontrollers to adjust the temperature profile and fine-tune the thermochemical processes. In addition, we will explore novel reactor designs to create spatial heating effects, through which we will investigate the effect of diffusion in controlling product distribution. We will employ GC-MS (gas chromatography-mass spectrometry) and NMR (nuclear magnetic resonance) to analyze the liquid and gas phase reaction products. The findings from this project can be used to understand complex reaction pathways in energy and chemical production contexts, thereby making the electrified biomanufacturing approach more efficient for broader applications and facilitating sustainable aircraft operations in the long term.

Keywords: Sustainable Aviation Fuel; Lignocellulosic Biomass Upcycling; Dynamic Operation; Electrified Pyrolysis; Selectivity

Mentor(s):

Qi Dong (Science); Abhirup Sen (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1268**
*Presentation Time: Session 2: 10:30am-11:30am*

# Chemical Analysis of Low-GWP Refrigerants: Modeling and Characterizing Membranes

Physical Sciences

Author(s):

Kayla Elizabeth Manley† (Engineering); Tanvir Kaur* (Engineering); Nishtha Singh* (Engineering); Madison Paige Ward* (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Low-GWP Refrigerants; Permeable Membranes; Electrochemical Charge; Heat Exchanger

Mentor(s):

Riley Bradley Barta (Engineering); Kyle Allen Shepard (Engineering); Ganesh Brammanayagam venkatesan (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1269**
*Presentation Time: Session 2: 10:30am-11:30am*

# Design, Fabrication, and Testing of Carbon Fiber Bridges

Innovative Technology / Entrepreneurship / Design

Author(s):

Stan Melkumian† (Polytechnic)

Abstract:

This study focuses on designing and testing carbon fiber bridges in four categories: I-beam, square beam, open design, and sandwich beam. To assess the performance of these bridges, three-point flexural tests will be performed following ASTM standard D7264. The data collected from these tests, such as load capacity and deflection behavior, will provide critical insights into the mechanical properties and failure modes of the bridges. This experimental data will then be used to build and refine simulation models in modeling software, allowing for accurate predictions of how the bridges perform under similar loading conditions. By incorporating real-world testing data into the simulations, the models will better reflect the actual behavior of the materials and structures. This process of integrating physical testing with computer simulations not only improves the reliability of the models but also enhances the understanding of the performance of composite bridges. Ultimately, this approach contributes to advancements in material engineering by providing a more robust foundation for predicting the behavior of carbon fiber structures, which could lead to optimized designs and more efficient use of composite materials in various applications.

Keywords: Composite Materials; Bridge Design; Flexural Testing; Materials Engineering; Manufacturing Processes

Mentor(s):

Jacob Robert Montrose (Polytechnic); Garam Kim (Polytechnic); Timothy D Ropp (Polytechnic)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1270**
*Presentation Time: Session 2: 10:30am-11:30am*

# Masson

Life Sciences

Author(s):

Ivan Mateo Meneses Rivera† (Universidad Nacional de Colombia)

Abstract:

Mechanical fasteners are widely used for wound closure in surgical procedures. However, these are increasingly being replaced by other less invasive alternatives, such as surgical adhesives, due to their ease of application and pain-free closure. The currently commercially available surgical adhesives either lack adhesion strength due to the wet tissue environment or show poor in vivo biocompatibility upon degradation. Therefore, to address this challenge, we developed a mussel-inspired wet-bonding surgical adhesive based on biodegradable polylactic acid. To ensure its in vivo biocompatibility, we subcutaneously injected the adhesive into mice and studied its effects for 72 h, 4 weeks, and 12 weeks post-injection. The injection sites were explanted post-euthanasia for histopathological analysis. Masson's trichrome stain (MTC) was pursued as part of histology to assess for the presence of fibrosis through qualitative analysis of the collagen formed around the injected adhesive. Herein, the MTC staining protocol was first optimized to stain the collagen, muscle, and nuclei, blue, red, and brown, respectively. Further, after optimization of the staining protocol, all the adhesive injection sites will be stained to highlight differences in fibrosis around the injected adhesive at different time points. A scale of 0 to 4 (0 indicated no reaction, 1 indicated minimal reaction, 2 indicated mild reaction, 3 indicated moderate reaction, and 4 indicated severe reaction) will be used to score the formed collagen around the adhesive. Statistical analysis will be performed to confirm differences.

Keywords: [no keywords provided]

Mentor(s):

Aishwarya Vijayan Menon (Engineering); Julie C Liu (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1271**
*Presentation Time: Session 2: 10:30am-11:30am*

# Analysis of the effect of single amino acid mutation in the budding and cell membrane localization of the Ebola virus matrix protein VP40

Life Sciences

Author(s):

Andres Felipe Monsalve Arango† (Universidad de Antioquia)

Abstract:

[Abstract Redacted]

Keywords: Budding; Cell Membrane Localization; Ebola; VP40; Mutagenesis

Mentor(s):

Hannah M Woods (Pharmacy)

Other Acknowledgement(s):

Robert V Stahelin (Pharmacy)

**Poster Presentation Abstract Number: 1272**
*Presentation Time: Session 2: 10:30am-11:30am*

# Monitoring in-season fungal spore release to aid in disease-risk predictions for Indiana corn

Life Sciences

Author(s):

Mariana Moreano Acevedo† (Universidad Nacional de Colombia)

Abstract:

The purpose of this study was to establish the association between spore release and disease development in small plot trials to aid in disease-risk predictions. The trial monitored tar spot (Phyllacora maydis), gray leaf spot (Cercospora zeae-maydis), and northern corn leaf blight (Exserohilum turcicum) in corn. Field trials were conducted in 2021, 2022 and 2023 using a strip-plot design with six replications, incorporating no-till and full-tillage treatments and two corn hybrids: one highly susceptible to tar spot and another with moderate resistance. Data collection included spring residue sampling, weekly airborne spore monitoring using Burkard and low-cost spore traps from planting to harvest, and disease rating from ear leaf on 10 plants per plot at least three times a season. Additionally, yield and ear rot assessments were performed. This approach aims to inform our disease prediction modeling to improve decision-making and management strategies against these main foliar diseases in corn.

Keywords: [no keywords provided]

Mentor(s):

Darcy E P Telenko (Agriculture)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1273**
*Presentation Time: Session 2: 10:30am-11:30am*

# FPGA Area Optimization

Innovative Technology / Entrepreneurship / Design

Author(s):

Thomas Munson† (Engineering|JMHC); Maxwell Christopher Sprague† (Engineering); Nathan Alexander Kilmer† (Engineering|JMHC); Alec Chong Peng† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Timothy Francis Hein (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1274**
*Presentation Time: Session 2: 10:30am-11:30am*

# Engineering of K562 Feeder Cells for NK Cell Expansion

Life Sciences

Author(s):

Khanh Ha Nguyen† (Science|JMHC)

Abstract:

Natural Killer (NK) cells are innate lymphocytes known for their spontaneous ability to kill tumor cells through a variety of direct and indirect mechanisms. Recent advancements have highlighted genetically-modified primary NK (pNK) cells, derived from human blood, as powerful immunotherapies against cancer. These cells are a promising alternative to traditional cancer cell therapies due to their innate cytotoxicity, lower risk profile, and distinct biological characteristics. However, unlike more abundant lymphocytes such as T-cells, pNK cells are present in much smaller quantities in the human body, making their ex vivo expansion challenging, and limiting their potential for clinical-scale development. To address this, we have developed a novel method to expand pNK cells using an engineered K562 feeder cell line that expresses Interleukin-15 (IL-15), a cytokine essential for NK cell proliferation and activation. The gene for membrane-bound IL-15 was co-expressed with IL-15Ra, 41BBL, and GFP, and introduced into the feeder cells using a lentiviral system produced in HEK293T packaging cells. Stable transduction was confirmed by GFP expression, and antibody sorting for IL-15 returned high purity, indicating successful creation of the desired cell line. Ongoing cytotoxicity assays are evaluating the functionality of these modified K562 cells in enhancing NK cell activation and cytotoxicity against tumor cells. This research will advance current NK expansion methods, providing a foundation for future adoptive transfer immunotherapies.

Keywords: Genetic Engineering; Immunotherapy; NK Cells; Lentivirus; Cell Therapy

Mentor(s):

Sandro Matosevic (Pharmacy); Soumyajit Das (Pharmacy)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1275**
*Presentation Time: Session 2: 10:30am-11:30am*

# How does social media use impact perceptions of body image in male and female adolescents?

Social Sciences / Humanities / Education

Author(s):

Ogechukwu Veronica Nnatubeugo† (HHS)

Abstract:

Social media has become highly influential in the lives of adolescents, significantly shaping their perceptions of body image and self-worth. Platforms like Instagram, TikTok, and Snapchat often showcase idealized images that reinforce societal beauty standards, leading to detrimental effects on mental health, including anxiety, depression, and disordered eating. This comprehensive literature review aims to explore the relationship between social media use and body image perceptions among male and female adolescents, highlighting the distinct experiences and pressures faced by each gender.

Existing literature indicates that while young women are often more heavily impacted by unrealistic portrayals of beauty, young men are increasingly experiencing similar pressures, contributing to body dissatisfaction and unhealthy behaviors. Research by Danthinne et al. (2022), Burnette et al. (2017), and Fardouly & Vartanian (2016) illustrates the complex relationship between social media exposure and body image concerns. Adolescents frequently internalize idealized standards presented on these platforms, leading to negative self-perception and lowered self-esteem. This review will also identify key issues in promoting interventions such as body-positive messaging and media literacy programs that could mitigate these effects.

By encouraging critical engagement with social media content, adolescents can better navigate their online experiences. This review will synthesize findings on the edited nature of social media and its implications for self-esteem and body image. Ultimately, this literature review seeks to provide insights into how social media influences body image among adolescents and to identify strategies for further research that can address these harmful effects, thereby contributing to the well-being of youth in today's digital age.

Keywords: Social Media; Body Image; Self-Worth; Mental Health; Adolescents

Mentor(s):

Panayota Y Mantzicopoulos-James (Education)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1276**
*Presentation Time: Session 2: 10:30am-11:30am*

# Amphibian biodiversity and health in Tippecanoe County

Life Sciences

Author(s):

Isis Atenea Ocegueda Medina†

Abstract:

[Abstract Redacted]

Keywords: Amphibian; Frog; Biodiversity; Ecology; Disease

Mentor(s):

Catherine L Searle (Science)

Other Acknowledgement(s):

Kurt Robert Lutz (Science); Jonathan Lopez (Science)

**Poster Presentation Abstract Number: 1277**
*Presentation Time: Session 2: 10:30am-11:30am*

# Bridging the Gap: Addressing Budgetary and Social Challenges in Expanding Equitable EV Charging Infrastructure

Social Sciences / Humanities / Education

Author(s):

Rafael Obici de Oliveira† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Electric Vehicle; Charging Station; Social Equity; Cost Efficiency; Sustainable Transportation

Mentor(s):

Carla B Rosell (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1278**
*Presentation Time: Session 2: 10:30am-11:30am*

# Isolation and Characterization of Halloweekend Using A. Globiformis B-2979

Life Sciences

Author(s):

Mia Cynthia Pfeiffer† (Agriculture|Engineering|JMHC); Anne Flynn Campbell† (Agriculture|Engineering); Collin Jayson Kao‡ (Agriculture|Engineering)

Abstract:

[Abstract Redacted]

Keywords: Bacteriophage; A. Globiformis B-2979

Mentor(s):

Kari L Clase (Engineering); Julia Ann Simler (Agriculture); Amanda K Limiac (Engineering)

Other Acknowledgement(s):

Aaron J Gin (Purdue University); Ruba Ahmad Qwai Alajlouni (Agriculture)

**Poster Presentation Abstract Number: 1279**
*Presentation Time: Session 2: 10:30am-11:30am*

# Understanding the role of bacterial exopolysaccharides as a virulence factor in the Ralstonia-tomato pathosystem

Life Sciences

Author(s):

Brooke Allison Pilkey† (Science); Shreya Joshy‡ (Science)

Abstract:

[Abstract Redacted]

Keywords: Ralstonia solanacearum; Exopolysaccharides; Bacterial Wilt

Mentor(s):

Rebecca Lynn Leuschen-kohl (Agriculture); Anjali Iyer-Pascuzzi (Agriculture); Stephen R Lindemann (Agriculture); Rwivoo Baruah (Agriculture)

Other Acknowledgement(s):

Silas Henry Buchanan (Agriculture)

**Poster Presentation Abstract Number: 1280**
*Presentation Time: Session 2: 10:30am-11:30am*

# Isolation of novel bacteriophage PeteJr using host Arthobacter globiformis

Life Sciences

Author(s):

Katherine Alfreda Poirier† (Agriculture|Engineering|JMHC); Lauren Elizabeth Bhat† (Agriculture|Engineering); Lauren Marie Schinker‡ (Agriculture|Engineering|JMHC)

Abstract:

A bacteriophage is a highly abundant virus that can attach to and lyse, or destroy, a bacterial cell. Despite this abundance, the vast majority of bacteriophages remain undiscovered and unsequenced. New research suggests that bacteriophages can be used for therapeutic purposes, spurring the need for research into this field. In this experiment a novel bacteriophage, named PeteJr, was successfully isolated from a soil sample using Arthobacter globiformis bacterial host and then contributed to the Actinobacteriophage database. A soil sample was collected and the novel phage was isolated through direct isolation and plaque assays. The phage was then purified to form a lysate solution that was usable for future protocols. The team proceeded to amplify the phage to the proper concentration, allowing a new lysate to be formed. The phage was archived and copies were sent to the head lab at the University of Pittsburgh for documentation as a part of the SEA-PHAGES project. To further characterize and define the phage, the team intends to utilize DNA extraction, electron microscopy, and gel electrophoresis. This will help define the phage morphology and visualize the DNA sequence. This effort expands the pool of eligible bacteriophages for research and testing. The work done here contributes to the growing field of phage research, with potential applications in phage therapy and bacterial pathogen control.

Keywords: [no keywords provided]

Mentor(s):

Kari L Clase (Engineering); Somali Chaterji (Engineering); Julia Ann Simler (Agriculture); Amanda K Limiac (Engineering)

Other Acknowledgement(s):

Opeyemi Samuel Oduniyi (Agriculture); Aaron J Gin (Purdue University); Ruba Ahmad Qwai Alajlouni (Agriculture); Marcelo Inaki I Guerrero Montalvan (Agriculture)

**Poster Presentation Abstract Number: 1281**
*Presentation Time: Session 2: 10:30am-11:30am*

# Pedestrian Detection: Crash Prevention

Mathematical/Computation Sciences

Author(s):

Aakarsh Nagendra Rai† (Science); Donald Alexander Weintz† (Engineering); Jianing Wang† (Science); Aditya Mallepalli† (Science); Preetham Reddy Yerragudi† (Science)

Abstract:

Pedestrian detection plays a crucial role in enhancing road safety and preventing accidents, especially in urban areas with heavy pedestrian traffic. In this project, we leverage Support Vector Machines (SVM) combined with Histogram of Oriented Gradients (HOG) features to accurately detect pedestrians in real-time scenarios. HOG features are well-suited for capturing the shape and structure of pedestrians, making them effective for object recognition tasks. We'll be using dashcam feed to detect pedestrians, so that this system can be installed in driverless cars. Additionally we'll be predicting the distance between the cars and the closest pedestrian for informed automated decision making in near crash situations

Keywords: Crash Prevention; Pedestrian Detection; Image Processing; Feature Extraction; Machine Learning

Mentor(s):

Edward J Delp (Engineering); Carla Zoltowski (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1282**
*Presentation Time: Session 2: 10:30am-11:30am*

# Simulation of Nitrogen Oxides and Isotopic Partitioning Using iNAQChem-KMT in a Box Model Framework

Life Sciences

Author(s):

Ana Carolina Ramirez Gonzalez†

Abstract:

[Abstract Redacted]

Keywords: Nitrogen Oxides; Isotope Fractionation; KMT; Box Model; Cloud Chemistry

Mentor(s):

Greg M Michalski (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1283**
*Presentation Time: Session 2: 10:30am-11:30am*

# Prebiotic Fibers as an Approach to Alleviating IBS-C Symptoms

Life Sciences

Author(s):

Miranda Ramos Campos†

Abstract:

[Abstract Redacted]

Keywords: Prebiotic; IBS; Gut Health; Probiotic; Constipation

Mentor(s):

Thaisa M Cantu Jungles (Agriculture)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1284**
*Presentation Time: Session 2: 10:30am-11:30am*

# A High-Linolenic Soybean Mutant

Life Sciences

Author(s):

alexander Ramsey† (Science|JMHC); Rachel Elizabeth Michaelis† (Science|JMHC)

Abstract:

Soybeans are used across a variety of industries due to their high protein and oil content. In soybeans, there are 5 primary fatty acids: palmitic acid, stearic acid, oleic acid, linoleic acid, and linolenic acid. In the wild-type commodity soybean (Williams-82), these make up 11%, 4%, 23%, 54%, and 8% of the total fatty acids, respectively. Some soybean lipids are essential fatty acids that cannot be synthesized by humans. Linolenic acid is one such fatty acid that plays a role in brain function and development of retinal and nerve tissues. This has a presence especially in East and Southeast Asian diets, where soyfoods are consumed daily (Kulkarni et al.). Mutations that result in increased percentages of linolenic acid in soybean seed can have positive health effects based on increasing levels of Omega-3 Polyunsaturated Fatty Acids (PUFAs). These include early visual system development and lessened risk of cardiovascular diseases. We identified one high-linolenic mutant which demonstrated an increase in acid content of up to 15% linolenic acid by screening a mutant population. Preliminary testing indicates that the mutation occurs on chromosome 14. We are designing and testing PCR-based markers to fine map the location of this mutation. We plan to identify the gene that causes the high linolenic acid phenotype, so that we can further understand lipid biosynthesis in soybean, and potentially develop soybean lines with increased linolenic acid for human consumption.

Keywords: Soybean; Linolenic Acid; Fatty Acid; Lipids; Genetics

Mentor(s):

Karen A Hudson (Agriculture); Militza Carrero-Colon (Agriculture)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1285**
*Presentation Time: Session 2: 10:30am-11:30am*

**AXI**

Innovative Technology / Entrepreneurship / Design

Author(s):

Atharva S Rao† (Engineering); Moeyad OmerAbdalla Omer† (Engineering); Avanish Karlapudi† (Engineering); Dogyu Ryu† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Om P Kotwal (Engineering); Vishnu Chaithanya Lagudu (Engineering); Isaac P Hagedorn (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1286**
*Presentation Time: Session 2: 10:30am-11:30am*

# Assessing the Growing Threat of Space Debris and Removal Techniques

Social Sciences / Humanities / Education

Author(s):

Utkarsh Rastogi† (Exploratory Studies)

Abstract:

Space debris has become a burgeoning problem for satellite operators and space agencies worldwide. It poses a significant threat to the current operational satellites such as the International Space Station, and future human space missions. Recent data demonstrates that the amount of space debris in Earth's orbit is increasing at a disconcerting rate (Hollinger & Learner, 2022). The purpose of this exploratory research project is to explore the current state of space debris and assess the effectiveness of existing space debris removal strategies. To investigate this issue, I conducted a preliminary literature review of scholarly articles and recent studies, comparing various actively researched methods. Additionally, I analyzed data from satellite tracking systems to identify debris accumulation trends. This research highlights the importance of developing and researching more space debris removal techniques to safeguard the space environment and allow for future space missions. I conclude by offering suggestions on the most promising methods of removal.

Keywords: [no keywords provided]

Mentor(s):

Carla B Rosell (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1287**
*Presentation Time: Session 2: 10:30am-11:30am*

# Using Computer Vision to approximate the orientation of a buoy.

Innovative Technology / Entrepreneurship / Design

Author(s):

Partha Rathi† (Engineering); Dat Hien Tieu† (Engineering); Jason Zhengxuan Huang† (Engineering); Cassandra Lobo Gonzalez† (Engineering); Kai Ye† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Kevin T Lee (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1288**
*Presentation Time: Session 2: 10:30am-11:30am*

# Utilizing Participatory Action Research to Preserve Indigenous Languages, Cultures, and Knowledge

Social Sciences / Humanities / Education

Author(s):

Collin Thomas Reagin† (Liberal Arts)

Abstract:

Linguistics relies on indigenous and minoritized language documentation to test theories because it contributes new data to the field. However, Indigenous language documentation is also necessary from a sociocultural standpoint because language cannot be separated from culture. Their preservation maintains diverse perspectives and other forms of Indigenous knowledge (cultural, ecological, medicinal, etc.). Previously, this research has been done by an outsider of the community whose findings are not shared with the speakers. Another research method aims to collaborate with the community and involve them through every step, including a final product that is beneficial to all parties. This method is Participatory Action Research (PAR), where the relationship between the linguist and the community is reciprocal. This study employs PAR to collaborate with Indigenous communities to document 3 variations of Mayangna, a language spoken in Nicaragua. Speakers of the language have shared the information and are working jointly with us to design and produce a dictionary, an ecological encyclopedia, and elementary teaching materials. In the present study, we are organizing, formatting, and presenting these end products to their corresponding communities. Through this work, we have exemplified how PAR can be a successful research method and how research in general can benefit both the researcher and those it depends on. In the future, these data will be analyzed to test generative grammar theories and to discover more about the Language Faculty as a whole.

Keywords: Linguistics; Language Documentation; Indigenous Knowledge; Traditional Ecological Knowledge; Indigenous Studies

Mentor(s):

Regan Michelle Honeycutt (Liberal Arts)

Other Acknowledgement(s):

Elena Benedicto (Liberal Arts)

**Poster Presentation Abstract Number: 1289**
*Presentation Time: Session 2: 10:30am-11:30am*

# How Do Reading Interventions Affect the Reading Fluency of Struggling Readers in Grades 3-6?

Social Sciences / Humanities / Education

Author(s):

Elizabeth G Ruckle† (Education); Ceylon Michelle Wargo† (Education)

Abstract:

[Abstract Redacted]

Keywords: Reading Fluency; Science of Reading; Structured Literacy; Struggling Readers; Interventions

Mentor(s):

Inna Abramova (Education)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1290**
*Presentation Time: Session 2: 10:30am-11:30am*

# Remote FPGA Integration for Electrical Engineering Technology Courses: Expanding Access Through ECELabs.io

Innovative Technology / Entrepreneurship / Design

Author(s):

Adam Jair Selby† (Engineering|JMHC)

Abstract:

This research focuses on the implementation of a Field-Programmable Gate Array (FPGA) tailored for Electrical Engineering Technology courses in alignment with ECELabs.io's mission to enhance access to hardware resources for Purdue University's Electrical and Computer Engineering (ECE) students. ECELabs.io addresses the challenges of high hardware costs and limited lab access by offering a remote platform for operating essential equipment. Currently supporting ECE270, the platform aims to expand its capabilities to a broader range of courses, including those within the Polytechnic School. This project involves configuring IO expanders to establish a seamless connection between hardware and the ECELabs.io application. The FPGA will be designed and integrated into the platform upon successful configuration, allowing students to remotely interact with and utilize FPGA technology. The research requires a deep understanding of FPGA hardware, software integration, and the operational architecture of the ECELabs.io system to achieve the project’s objectives.

Keywords: [no keywords provided]

Mentor(s):

Junfei Li (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1291**
*Presentation Time: Session 2: 10:30am-11:30am*

# Real-Time Accompaniment for Pre-Scored Musical Practice

Mathematical/Computation Sciences

Author(s):

Ranav Sethi† (Science); Robert M Rattray† (Engineering); Rohit Kannan† (Science|JMHC); Ping-Hung Nick Ko† (Engineering)

Abstract:

Musicians often perform in the form of ensembles. Playing in ensemble requires coordination and adaptability beyond solo performances. Practicing in groups sometimes poses logistical issues, ranging from schedule conflicts to large separating distances. To address this, we are developing Companion, an artificial intelligence system designed to simulate ensemble performance, enhancing the way musicians practice even when some musicians are absent. In our current experimentation with a cellist, Companion can play all but one part of a selected or uploaded musical score, responding to the musician's input while also recognizing voice commands for pausing, stopping, and restarting playback.

Companion's mobile app interface not only tracks and displays the score but also synchronizes with the human musician's performance through dynamic time-warping, aligning to their playing with synthesized accompaniment. A proportional-integral-derivative (PID) controller fine-tunes this synchronization, adjusting playback in real time. By offering flexibility beyond static backing tracks, Companion enhances practice of pre-scored polyphony.

Future developments may extend Companion to accommodate improvisation, multiple musicians, and further dimensions of accompaniment adjustment. This includes dynamics and articulation, broadening its applications for music performance and pedagogy.

Keywords: Music Rehearsal; Musical Accompaniment; Dynamic Time-Warping

Mentor(s):

Yeon Ji Yun (Liberal Arts); Yung-Hsiang Lu (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1292**
*Presentation Time: Session 2: 10:30am-11:30am*

# AI-Driven Grief Stage Classification for Military Survivors

Innovative Technology / Entrepreneurship / Design

Author(s):

Ace Setiawan† (DSB); Leila Nicole Yee† (DSB); Ethan Broderick Gartner† (DSB); Ryan Andrew Leighton† (DSB)

Abstract:

[Abstract Redacted]

Keywords: Data Mining; AI; LLMs; Data for Good; Grief Journey

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1293**
*Presentation Time: Session 2: 10:30am-11:30am*

# Incentives in Regenerative Agriculture: A Review

Social Sciences / Humanities / Education

Author(s):

Aarav Singh† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Regenerative Farming; Soil Health; Farmers

Mentor(s):

Carla B Rosell (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1294**
*Presentation Time: Session 2: 10:30am-11:30am*

# Flaring Characteristics of M dwarfs observed by TESS and Kepler

Physical Sciences

Author(s):

Thomas Anthony Slamecka† (Science)

Abstract:

[Abstract Redacted]

Keywords: Astronomy; Stars; Stellar

Mentor(s):

Jeffrey Miles Gerber (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1295**
*Presentation Time: Session 2: 10:30am-11:30am*

# Association Between Hyporesponsiveness and Engagement during Parent-Child Interactions across Children with and without Neurogenetic Syndromes

Life Sciences

Author(s):

Elizabeth Soller† (HHS); Priscilla Amaya Gallardo† (HHS)

Abstract:

[Abstract Redacted]

Keywords: Hyporesponsiveness; Unengagement; Parent-Child Interactions

Mentor(s):

Bridgette Kelleher (HHS); Wei Siong Neo (HHS)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1296**
*Presentation Time: Session 2: 10:30am-11:30am*

# Discovery and characterization of Arthrobacter phage FrancisForever

Life Sciences

Author(s):

Sara Thomason† (Agriculture|JMHC); Zhiyuan Chen† (Agriculture|Engineering)

Abstract:

Bacteriophages are highly abundant and genetically diverse viruses that infect bacteria. Bacteriophages have been shown to successfully treat diseases caused by antibiotic resistant bacteria. Recent programs such as SEA-PHAGES have allowed for bacteriophage discovery and cataloging to better analyze these phages. In this study, the newly discovered phage FrancisForever is characterized. Phage FrancisForever was isolated using the host bacteria Arthrobacter globiformis B-2979 from a soil sample in West Lafayette, IN. Then, the phage was purified through serial dilution and plaque assay. As a part of the SEA-PHAGES program, phage FrancisForever was amplified to reach an adequate titer and archived in The Actinobacteriophage Database.

DNA extraction of phage FrancisForever was performed using a Wizard® Genomic DNA Purification Kit. The extracted DNA was eluted and quantified with spectrophotometry. Further experiments with the isolated phage FrancisForever will include characterization by electron microscopy, genome sequencing, and gel electrophoresis of phage DNA restriction digests. Additionally, the host range and phage sensitivity will be examined. The results of this experiment will aid in expanding the SEA-PHAGES database for Actinobacteriophage which will improve overall knowledge of phage genomics and applicability to medicine.

Keywords: Bacteriophage; Genomics; Antibiotic Resistance

Mentor(s):

Kari L Clase (Engineering); Julia Ann Simler (Agriculture); Amanda K Limiac (Engineering)

Other Acknowledgement(s):

Aaron J Gin (Purdue University); Ruba Ahmad Qwai Alajlouni (Agriculture)

**Poster Presentation Abstract Number: 1297**
*Presentation Time: Session 2: 10:30am-11:30am*

# C to Rust: Manual Conversion Methods & Standardized Dataset Creation

Innovative Technology / Entrepreneurship / Design

Author(s):

Gaurav Vermani† (Engineering); Ryan Alexander Kubinski† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: C; Rust; Pointer-Safe Operations; Memory-Safe Operations

Mentor(s):

Aravind Machiry (Engineering); Shashank Sharma (Engineering); Ayushi Sharma (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1298**
*Presentation Time: Session 2: 10:30am-11:30am*

# Estimation of Soil Moisture with Synthetic Aperture Radar and Machine Learning

Physical Sciences

Author(s):

Jingyu Xiao† (Engineeing|JMHC); Jessica Serena Jiayue Li‡ (Engineering|JMHC)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Jinha Jung (Engineering); Fatemeh Azimi (Interdisciplinary & Special Programs)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1299**
*Presentation Time: Session 2: 10:30am-11:30am*

# Out Of Focus Image Correction

Mathematical/Computation Sciences

Author(s):

Jeslyn Cheng Yang† (Science); Brian Ross Ramos† (Polytechnic); Angela Qian† (Science); Jacob Ray Morales† (Engineering); Ramsey Daniel† (Engineering); Alessandra Rice† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Out-of-Focus; Deblur; Detection

Mentor(s):

Soudabeh Taghian Dinani (Engineering); Carla Zoltowski (Engineering); Zheyuan Zhang (Engineering); Edward J Delp (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1300**
*Presentation Time: Session 2: 10:30am-11:30am*

# To What Extent Should Antitrust Laws Have the Power to Control Big Tech Companies?

Social Sciences / Humanities / Education

Author(s):

Ryan Zhe-Wei Yang† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Big Tech Companies; Antitrust; Monopoly; Fair Competition

Mentor(s):

Carla B Rosell (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1301**
*Presentation Time: Session 2: 10:30am-11:30am*

# How do LLM Responses Differ When Asked About Medication Interactions with Alcohol?

Social Sciences / Humanities / Education

Author(s):

Yao Yao† (HHS); Ramsey David Frederick Miller† (HHS)

Abstract:

Introduction: Large Language Models (LLMs; e.g., ChatGPT) are designed to generate written human-like responses to written prompts, but often provide information unrelated to the prompt given. Responses vary from one LLM to another and can vary across time, as they continually grow. Individuals ask LLMs about a range of healthcare topics, including infectious disease and medication related questions.

Purpose: In this project, we aimed to: a.) evaluate and classify extraneous information given by LLMs when asked how alcohol affects certain HIV medications, b.) examine how that information differs across LLMs, and c.) assess how that information changes across time as the LLMs grow.

Methods: We asked ChatGPT Free and Paid, Google Bard, and HIV.gov Chatbot “How does alcohol affect XXXX”, where X was either a specific HIV medication or HIV medications as a whole. Responses were qualitatively coded by two independent raters (using a previously established codebook) and input into NVIVO (Version 14). Codes were analyzed across LLM platforms and, for each LLM, across the four one-week intervals.

Results: Of the 849 total codes found across the LLMs’ responses over a four-week period, 40% of the responses given by the LLMs were related to alcohol-medication interactions, while the remaining 60% of the codes were considered extraneous. Across the LLMs examined, ChatGPT Free gave the most relevant information, as well as increased the percentage of relevant information it gave across weeks.

Discussion: This study adds to the deficit in literature focusing on the content of LLM’s responses regarding HIV medication interactions.

Keywords: Large Language Models; ChatGPT; HIV Medication; Medication Interaction; Alcohol

Mentor(s):

Jennifer Lynn Brown (HHS); Luis A Gomez (HHS); Stephen Allan Paul Beegle (HHS); McKalaih Elizabeth Legault (HHS)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1302**
*Presentation Time: Session 2: 10:30am-11:30am*

# Optimization of Bispecific Adapter Length for Enhanced Universal CAR T Cell Activation in Prostate Cancer Models

Life Sciences

Author(s):

Vicky Zheng† (HHS)

Abstract:

CAR T cell therapy is an advanced immunotherapy that involves engineering a patient's T cells to express chimeric antigen receptors (CARs), enabling them to recognize and destroy cancer cells. The success of CAR T cell therapies in hematologic malignancies has driven interest in applying CAR T technology to solid tumors. For CAR T cells to exert their cytotoxic effects, the chimeric antigen receptors (CARs) on T cells must engage with the tumor antigens on the cancer cell surface. Unlike classical CARs, where single-chain variable fragments (ScFv) directly bind to tumor antigens, universal CAR T cells rely on bispecific adapters that simultaneously bind to both CARs and tumor antigens. In this study, we used mouse prostate-specific membrane antigen (PSMA) as a model to assess how the length of bispecific adapters affects tumor antigen binding and universal CAR T cell function. Bispecific adapters were composed of DUPA, a ligand that binds PSMA, fluorescein (FL), which interacts with the ScFv of universal CARs, and polyethylene glycol (PEG) linkers of varying lengths. Our results show that increasing the PEG linker length reduced binding affinity to mouse prostate cancer cells. However, longer linkers enhanced the activation of universal CAR T cells when co-cultured with cancer cells, with no additional benefit observed beyond PEG8 linkers. This study highlights the adaptability of the bispecific adapter/universal CAR platform, offering a flexible strategy for optimizing the intermembrane distance between CAR T cells and cancer cells, rather than tailoring CAR length for each antigen epitope.

Keywords: Prostate Cancer; Cancer; Car T Cell Therapy; Bispecific Adapters; Immunotherapy

Mentor(s):

Suilan Zheng (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1303**
*Presentation Time: Session 2: 10:30am-11:30am*

# Investigating Properties of 2n-Regular Graphs

Mathematical/Computation Sciences

Author(s):

Isaac Folorunso† (United States Military Academy West Point)

Abstract:

This research explores the structural properties of 2n-regular directed multigraphs, focusing on investigating key characteristics through the overlay of disconnected 2-regular graphs. Using tools from discrete mathematics, we aim to uncover and understand specific attributes within these graph structures. The project seeks to provide a deeper theoretical framework for understanding the complexities introduced by directed edges and multiple edges between vertices.

Keywords: 2n-Regular Graphs; Discrete Mathematics

Mentor(s):

John Borger (United States Military Academy West Point)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1304**
*Presentation Time: Session 2: 10:30am-11:30am*

# Optimization for Diverse Team Assignment with a Case Study at West Point

Mathematical/Computation Sciences

Author(s):

Bryan Frost† (United States Military Academy West Point)

Abstract:

[Abstract Redacted]

Keywords: Optimization; Assignment; Teaming; Diversity

Mentor(s):

John Borger (United States Military Academy West Point); Andrew James Banko (United States Military Academy West Point)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1305**
*Presentation Time: Session 2: 10:30am-11:30am*

# What the Decommissioning of Delafield Pond Teaches Us About the Importance of Stormwater Management Projects Across US Army Installations

Physical Sciences

Author(s):

Owen Hodges† (Engineering); Keiko Yamamoto*

Abstract:

The purpose of this study was to understand how the US Army can improve resilience of its stormwater management infrastructure (SMI) so that military installations are prepared to handle an uncertain climate and increasingly intense storm events. This project frames the decommissioning and infilling of Delafield Pond—a former reservoir located on the United States Military Academy installation in West Point, New York—as a case study of valuable stormwater management infrastructure on an Army base being decommissioned despite its potential value to mission execution and the infrastructural integrity of the installation. The study begins with a literature review of Department of Defense and Army climate policy regarding SMI in the present day, issues facing SMI on Army installations, and pertinent legislation. This investigation is followed by a hydrologic analysis and level-pool routing of Delafield Pond prior to its decommissioning. It was determined the pond did not have enough storage to provide sufficient

Keywords: Stormwater Management; Infrastructure Resilience; Hydrologic Engineering; Army; Climate Change

Mentor(s):

Joseph Speight (United States Military Academy West Point)

Other Acknowledgement(s):

Aiden Bay Griggs (Engineering)

**Poster Presentation Abstract Number: 1306**
*Presentation Time: Session 2: 10:30am-11:30am*

# Optimized Tactical Routing for Unmanned Ground Vehicles

Mathematical/Computation Sciences

Author(s):

Jacob Hyatt† (United States Military Academy West Point)

Abstract:

Military autonomous vehicles, particularly electric or hybrid variants traversing terrain, are unlikely to complete their specific mission unless they can avoid detection and manage their onboard energy sources. These two critical criteria are often at odds with one another. Traditional path-planning algorithms historically optimize a single objective such as distance, energy consumption, or signature. This work employs a multi-objective optimization approach to choose the best path for the vehicle while also minimizing energy consumption and avoiding detection. This work leverages open-source satellite imagery to calculate energy consumption over terrain and detection from enemy in various locations in the area of operations. The work shows that the algorithm reduces energy consumption by 10% while decreasing probability of detection to 20%, increasing station time and survivability of the vehicle and any Soldiers paired with it.

Keywords: Unmanned Ground Vehicle; Multi-Objective Optimization; Energy Consumption; Detection Avoidance

Mentor(s):

James Grymes (United States Military Academy West Point)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1307**
*Presentation Time: Session 2: 10:30am-11:30am*

# Electromigration Failures in Cu-micro bumps with Sn-Ag solder caps

Physical Sciences

Author(s):

Caroline Marie Cameron† (Engineering)

Abstract:

As computer chips become increasingly advanced, their designs grow more compact each year. This shrinkage of electrical components results in higher current density, which can lead to electromigration. Electromigration is the movement of atoms within a material caused by electrical current. At high current densities, the heat generated can displace atoms, forming ‘vacancies’ and ‘deposits.’ Over time, the expansion of vacancies can sever the circuit, resulting in an open-circuit, while the growth of deposits may create unintended connections, leading to short-circuits.

This research project is investigating the effect of electromigration on the time to failure of copper micro bumps with Sn-Ag caps interconnects at various temperatures. Pre-prepared samples are arranged in a daisy chain configuration with each sample containing over 50 copper pillars. Electromigration tests were performed by applying a current density of 4.21×104 A/cm2 to the copper pillar portion of the bumps while simultaneously measuring the resistance across the sample. Each test sample was run until either failure, or the circuit resistance increased by 20%. Testing was performed at both room temperature and 100°C to simulate normal operation temperatures.

Samples will next be polished and analyzed using a scanning electron microscope (SEM). Information gathered from the SEM will be used to explore potential failure sources and gain insights into how and when copper micro bumps with Sn-Ag solder caps fail under electromigration. Additional future testing will include measuring the time to failure of each sample to better understand the relationship between time to failure, temperature and current density.

Keywords: [no keywords provided]

Mentor(s):

Shubhra Bansal (Engineering); Jakob Isaiah Ramos (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1308**
*Presentation Time: Session 2: 10:30am-11:30am*

# UV-Vis-NIR Spectroscopy to measure Degradation in Dielectric Fluids and Thin-Film Semiconductors

Innovative Technology / Entrepreneurship / Design

Author(s):

Ethan Christian Christie† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Shubhra Bansal (Engineering); Huilong Liu (Engineering); Bijay Chhetri (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1309**
*Presentation Time: Session 2: 10:30am-11:30am*

# Reliability of Plastic Encapsulated Microelectronics in the near Earth Radiation Environment

Physical Sciences

Author(s):

Luke Joseph Fortner† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Muhammad A Alam (Engineering); Md Asaduz Zaman Mamun (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1310**
*Presentation Time: Session 2: 10:30am-11:30am*

# Laser-Assisted Heterogeneous Integration of Optical Waveguides in Glass Substrate

Innovative Technology / Entrepreneurship / Design

Author(s):

Siddharth Gaur† (Engineering); Franco Harding Garcia† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Optics; Waveguide; Heterogeneous Integration; Glass

Mentor(s):

Saeed Mohammadi (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1311**
*Presentation Time: Session 2: 10:30am-11:30am*

# Thermo-mechanical Reliability of Metal Embedded Chip Assembly (MECA) Package

Physical Sciences

Author(s):

Parker Joseph Jeffrey† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Shubhra Bansal (Engineering); Faharia Hasan Bhuiyan (Engineering); Haohan Guo (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1312**
*Presentation Time: Session 2: 10:30am-11:30am*

# Experimental Investigation of Thermal and Hydraulic Performance in Series Connections of Inlet Nozzles for Jet Impingement Cooling in Large Die Applications

Innovative Technology / Entrepreneurship / Design

Author(s):

Alexander Hanson Lam† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Semiconductors

Mentor(s):

Ketankumar Jayantkuma Yogi (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1313**
*Presentation Time: Session 2: 10:30am-11:30am*

# Fabrication Process Flow Development for 3D Monolithic Integration of 2D Monolayer FETs

Innovative Technology / Entrepreneurship / Design

Author(s):

Ho Jun Lee† (Engineering); Geetika Chitturi† (Engineering|JMHC)

Abstract:

[Abstract Redacted]

Keywords: Semiconductor; Fabrication; CMOS; AI; Birck Nanotechnology Center

Mentor(s):

Haitong Li (Engineering); Jun Cai (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1314**
*Presentation Time: Session 2: 10:30am-11:30am*

# Reliability for High-Temperature Solder Alloys with Microalloying

Innovative Technology / Entrepreneurship / Design

Author(s):

Colton Pierce Lennen† (Engineering); Caleb Michael Braziel* (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Microelectronics; Solders; PCB; Microstructure; SAC305

Mentor(s):

Lijia Xie (Engineering); John E Blendell (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1315**
*Presentation Time: Session 2: 10:30am-11:30am*

# Electrochemical Deposition Surface Enhancement for Single Phase Jet Impingement

Physical Sciences

Author(s):

Ian Quan† (Engineering)

Abstract:

As semiconductor systems become more power-dense and demand for greater computational power grows, limitations of traditional cooling methods become apparent. Traditional direct multi-jet impingement provides an attractive cooling solution, as impinging jets create a thinner boundary layer, increasing the convective heat transfer coefficient. However, there are still limitations present in jet impingement cooling, namely the correlation between jet velocity and heat transfer coefficient. Therefore, higher pumping power and larger pressure drops across the jet impingement cooler will be present as the heat transfer coefficient is increased. Surface enhancement of the impinging surface by creating a multilayer structure with a porosity gradient has been proposed to increase the heat transfer coefficient without affecting other factors such as pumping power, but current literature relies on high-temperature sintering of copper mesh to create surface enhancement features. This presentation proposes a novel method of electrochemical deposition of copper to create multilayer surface enhancement features, without the requirement of expensive equipment or high temperatures. Numerical analysis was performed on the electroplated structure to determine the effectiveness of the surface enhancement features with ANSYS Fluent and was verified with experimental results. It was found that the multilayer structures was able to increase the heat transfer coefficient and decrease the surface temperature significantly, without changes to the parameters of the jet impingement cooler. Further studies can vary the surface enhancement feature geometry, and the surface enhancement features can be optimized for the jet impingement cooler design.

Keywords: Heat Transfer; Semiconductor Cooling; Electrochemical Deposition; Numerical Analysis; Jet Impingement

Mentor(s):

Tiwei Wei (Engineering); Ketankumar Jayantkuma Yogi (Engineering)

Other Acknowledgement(s):

Ainur Sabirova (Engineering); Keyu Wang (Engineering)

**Poster Presentation Abstract Number: 1316**
*Presentation Time: Session 2: 10:30am-11:30am*

# Heterogeneous Integration of 5G Receivers Using SAWLIT Chiplet Technology: Antenna Design and Impedance Matching on Glass Substrates

Physical Sciences

Author(s):

Ethan Xinghan Tan† (Engineering|JMHC)

Abstract:

[Abstract Redacted]

Keywords: SAWLIT; Glass; Advanced Packaging; Heterogeneous Integration

Mentor(s):

Saeed Mohammadi (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1317**
*Presentation Time: Session 2: 10:30am-11:30am*

# Degradation Kinetics of Thermal Interface Materials in Liquid Immersion Cooling Systems

Innovative Technology / Entrepreneurship / Design

Author(s):

Mark Joseph Tereck† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Immersion Cooling

Mentor(s):

Shubhra Bansal (Engineering); Bijay Chhetri (Engineering)

Other Acknowledgement(s):

Luz Sotelo (Engineering)

**Poster Presentation Abstract Number: 1400**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Survivor Grief Mapping for Efficient Support Systems

Innovative Technology / Entrepreneurship / Design

Author(s):

Yaqeen Al Futaisi† (DSB); Peter Abernethy Krivacka† (DSB); Elijah Robert Windle† (DSB); Kuiyan Zhao† (DSB)

Abstract:

[Abstract Redacted]

Keywords: Data Mining; AI; LLMs; Data for Good; Grief Journey

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1401**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Data Driven Decisions in Collaboration with TAPS

Innovative Technology / Entrepreneurship / Design

Author(s):

Omar Haytham Al Husseini† (DSB); Qeren Isabella-Nailah Blakey† (DSB); Olivia Francis Hojnicki† (DSB); Marshall Alex Prince† (DSB)

Abstract:

[Abstract Redacted]

Keywords: Data Mining; AI; LLMs; Data for Good; Grief Journey

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1402**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Navigating Grief

Innovative Technology / Entrepreneurship / Design

Author(s):

Achyuth Balram Ambady† (DSB); Harshini Malarvannan† (DSB); Arnav Singh† (DSB); John Martin Strabala† (DSB)

Abstract:

[Abstract Redacted]

Keywords: Data Mining; AI; LLMs; Data for Good; Grief Journey

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1403**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# The Effects of pH, Moisture Content, and Photoperiod on the Mycobiome of Lasallia papulosa

Life Sciences

Author(s):

Kaitlyn Marie Annunziata† (Agriculture)

Abstract:

Lichens are symbiotic organisms comprised of a thallus-forming fungus and an alga and/or a cyanobacteria. These organisms have recently been found to harbor a diverse mycobiome. This research aims to explore the influence of several abiotic factors including pH, moisture content, and photoperiod on the lichen thallus's mycobiome.

Using the lichen Lasallia papulose as the model organism, it is hypothesized that compared to the control, the alpha and beta diversities of the acidic, low moisture, and different photoperiod conditions will be similar. In contrast, the alpha and beta diversities of the alkaline and high moisture conditions will present a significant shift.

To test the effects of pH, individual thalli were sprayed with 3, 5, 7, 9, and 11 pH solutions. When investigating moisture conditions, thalli were sprayed periodically with sterile water compared to thalli under 100% humidity. Photoperiod was examined at 8-hour and 15-hour increments in different light chambers. Controls consisted of an environmental thallus and thalli sprayed with sterile water in lab conditions. The mycobiome of these thalli were analyzed using standard Next Generation sequencing in addition to a benzonase pre-treatment to remove external DNA.

Preliminary visual observations showed that under alkaline conditions there was an increase in chlorosis of the thallus. No distinct visual observations were noted in the photoperiod and moisture conditions, except that under high moisture, more apothecia were present. Research is ongoing. This research is important because alterations in weather patterns have the potential to shift diversity within a lichen's mycobiome.

Keywords: Lichen; pH; Mycobiome; Diversity

Mentor(s):

Daniel B Raudabaugh (Agriculture); Mary Aime (Agriculture)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1404**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Generative AI and LLM in Healthcare Operations

Mathematical/Computation Sciences

Author(s):

Yash Rajendra Ashtekar† (Engineering); Utkarsh Bali† (Science|Graduate)

Abstract:

The purpose of this research is to develop a conversational chatbot leveraging Generative AI for healthcare professionals to gain deeper insights into complex data analysis and machine learning models derived from healthcare operations data. By utilizing OpenAI's API, the chatbot will allow doctors, nurses, and other medical staff to engage with the models, asking intuitive, scenario-based questions. This innovative approach aims to enhance decision-making by providing real-time, model-based insights in an accessible, conversational format. Our methods include integrating the OpenAI API with machine learning models trained on healthcare operations data. The chatbot can interpret and respond to a wide range of queries, transforming abstract data into comprehensible and actionable insights. Model explainability techniques such SHAP values to are used ensure that healthcare professionals understand not only the predictions but also the rationale behind them. Preliminary results suggest that the chatbot generates accurate, context-sensitive responses, facilitating a better understanding of model predictions and enhancing user engagement. The ability to handle "what-if" scenarios has shown potential in assisting healthcare practitioners with decision-making processes in real-time. This research offers an innovative tool to improve the efficiency and accuracy of clinical decision-making. By bridging the gap between complex data models and medical professionals, this technology can enhance patient outcomes and operational efficiency in healthcare settings.

Keywords: Generative AI; Machine Learning; SHAP Explanation; Healthcare Operations; Data Analysis

Mentor(s):

Pengyi Shi (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1405**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Leveraging City Conversations to Understand Public Opinion Towards Renewable Energy Initiatives

Innovative Technology / Entrepreneurship / Design

Author(s):

Nihar Pushkar Atri† (Science)

Abstract:

[Abstract Redacted]

Keywords: Natural Language Processing; Renewable Energy; Data Analysis; Sentiment Analysis; Environmental Policy

Mentor(s):

Madhumathi Ponnusamy (Polytechnic); Shan Zhou (Liberal Arts); Gaurav Nanda (Polytechnic)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1406**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Entrepreneurship: An area revolutionized by AI?

Social Sciences / Humanities / Education

Author(s):

Ekam Bhullar† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Co-Evolve; Risk Reduction; Automation; Misalignment; Optimization

Mentor(s):

Carla B Rosell (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1407**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# AI-Powered Classification of Military Grief Stages for Survivor Support

Innovative Technology / Entrepreneurship / Design

Author(s):

Nicolo Roberto Chuapoco Biscocho† (DSB); Ryo Hasegawa† (DSB); Emeline Marie Papp† (DSB); Elliot Joseph Surnamer† (DSB)

Abstract:

[Abstract Redacted]

Keywords: Data Mining; AI; LLMs; Data for Good; Grief Journey

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1408**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Transforming Survivor Support: AI-Powered Journey Mapping for TAPS

Innovative Technology / Entrepreneurship / Design

Author(s):

Caleb Zachariah Brunton† (DSB); Nelson A Paguada† (DSB); Neha A Venkatraman† (DSB)

Abstract:

[Abstract Redacted]

Keywords: Data Mining; AI; LLMs; Data for Good; Grief Journey

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1409**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# From Data to Care: AI Solutions for Personalized Survivor Support at TAPS

Innovative Technology / Entrepreneurship / Design

Author(s):

Jose Jorge Bueso† (DSB); Mia Claire Dunsmore† (DSB); Mitchell Louis Rittman† (DSB); Olivia Kylie Troy† (DSB)

Abstract:

[Abstract Redacted]

Keywords: Data Mining; AI; LLMs; Data for Good; Grief Journey

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1410**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Flow Dynamics in a Cooling Microstructure: A Particle Image Velocimetry Analysis

Physical Sciences

Author(s):

Joshua Decker Buss† (Engineering|JMHC); Grant Joseph Miller* (Engineering|JMHC)

Abstract:

The increasing demand for efficient cooling in computers, driven by massive growth in cloud computing and artificial intelligence sectors, presents a major research opportunity in developing and understanding novel cooling solutions such as jet impingement cooling. Several cooling manifold structures for confined, direct on-chip jet impingement cooling in both single- and two-phase flow regimes have been designed, intended as large-scale commercial solutions for cooling data center servers. Hence, the flow behavior within the manifold is of fundamental and practical interest in understanding the internal heat and mass transfer mechanism and improving thermal performance. This research project will gather flow data from the impingement zone using particle image velocimetry (PIV). As the impingement zone is enclosed and on a micro-scale, the main challenge will be observing the fluid flow without affecting flow characteristics. Research project activities include literature review, designing, modeling, and fabricating a test block capable of approximating fluid flow in a micro-scale cooler, and setting up a flow loop for PIV testing. Development of the test block and flow loop is ongoing, with initial flow visualization results expected. The final PIV data will provide insights into flow velocity, turbulence, and heat transfer within the impingement zone, helping to optimize micro-scale cooling designs.

Keywords: Particle Image Velocimetry; Jet Impingement; Cooling

Mentor(s):

Tiwei Wei (Engineering)

Other Acknowledgement(s):

Yubo Song (Engineering)

**Poster Presentation Abstract Number: 1411**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Analysis of Cicada appearance through a pre-built TensorFlow model BirdNet

Mathematical/Computation Sciences

Author(s):

Zhixin Cai† (Science|JMHC); Keith Meyers* (Science|JMHC)

Abstract:

Insect biomonitoring plays a critical role in assessing habitat quality, informing conservation efforts, and in early detection of invasive species. Passive acoustic monitoring has the potential to revolutionize insect monitoring, but acoustic insect recognition is presently a challenge. Current deep learning and Tensor Flow models accurately identify thousands of bird species, but insect calls have been traditionally viewed as noise. As a continuation of previous research, I will advance the ability of the convoluted neural network BirdNet to identify periodical cicadas. BirdNet is an open-source deep learning program that ingests wave files, converts them to spectrograms, and then compares those images to a training data set. Last semester, I developed a custom cicada classifier for BirdNet using binary classification. After gathering extensive new data, I aim to improve the classifier's accuracy and precision. I will also modify the classifier to allow BirdNet to recognize specific cicada species using multinomial classification. Since our acoustic data mainly contains Magicicada cassini and Magicicada septendicim, I will create a training library for each species, plus a non-cicada library. After training, I will test the classifier using a separate validation library for both species and non-cicadas. In future work, I aim to perfect the cicada classifier for citizen use and allow public access. In addition to helping bridge the gap between scientists and citizens through citizen science, this project also supports insect biomonitoring for conservation, agricultural management, or invasive species identification.

Keywords: [no keywords provided]

Mentor(s):

Kristen Marie Bellisario (JMHC); Christine Harrison Elliott (Agriculture)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1412**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Cultural-Identity Audio Biography and their affects on Asian American teenager (General Health, Loneliness, and Sleep)

Social Sciences / Humanities / Education

Author(s):

Gael Calderon Sermeno† (HHS); Reese Caroline Pinkley‡ (HHS)

Abstract:

According to the U.S. Surgeon General and the American Public Health Association, loneliness is a public health crisis. For teens, loneliness has become an acute problem especially for Asian American youth. According to UCLA Health, Asian American youth are 50% less likely than other racial groups to seek mental health services2. For Asian Americans teens it is hard to grow up in the United States let alone in Indiana. You have the Model Minority Myth, parental pressure, and the feeling of social isolation among your friend groups. This study examines the effects of Music Therapy intervention delivery. Teens had three sessions with a licensed music therapist where they talked about their identity and put those feelings and thoughts into a Cultural-Identity-Audio-Biography (CIAB). CIABs are designed to let teens express themselves and how they want to be perceived by others. We enrolled 16 Asian American & Asian (AA&A) teens from Indiana. These teens answered a survey before the music therapy sessions and then again 3 weeks after the last session. Each CIAB was analyzed using music analysis, and pre-post scores on general health (GH), loneliness (A) and sleep (S) were tested to see if creating a CIAB would result in better health outcomes. We are currently enrolling control group participants. We plan to do a multilevel model analysis between the intervention and control groups to see if the CIAB intervention improved teens' well-being. Stay tuned!

Keywords: Asian American; General Health; Music Therapy; Indiana; Mental Health

Mentor(s):

Stewart C Chang Alexander (HHS)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1413**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Investigating the Role of Genes Regulating Cell-Cycle Progression on Intrauterine Growth Restriction

Life Sciences

Author(s):

Evan James Campbell† (Agriculture); Delaney Alexandra Doncer* (Agriculture); Megan Grace Ashby* (Agriculture)

Abstract:

High ovulation rates are ubiquitous in production swine breeds but can increase the occurrence of intrauterine growth restriction (IUGR), a development condition characterized by asymmetrical growth of fetal organs, reduced post-natal survival, and reduced growth potential. There is currently a poor understanding of the underlying mechanisms in which organ development is impeded during IUGR. We hypothesize that IUGR liver tissue will experience more cell-cycle inhibition than non-IUGR liver tissue, while brain tissue development is less affected by IUGR. This study aims to determine the effects of IUGR on the expression of cyclin-dependent kinase genes (CDK1,2, and 4) and cyclin-dependent kinase inhibitor 1A (CDKN1A) in fetal brain, heart, and liver tissue. IUGR was intentionally induced in n=12 gilts via unilateral hysterectomy and ovariectomy to reduce available uterine space per conceptus. In contrast, IUGR was eliminated in n=12 gilts that underwent a unilateral oviductal ligation, increasing space for each conceptus. Gilt were necropsied on gestation day 94-96, all fetuses were phenotyped and tissue samples were collected. A subpopulation of biological extremes was identified based on a Z score of brain: liver weight ratios. Brain, heart, and liver tissues for each n=24 individual were ground under liquid nitrogen, RNA extracted, and DNAse treated to remove contamination. Isolated RNA integrity was evaluated using a denaturing electrophoresis gel. Our gene expression analysis results are pending. The results of our gene expression analysis are pending, but when complete are expected to enhance our understanding of organ specific cell cycle regulation in the pathophysiology of IUGR.

Keywords: Reproductive Physiology; Swine; IUGR; Cell Cycle

Mentor(s):

Jonathan Pasternak (Agriculture); Sarah M Innis (Agriculture); Dayeon Jeon (Agriculture); Alyssa Smith (Agriculture)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1414**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Implementation of Zcmt extension in a RISC-V processor

Mathematical/Computation Sciences

Author(s):

Aniket Chatterjee† (Engineering|JMHC)

Abstract:

RISC-V has several extensions that define 16-bit compressed instructions, which take up less space than regular 32-bit instructions and allow for code size reduction. Many of these compressed instructions have a simple mapping to full-sized instructions, which allows for a relatively simple implementation. The Zcmt extension for RISC-V, however, contains instructions which cannot be directly translated to any number of regular 32-bit instructions. These are the “table jump” compressed instructions, which allow jumps to be performed using table values from a table stored in instruction memory as targets. This is in contrast to regular jumps in RISC-V, which use immediate values or register values as targets. The location of this table is stored in the jump vector table CSR. The implementation of this instruction required modifications to the pipeline to allow a CSR read, an instruction memory lookup of the correct table address, and then a jump. In addition to the implementation, RISC-V assembly tests for the new instructions were also written to ensure that they function as expected.

Keywords: RISC-V; Table Jump; Compressed Instructions; Embedded Programming

Mentor(s):

Mark Johnson (Engineering); Cole Aaron Nelson (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1415**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Adaptive responses of frog-biting mosquitoes to rising temperatures: A study of survival and selection

Life Sciences

Author(s):

Yu-Wei Cheng† (Agriculture)

Abstract:

Climate change has already led to significant increases in global temperatures, with freshwater ecosystems being particularly sensitive to these thermal shifts. Rising temperatures in freshwater environments directly influence the habitat of species with aquatic larvae, including mosquitoes. This study aims to examine how elevated water temperatures during development influence larval survival and their responses to thermal environments across generations in a frog-biting mosquito, Uranotaenia lowii. We hypothesize thermal responses have high heritability and thus predict that the progeny of mosquitoes who survive at high water temperatures will have higher performance in those conditions. In this study, the early stages of mosquitoes are raised under different thermal conditions, and once they reach adulthood, F1 generations are produced. The performance of their offspring is then evaluated under different thermal. By applying this selection process, we aim to investigate how increased freshwater temperature affects mosquito development and whether the progeny of survivors have a better chance of adapting to warmer conditions.

Keywords: Climate Change; Thermal Responses; Heritability; Freshwater Temperature; Uranotaenia lowii

Mentor(s):

Ximena Bernal (Science); Richa Singh (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1416**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Machine Learning In Motion

Innovative Technology / Entrepreneurship / Design

Author(s):

Arunima Chowdhury† (Science); Marisa Jean Fredrickson† (Engineering); Aryan Kaul† (Science); Amber Kuoiwa Khauv† (Science); Hridhay Monangi† (Science); Dean Snyder† (Engineering|JMHC); Sophia Elizabeth Steele† (Engineering); Taryn Celia Zakrzewski† (Engineering); Matthew Dharma Kurniawan† (Science); Mark Alexander Myers‡ (Polytechnic); Aaron Parihar‡ (Polytechnic|JMHC); Kyle Patrick Fox‡ (Polytechnic); Daitian Zhao‡ (Polytechnic)

Abstract:

[Abstract Redacted]

Keywords: Performance Art; Motion Capture; Machine Learning; Choreography; PyTorch

Mentor(s):

Renee Murray (Liberal Arts); Frederick C Berry (Polytechnic)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1417**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Integration of Learning by Evaluating (LbE) within the 5E Instructional Model in Engineering Design Education

Social Sciences / Humanities / Education

Author(s):

Amiah Bailey Clevenger† (Education|Polytechnic)

Abstract:

[Abstract Redacted]

Keywords: 5E Instructional Model; Engineering Education; Design Thinking; Learning by Evaluating (LbE)

Mentor(s):

Wonki Lee (Education); Nathan Mentzer (Polytechnic); Andrew Jackson (Polytechnic); Scott Ronald Bartholomew (Education)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1418**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# How do Latinas experience pregnancy loss? A Study Protocol

Social Sciences / Humanities / Education

Author(s):

Gisselle Cordoba† (Science)

Abstract:

[Abstract Redacted]

Keywords: Latine; Pregnancy Loss; Miscarriage; Health

Mentor(s):

Kathryn Jean LaRoche (HHS)

Other Acknowledgement(s):

Anayra Maldonado Quiles (HHS)

**Poster Presentation Abstract Number: 1419**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Discussing the ethical implications of autonomous vehicles

Social Sciences / Humanities / Education

Author(s):

Felipe da Paixao† (DSB)

Abstract:

The purpose of this project is to discuss the ethical implications of autonomous vehicles (AVs) as they become increasingly integrated into the modern transportation system. The methods include examining three critical ethical dilemmas: the famous trolley problem (which addresses decision-making in split-second scenarios involving multiple lives), a discussion about liabilities in accidents involving AVs, and concerns over data privacy and security. The scope focuses primarily on the U.S. transportation system, examining both private AVs (such as those produced by Tesla and Rivian) and commercial AV trucks, like the Rivian delivery vehicles for Amazon. This focus is due to the U.S.'s extensive infrastructure that supports AV operations, the willingness of consumers to adopt these technologies, and the country's significance in AV development as a crucial testing ground for future applications globally.

Keywords: Ethics; Autonomous Vehicles

Mentor(s):

Shreya Ghosh (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1420**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# The Importance of Sustainable Fashion

Social Sciences / Humanities / Education

Author(s):

Aryan Daga† (Engineering)

Abstract:

The fashion industry is producing over 100 billion garments annually, with more than 60 percent made from non-biodegradable fabrics (businesswaste.co.uk, 2023). Nearly 57 percent of these garments end up in landfills, contributing to massive environmental waste (businesswaste.co.uk, 2023). In this exploratory research poster, I argue for a necessary shift in the fashion industry, both from manufacturers and consumers, toward a sustainable model. To investigate this issue, I conducted a preliminary literature review on several peer-reviewed and popular sources on several topics under this banner. While switching to green fabrics and processes may initially lead to a drop in profits for companies, long-term benefits far outweigh short-term losses (Standish, 2024). Sustainable brands have already shown higher profit margins, and consumers are increasingly willing to pay more for eco-friendly clothing (Pires et al., 2024).

From an economic perspective, the rise of slow fashion offers a viable alternative to the rapid overproduction model of fast fashion. By adopting longer production cycles, brands can focus on quality and ethical practices, appealing to consumers who are moving away from the culture of overconsumption (Henninger, 2016). The poster also highlights fabrics like hemp and linen, which offer significant environmental advantages over traditional cotton, from reduced water usage to better durability. These fabrics, though often overlooked, have the potential to reshape the industry in a more sustainable direction. The transition to sustainable fashion is not just a possibility but a necessity. Both producers and consumers have a responsibility to shift towards more environmentally friendly practices to avoid long-term damage. Sustainability must become a core value for the entire industry to ensure the future of both fashion and the planet.

Keywords: Sustainability; Fashion; Environment; Business

Mentor(s):

Carla B Rosell (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1421**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Large Language Models for Energy Efficient Code: Emerging Results and Future Directions

Mathematical/Computation Sciences

Author(s):

Leo Deng† (Science); Chien Chou Ho† (Engineering); Rishi Mantri† (Engineering); Arjun Sandeep Gupte† (Engineering)

Abstract:

Energy-efficient software helps improve mobile device experiences and reduce the carbon footprint of data centers. However, energy goals are often de-prioritized in order to meet other requirements. We take inspiration from recent work exploring the use of large language models (LLMs) for different software engineering activities. We propose a novel application of LLMs: as code optimizers for energy efficiency. We describe and evaluate a prototype, finding that over 6 small programs our system can improve energy efficiency in 3 of them, up to 2x better than compiler optimizations alone. From our experience, we identify some of the challenges of energy efficient LLM code optimization and propose a research agenda.

Keywords: Energy Efficiency; Software Optimization; Large Language Models

Mentor(s):

James C Davis (Engineering); Huiyun Peng (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1422**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Dedupr: Streamlining Citation Deduplication for Systematic Reviews

Social Sciences / Humanities / Education

Author(s):

Dhruv Vishal Dhawan† (Science|JMHC)

Abstract:

In evidence synthesis projects, removing duplicated citations from multiple databases is a critical but often time-consuming task. To streamline this process, we developed dedupr, a user-friendly R package and Shiny web app. This tool automates the reliable Bramer's method for citation deduplication, significantly reducing the effort required in systematic reviews. By simplifying the removal of duplicates, dedupr improves the accuracy and efficiency of research, ensuring compliance with PRISMA2020 guidelines.

Dedupr is particularly valuable as it removes the need for users to know R coding, offering an accessible solution through a straightforward interface. Researchers can upload their citation files, deduplicate them, and export results quickly and easily. The tool's broader impact includes enhancing the accessibility of systematic reviews for professionals in fields like healthcare, public health, and academia. By providing a cost-effective and efficient solution, dedupr empowers researchers, especially in resource-limited environments, to conduct high-quality evidence synthesis without extensive technical expertise.

Keywords: Citation Deduplication; Systematic Reviews; Resource-Limited Environments; Evidence Synthesis

Mentor(s):

Chao Cai (Libraries)

Other Acknowledgement(s):

Chaitanya Rajesh Patange (Engineering)

**Poster Presentation Abstract Number: 1423**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Effects of Biomechanical and Biochemical Cues on Intestinal Organoid Growth and Morphology

Life Sciences

Author(s):

Abigail J Dressman† (Engineering)

Abstract:

The intestinal epithelium responds to biomechanical and biochemical cues that regulate its growth, differentiation, and function. A key factor in maintaining epithelial integrity is luminal fluid movement, generating shear stress that influences nutrient absorption, cell proliferation, and barrier function. However, the effects of luminal fluid motion on intestinal epithelial growth remain unclear.

In this study, intestinal organoids were used to model the effects of dynamic flow on organoid growth and budding morphology. Organoids, derived from intestinal stem cells, replicate the crypt-villus architecture of the intestinal epithelium, offering a valuable tool for studying intestinal development. To simulate dynamic flow, organoids were cultured in a rocker system, and growth was compared to static conditions. Results showed that flow conditions significantly enhanced organoid size and budding, suggesting improved nutrient distribution and epithelial health.

Biochemical factors, like gut microbiota-derived short-chain fatty acids (SCFAs), also influence intestinal health. Butyrate, an SCFA, is a key energy source for intestinal epithelial cells and regulates inflammation. In this study, 1 mM and 0.5 mM concentrations of sodium butyrate were found to significantly promote organoid growth and structural integrity under flow conditions. These findings highlight the importance of butyrate in epithelial development, particularly under dynamic conditions, and suggest its potential therapeutic role in treating intestinal disorders. Future research will explore other gut metabolites for therapeutic applications.

Keywords: Shear Stress; Butyrate; Crypt-Villus Architecture; Metabolites; Intestinal Organoids

Mentor(s):

Sunghee Park (Engineering)

Other Acknowledgement(s):

Jongkeun Sim (Engineering); Hoi Joong Youn (Engineering)

**Poster Presentation Abstract Number: 1424**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Establishing Viable Solutions to Electric Vehicle Battery Recycling

Social Sciences / Humanities / Education

Author(s):

Prakhar Drolia† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Recycling; Electric Vehicles; Batteries; Future; Direct-Recycling

Mentor(s):

Carla B Rosell (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1425**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# ‘By veterans, for veterans’: Qualitative impacts of an equine-assisted learning program for veterans and their families

Social Sciences / Humanities / Education

Author(s):

Tatum Reese Ebbeskotte† (Science|JMHC); Sophie Kaitlyn Stahl* (Science|JMHC)

Abstract:

There is a large amount of anecdotal evidence to support the concept that equine-assisted learning programs have a positive psychosocial impact on military veterans and their families. The aim of this study was to analyze the qualitative impacts that the Horsemanship for Heroes equine-assisted learning program has on its participants which include veterans, and their family members. In this study, participants of the Horsemanship for Heroes program were interviewed following the completion of the eight-week program. Open-ended responses (N=13) were analyzed qualitatively using a content analysis. Responses consistently demonstrated the program's positive impact, with many participants stating they may not be here today without the program. Interviewees also commented that one of the most important parts of this program was that it was “by veterans, for veterans”. Implications found within the responses highlight what similar programs can consider when refining their programs to be more successful. Additionally, with the overwhelmingly positive responses to the Horsemanship for Heroes program, future studies should consider exploring how equine-assisted learning works in tandem with traditional interventions.

Keywords: Military Family; Animal-Assisted Intervention; Horses; Equine-Assisted Learning; Psychosocial Wellbeing

Mentor(s):

Leanne Nieforth (Vet Med)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1426**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# AI-Driven Survivor Journey Mapping for TAPS: Automating Grief Stage Classification

Innovative Technology / Entrepreneurship / Design

Author(s):

Kyle Steven Emgenbroich† (DSB); Marco Ryan Bravo† (DSB); Orion Matthew Barrett-Tzannes† (DSB); Hunter McCormick Danton† (DSB)

Abstract:

[Abstract Redacted]

Keywords: Data Mining; AI; LLMs; Data for Good; Grief Journey

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1427**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Investigation, optimization and application of MIP-based PFAS sensing across sample matrices

Physical Sciences

Author(s):

Keeley Vonne Farmer† (Science)

Abstract:

[Abstract Redacted]

Keywords: Sensor; PFAS; Environmental; Interferent; MIP

Mentor(s):

Jeffrey Edward Dick (Science); Dane Christophe Wagner (Science); Mobina Masdari (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1428**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# How Social Support Impacts Rare Disorder Caregiver

Life Sciences

Author(s):

Evelyn Hanson Frank† (HHS); Jacoba Marlene Babin† (HHS)

Abstract:

Rare disorder caregivers manage a wide variety of responsibilities every day; as a result, they often experience high stress and burden levels. Past research has shown that a possible way to decrease stress and burden is through social support systems (George, E.S., et al. 2019). However, it is currently unknown what types of social supports best meet the needs of rare disorder caregivers. To answer this question, we examined social support patterns of 335 caregivers of children with rare neurogenetic conditions who participated in Project WellCAST, an ongoing clinical trial that is using telehealth-based support programs to determine what interventions best meet the needs of rare disorder caregivers. Data from the pre-intervention baseline phase of this trial were utilized for analysis. During this phase, participants responded to ecological momentary assessment (EMA) questionnaires three times per day for two weeks. Questions measured daily burden and stress levels, along with what types of social support they were engaging in each day; participants could select multiple options at each timepoint. Preliminary descriptive data indicated varied levels of support uptake across in-person (91.28%), phone calls (60.12%), text (69.78%), video chat (24.30%), and social media (36.45%); 67.29% also endorsed “I did not receive social support from other adults today.” Final statistical analysis will investigate the association between different forms of social support and caregiver’s daily stress and burden levels. Our anticipated results will inform clinicians on how to create specifically tailored support programs that encompass a more holistic approach for supporting caregiver well-being.

Keywords: Mental Health; Stress; Burden; Rare Disorders; Caregivers

Mentor(s):

Bridgette Kelleher (HHS); Lyndsey Nicole Graham (HHS)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1429**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Development of Modular Robotic Platform for Ocean Exploration Through Composites Additive Manufacturing

Innovative Technology / Entrepreneurship / Design

Author(s):

Raul Hector Fuentes Hernandez†; Ivan Gregorio Vega Campas†

Abstract:

Autonomous Underwater Vehicles (AUVs) are essential for subsea inspections, environmental monitoring, and data collection. However, many AUVs remain non-reconfigurable due to the complexities of operating in high-pressure environments, maintaining waterproofing and structural integrity, and the high costs of adapting components and control systems. Additive manufacturing with fiber-reinforced thermoplastics offers a rapid and customizable solution by producing lightweight components with complex geometries tailored for specific hydrodynamic characteristics, supporting modular designs for diverse mission needs. The flexibility of 3D printing allows for the creation of intricate hydrodynamic designs, essential for efficient underwater navigation, while fiber-reinforced thermoplastics provide superior mechanical properties compared to traditional additive manufacturing materials, offering corrosion resistance and durability ideal for harsh marine environments. This project introduces the Modular Robotic Platform for Ocean Exploration through Composites Additive Manufacturing (MORPHO-CAM), built around five core modules: actuation, processing, sensing, structural, and communication. These modules can be arranged in different configurations to accommodate various exploration tasks. The Composites Additive Manufacturing Research Instrument (CAMRI) is used to print short fiber-reinforced thermoplastics at scales of 0.5 by 0.5 by 0.5 meters, creating watertight structures through bead compaction to prevent leaks. Preliminary results include CAD designs of building blocks and configurations for three different scenarios, along with modular robot sections printed using CAMRI. The software and electrical systems provide control and power interfaces. Initial tests demonstrate basic control over the platform, confirming the feasibility of the modular and reconfigurable design for underwater missions.

Keywords: Underwater Vehicle; Modular Design; Additive Manufacturing; Fiber-Reinforced Thermoplastics

Mentor(s):

Eduardo Barocio Vaca (Engineering); Jalil Francisco Francisco Chavez Galaviz (Engineering)

Other Acknowledgement(s):

Garam Kim (Polytechnic)

**Poster Presentation Abstract Number: 1430**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Correlates of Self-Directed, Interpersonal, and Cultural Violence Among International College Students

Social Sciences / Humanities / Education

Author(s):

Anaelle Gackiere† (HHS)

Abstract:

International college students are a population that is at high risk of experiencing victimization across multiple forms of violence, including self-directed (e.g., suicide), interpersonal (e.g., sexual assault), and cultural violence (e.g., honor crimes). While both general (e.g., social isolation) and specific (e.g. discrimination) risk factors have been identified as increasing college students' risk for experiencing violence, few studies have examined how these risk factors differ among international students. Little is known about how these risk factors predict varying forms of violence among international students, including how these risk factors contribute to other culturally specific forms of violence against women, such as female genital mutilation and honor killing. Given the lack of integrated approaches used to address these concerns, the current study uses a mixed-methods design to examine the relationship between individual, social, and cultural factors that may affect outcomes related to self-directed, interpersonal, and cultural violence amongst international college students. International students between the ages of 18 and 24 will be recruited from the Psychology SONA Subject Pool. Eligible participants will be invited to complete a brief online survey and participate in a semi-structured interview session assessing their perspectives on risk factors for violence and substance abuse, sources of support, and usage of mental health resources. Thematic analysis will be used to will be used to identify, analyze, and interpret emergent qualitative themes. Results from the present study will be discussed regarding implications for violence prevention programming targeting undergraduate international students.

Keywords: Violence; Risk Factors; International Students; Prevention; Acculturation

Mentor(s):

Christopher I Eckhardt (HHS); Daniel William Oesterle (HHS)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1431**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# TAPS Grief Journey with R and AI

Innovative Technology / Entrepreneurship / Design

Author(s):

Daniel Robert Gallagher† (DSB); Ronak Bhagia† (DSB); Mansi Shakalya† (DSB); Huei Syuan Chiang† (DSB)

Abstract:

[Abstract Redacted]

Keywords: Data Mining; AI; Data Science; Data for Good; Grief Journey

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1432**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Camera Lidar Fusion Pipeline

Mathematical/Computation Sciences

Author(s):

Justin Zijie Gan† (Engineering); Sahithi Gokavarapu† (Science); Pranati Patchigolla† (Science)

Abstract:

[Abstract Redacted]

Keywords: Camera; LIDAR; Perception; Machine Learning

Mentor(s):

Andres Felipe Hoyos Moreno (Engineering); Samuel Labi (Engineering); Richard Osita Ajagu (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1433**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Diving Deep: Creating the Best AI Model to Support Grief Stages for Survivors

Innovative Technology / Entrepreneurship / Design

Author(s):

Arya Garg† (DSB); Yujie Huang† (DSB); Aryaa Madan† (DSB); Ethan Brian Kobylinski† (DSB)

Abstract:

[Abstract Redacted]

Keywords: Data Mining; AI; LLMs; Data for Good; Grief Journey

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1434**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# BoilerGPT: Optimizing Large Language Models for Education

Mathematical/Computation Sciences

Author(s):

Kush Gogia† (Engineering); Christopher Michael Sigmund† (Engineering); Ilhoon Lee† (Science)

Abstract:

Large Language Models (LLMs) know a vast amount of information across broad fields of data, but the data is not domain-specific: LLMs do not know everything about a single category. The purpose of this paper is to perform an array of state of the art modifications on flagship LLMs and analyze its performance to achieve mastery from an educational standpoint. The data we use to train the model comes from a range of sources, all of which pertain to ECE 368: Data Structures at Purdue University. So far, we have looked into fine-tuning and Retrieval Augmented Generation (RAG). These methods have proved effective in producing answers when the question asked is similar to the existing database, but not otherwise. Also, these methods can be computationally expensive as they involve tinkering with the model's parameters. A new method we implement in the study is prompt engineering, which involves modifying inputs at the user level. This does not change the model at all, making it easy and fast to use. Furthermore, we look into aligning the outputs of the model to human preferences and producing responses that are helpful, honest, and harmless with Reinforcement Learning from Human Feedback (RLHF) and Proximal Policy Optimization (PPO). We also work towards encouraging the model to provide responses that promote deeper thought and learning amongst students. We investigate methods to emulate the interactions a student may have with their teacher by returning questions rather than direct answers.

Keywords: Artificial Intelligence; Machine Learning; Large Language Models

Mentor(s):

James C Davis (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1435**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Goal-directed sequence discrimination behavior in mice

Life Sciences

Author(s):

Saloni Gupte† (Science)

Abstract:

The ability to integrate sensory information flexibly and adaptively is crucial for producing appropriate behaviors. For instance, a sound can signal danger in one contex -- like rustling in the bushes --while indicating safety in another, such as the wind blowing through trees. An intriguing question, then, is how the same sensory stimulus can be interpreted differently according to context to generate different behavioral responses. To understand this, we designed a Go/No-go whisker sequence discrimination task involving three adjacent whiskers. Mice were trained to respond to specific whisker touch sequences by licking after a correct sequence (first whisker touch followed by second whisker touch) and withholding their response to incorrect sequences (third whisker touch followed by second whisker touch). Single whisker stimulus has no value to them, while the sequential whisker stimuli establish the context. Classical and operant conditioning were used to train mice. Our next step is to record neural activity from relevant barrel columns in the primary somatosensory cortex while the mice perform the task. This will allow us to investigate the neural circuit mechanisms underlying contextual sensory processing.

Keywords: Sequence Discrimination; Behavioral Context; Somatosensory Cortex

Mentor(s):

Hayagreev Vadhiraj Sarma Keri (Engineering); Scott R Pluta (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1436**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# An Anthropological Case Study of Care in Wea Creek Orchard

Social Sciences / Humanities / Education

Author(s):

Bek Hamelin† (Liberal Arts)

Abstract:

[Abstract Redacted]

Keywords: Care; Orchard; Farmers; Community; Values

Mentor(s):

Andrew T Flachs (Liberal Arts)

Other Acknowledgement(s):

Perry M Kirkham (Vice President Research)

**Poster Presentation Abstract Number: 1437**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Naval Surface Warfare Center Artificial Intelligence Maritime Maneuvering Challenge

Innovative Technology / Entrepreneurship / Design

Author(s):

Bennett Michael Hanan† (Engineering); Margulan Mukhametkarim† (Engineering); Benjamin Harris Ciliberto† (Engineering); Ridge McCain Blankenship† (Engineering); Alexander T Valdes‡ (Engineering); Nicholas Keir Wade‡ (Science); Andrew Joseph Shelley‡ (Polytechnic); Alexander Kmetko‡ (Engineering); Liam M Mccormack‡ (Polytechnic)

Abstract:

[Abstract Redacted]

Keywords: Artificial Intelligence; Computer Vision; Boat; Autonomous

Mentor(s):

Brittany A Newell (Polytechnic); Richard M Voyles (Polytechnic); Samuel Labi (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1438**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Helping TAPS with Machine Learning and Data Mining

Innovative Technology / Entrepreneurship / Design

Author(s):

Mya E Hardin† (DSB); Ryan Michael Sagendorph† (DSB); Christina Wan† (DSB); Peregrine Zhang† (DSB)

Abstract:

[Abstract Redacted]

Keywords: Data Mining; AI; LLMs; Data for Good; Grief Journey

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1439**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# VIP - Organoid On Chip

Life Sciences

Author(s):

Nolan Lee Hardman† (Engineering); Jacob Henry Rikkola† (Engineering); Adrienne Dale Torres Balahadia† (Engineering); Bader Emad Abu-Shanab† (Engineering); Zilan Patel† (Engineering); James M Scanlan† (Engineering); Aaditi Anupam Vaval† (Engineering)

Abstract:

Our group's task is to create a lighting system to activate different cell types used in this project. Specific wavelengths (470, 525, and 630 nm) stimulate the cells, while near-infrared light dissolves a thin layer of PLGA separating them. We researched, purchased, and tested the necessary LEDs and drivers, assembling a circuit with LEDs, resistors, a driver, a power source, and a function generator. We also measure and control the heat output of the LEDs to ensure cell viability. This study focuses on designing and utilizing 3D modeling for an Organoid on-chip, primarily creating the bottom piece of the prototype. We employed superglue, which is used in medical devices, to safely attach the model to a glass slide. Additionally, this research presents a light attachment for microscope slides to study cancer cell interactions with normal healthy cells, offering versatility for observing and analyzing these interactions.

Keywords: Organoid; Chip; Cell Culture; Tumor; Light Excitation

Mentor(s):

Afshin Izadian (Polytechnic); Christine Taylor (Polytechnic); Arvind Krishna Radhakrishnan (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1440**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Mental Health Struggles Experienced In Students and Student-Athletes

Social Sciences / Humanities / Education

Author(s):

Michaela Danielle Headlee† (HHS)

Abstract:

An increase in mental health struggles within college students and collegiate student-athletes have created a greater need for support facilities. The majority of college students (over 60%) are now meeting the criteria for at least one mental health issue, which is a 50% increase from 2013 (Flannery, 2023). In this exploratory research project, I investigate the differences in the mental health struggles experienced in college students compared to collegiate-athletes at Purdue University. This also includes their knowledge on mental health support facilities that are offered to them. To better understand this issue, I administered a 7 question survey to students and student-athletes at Purdue. Within the survey, the questions gathered data on their knowledge of mental health facilities on campus, if they have ever visited a mental health facility on campus, the stress and pressure they experience, and ways they take care of themselves in regard to their mental health. The findings from this research have the potential to allow us to better understand how Purdue students really feel on campus and ways that we can more effectively support our students to allow them to be the best they can be.

Keywords: Mental Health; Students; Student-Athletes; Support Facilities

Mentor(s):

Michael Douglas Johnson (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1441**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Predicting Grief Stages for Veteran Survivors

Innovative Technology / Entrepreneurship / Design

Author(s):

Ian William Hedges† (DSB); Somin Yang† (DSB); Kyle Anthony Fernandez† (DSB); Mackenzie Elizabeth Arnish† (DSB)

Abstract:

[Abstract Redacted]

Keywords: Data Mining; AI; LLMs; Data for Good; Grief Journey

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1442**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Development and Utilization of Online Interactive Review Modules for Collegiate-Level General Chemistry

Physical Sciences

Author(s):

Hailey Choi Hiatt† (Science)

Abstract:

General chemistry is the foundation upon which all other subsets of chemistry and numerous scientific disciplines build upon. Therefore, it is important that students come into college well equipped with the necessary knowledge and experience to succeed in introductory chemistry courses. However, certain situations could limit a students' preparedness for entering into these classes, such as socioeconomic factors, disparities in school systems, COVID-19/online learning, and more. In response to these challenges, our team set out to develop online interactive review modules in Purdue University's campus-wide online learning system, Brightspace, in order to use technology to make chemistry education more accessible and engaging. This was achieved by creating written content, video tutorials, diagrams, and practice quizzes with personalized feedback. These review modules and their associated video tutorials were widely accessed and utilized by the students enrolled in various general chemistry courses.

Keywords: Chemical Education; Interactive Learning; Virtual Learning; Content Review; Accessible Learning

Mentor(s):

Hannah Elise Starr (Science)

Other Acknowledgement(s):

Caroline Sorrells

**Poster Presentation Abstract Number: 1443**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Analyzing bobcat presence in relation to species occupancy within trail-use factors

Life Sciences

Author(s):

Katie Luo Hong† (Agriculture); Sierra Hunnicutt‡ (Science|JMHC); Abigail Rose Malott‡ (Agriculture|JMHC); Antonia Christina Alexiou* (Science|JMHC); Sabrina Michelle Hardy* (Science|JMHC); Vaishnnavi Purram* (Science|JMHC)

Abstract:

Increasing human disturbances pose substantial risks and force sub-optimal energy-draining adaptations for predators like Bobcats (Lynx rufus). Predators often must utilize low efficient pathing behaviors. Research also demonstrates predators respond differently to varied human impacts such as hunting by utilizing roads, non-paved roads, and corridors developed for human use concluding that predators can recognize high-risk situations and adjust to lower risk situations despite the presence of human disturbance. Little is known about the trade-offs that shape a bobcat's pathing behaviors, as avoidance from human disturbance is likely impossible. In this study, we compared species occupancy in sites with a gradient of trail-use, to observe a relationship between species occupancy and bobcat presence in human trail-use sites from the Illinois border to Michigan border. We deployed multiple remote sensing camera traps at 8 sites which have multiple different trail-use features, with an added scent bait to increase bobcat attraction. We predicted that low use trails will equate to high presence of Bobcats. Which resulted in no trail-use sites found higher bobcat (11) and species diversity presence and population. This research could be useful for assessing different levels of trail-use and their species diversity that could be beneficial to large mammal wildlife corridors.

Keywords: [no keywords provided]

Mentor(s):

Kristen Marie Bellisario (JMHC)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1444**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# The College Housing Crisis.

Social Sciences / Humanities / Education

Author(s):

Sarah Elizabeth Kady† (HHS)

Abstract:

[Abstract Redacted]

Keywords: Housing Crisis; Mental/Physical Health; Purdue Housing; Homelessness; New Housing Plans

Mentor(s):

Michael Douglas Johnson (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1445**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Effects of FMR1 premutation status on neural measures of executive function and cerebellar GABA

Life Sciences

Author(s):

Roma Nandan Kamat† (HHS)

Abstract:

Fragile X Syndrome is a genetic disorder which causes developmental and cognitive disabilities and is passed down through Fragile X premutation carriers (PMC). Women with the premutation are at elevated risk for developing mood and anxiety disorders. Two possible pathways that may explain this risk are differences in cerebellar GABA functioning and executive function. The current study sought to investigate how Cerebellar GABA concentration and executive function may vary between PMC and unaffected controls. Further, we explored how the correlation between cerebellar GABA and neural measures of response monitoring—an important component of executive function—would vary between groups. The study compared 15 adult PMC women with 15 matched controls. Participants underwent MR spectroscopy to assess resting state GABA concentration in the cerebellum as well as an electroencephalogram (EEG) while they completed an arrows flanker task to measure response monitoring. Contrary to our expectations, there was no mean difference in cerebellar GABA concentration between groups (t24= -0.34, p= .735, d= -.135). However, neural activity involved in response monitoring was reduced in PMC versus controls (F2,27=5.91, p=.005, ?p2=.174). Further, there was a difference in the strength of correlation between GABA concentration and response monitoring across groups. Among controls, these variables were highly correlated (r= .72, p= .008), while in PMC this association was not observed (r= -.07, p= .811). These findings suggest that the FMR1 premutation may disrupt the link between cerebellar GABA and response monitoring and has implications for the broader cognitive and neuropsychiatric phenotype in PMC women.

Keywords: Fragile X Premutation; Cerebellar GABA; Executive Function; Error Related Negativity

Mentor(s):

Daniel J Foti (HHS); Roslyn B Harold (HHS)

Other Acknowledgement(s):

Bridgette Kelleher (HHS); Gianna K Nossa (HHS); Humberto Monsivais (HHS); Xiaopeng Zhou (HHS); Ulrike Dydak (HHS)

**Poster Presentation Abstract Number: 1446**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Cash Crops and Pathogens: How historical examples can inform the fight against tar spot in cornfields

Social Sciences / Humanities / Education

Author(s):

Colin Francis Kelly† (Science|JMHC)

Abstract:

First identified in the United States in 2015, tar spot, a prominent disease in corn commonly caused by the fungi Phyllachora maydis, has decimated yellow dent corn in Indiana and Illinois fields. Today, tar spot has been recorded in the cornfields of Florida, Georgia, Iowa, Kansas, Kentucky, Michigan, Missouri, Nebraska, New York, Pennsylvania and Wisconsin. This project focuses on how devastation of cash crops by disease in the past can inform the fight against tar spot in cornfields. Three historical examples of pathogenic decimation of crops are used to highlight the issue of clonal propagation of commercial crops. Ireland's potato famine, Sri Lankan coffee rust, and the papaya ring virus in Hawaii provide specific case studies into how human actions impact crop-specific pathogens. Using these examples, in the context of their situations and outcomes, we can formulate a comprehensive projection of the current tar spot in the United States. I predict that the USDA will focus on the complete eradication of Phyllachora maydis through microbial development in corn species and further genetic mutation of the most valuable crop in the United States Agricultural Society. This implies that humans are more willing to invest in strategies to combat crop pathogens than to alter the types of foods that are commercially used in their own diets. Highlighting humans' adaptation strategies throughout history through technology.

Keywords: Tar Spot; Cash Crop; Agriculture; Human Intervention

Mentor(s):

Melanie M. Beasley (Liberal Arts)

Other Acknowledgement(s):

Sana Anum Mohammad (Agriculture)

**Poster Presentation Abstract Number: 1447**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Optimizing Quantum Annealing Parameters for Enhanced Performance in Track Clustering Algorithms: A Case Study with CMS Event Data

Mathematical/Computation Sciences

Author(s):

Azain Khalid† (Science); Jack Harrison Reynolds† (Science); Kushal Venkata Peddakotla† (Engineering); Aiden M Hudson† (Science); Bailey Marie Jones† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Quantum Annealing; Track Clustering; CMS Event Data; Parameter Optimization

Mentor(s):

Robin Carpenter (Science); Andy Jung (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1448**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Chess Position Recognition Application

Mathematical/Computation Sciences

Author(s):

Devansh Khandelwal† (Science); Dinh Huy Tuan Nhu† (Science); Arnav Daryani† (Science); Jeffrey Jingwei Wu† (Science)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Edward J Delp (Engineering); Carla Zoltowski (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1449**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# 8-bit flash Analog to Digital Converter for System-on-Chip Applications

Mathematical/Computation Sciences

Author(s):

Seeun Kim† (Engineering)

Abstract:

The goal of this project is to develop and implement a 8-bit Flash Analog to Digital Converter (ADC) that implements the team's microcontroller system. Flash ADC is chosen because of its faster operation than other types of ADCs, making it ideal for applications that require fast signal conversion. Moreover, to match the resolution as the DAC, 8 bit is chosen which is common use in microcontrollers. The project involves designing essential elements for the Flash ADC, such as a comparator and a 256-to-8 encoder. For proper functionality, each component will be examined individually on specific testbenches using TSMC180 PDK as a design kit. Following that, the top layout of the ADC will be built, combining the components, and the entire system will be tested using further testbench simulations to confirm proper operation. The expected conclusion is a working 8-bit Flash ADC that can convert analog signals at fast speeds. The test benches through cadence will ensure that the individual comparator and encoder, as well as the entire ADC, work as planned, producing correct digital outputs for a specified range of analog inputs. The successful implementation of the 8-bit Flash ADC will show the possibility of utilizing Flash architecture for high-speed signal conversion.

Keywords: Analog to Digital; Data Converter; SoC; IC Design

Mentor(s):

Dali Lai (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1450**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# The History of Bovine Tuberculosis in the United States and its Modern Day Implications

Social Sciences / Humanities / Education

Author(s):

Jolie Grace Klimczak† (Agriculture|JMHC)

Abstract:

The emergence of Bovine Tuberculosis in the early nineteenth century was the catalyst that brought American agriculture into the public health sphere. Since Robert Koch's discovery of tuberculosis in the late 1800s, tuberculosis and medicine have evolved side by side locked in a constant battle with each side looking to thwart the other. The initial lack of action by the American government led to sickness spreading across the country to humans and cattle alike causing a public health crisis. This also created financial hardships for farmers and resulted in many American citizens losing their lives to the disease; however, large-scale change in response to zoonotic diseases was accomplished and can still be seen to this day. Bovine Tuberculosis was a serious public health issue rising in the late 1800s and lasting through the late 1930s which caused scandals, a war, and the creation of multiple agencies and policies within the Department of Agriculture. By examining the actions of the United States government in response to Bovine Tuberculosis, this paper will offer insight on how to carefully continue combat against Bovine Tuberculosis in the modern day.

Keywords: Bovine Tuberculosis; Bureau of Animal Industry; 1880s-2020s; Tuberculous Cattle Trust; bTB

Mentor(s):

Emma Maggart (Dynamic Redevelopment Solutions)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1451**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Development of POTATO for 2S Module Grading for the CMS Phase-2 Outer Tracker Upgrade

Physical Sciences

Author(s):

Anna G. Klupshas† (Science)

Abstract:

Due to the High Luminosity-Large Hadron Collider (HL-LHC) upgrade, several detectors of the Compact Muon Solenoid (CMS) will need to be replaced, specifically the new Outer Tracker (OT) that will be assembled with 13,200 silicon modules. The OT is composed of two types of modules; the PS (pixel-strip) and the 2S (strip-strip) modules. With a large influx of production of modules, extensive testing is required to ensure quality of the modules. This research introduces POTATO (Phase-II Outer Tracker Analyzer of Test Outputs), a specialized software developed in C++ to analyze, grade, and store results in a centralized database. Module data will be collected from various international production facilities. The implementation of POTATO will facilitate with selecting the best performing modules for the Outer Tracker upgrade. This research is focused on the implementation of the analysis of  2S Module results within POTATO.

Keywords: POTATO; Modules; HL-LHC; CMS; Outer Tracker

Mentor(s):

Jan-Frederik Schulte (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1452**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Students, Shelter, and Success: Exploring the Impact of Housing on Student Outcomes

Social Sciences / Humanities / Education

Author(s):

Tess Elaine Korte† (HHS)

Abstract:

Student housing is a necessity but the impact the quality and quantity of this housing has on students is often overlooked. Student housing can impact student grade point average, involvement on campus, and infringement on the student code of conduct (Kowalski, 2022). The aim of this exploratory research project is to better understand the ways students at Purdue have been impacted academically and socially by the lack of adequate student housing. To better understand student feelings around this issue, I sent out a survey to a sample of students to ask their thoughts on the housing crisis. I then compared the responses of students in alternative housing (economy triples, UR apartments as a freshman) to the responses of people in typical housing assignments to more deeply assess the impact it's had on students. This research underscores the need for Purdue to rectify their housing situation for future students, as well as current students who will continue to live in University Residences.

Keywords: [no keywords provided]

Mentor(s):

Michael Douglas Johnson (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1453**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Effects of PCOS on Cognitive Function

Life Sciences

Author(s):

Linnaea Eileen Krupke† (HHS)

Abstract:

Polycystic Ovary Syndrome (PCOS) is a prevalent hormonal condition that affects 10-15% of women yet remains critically understudied. It is characterized by an irregular menstrual cycle, cystic ovaries, and an increase in androgen levels in females, referred to as the Rotterdam criteria. Recent studies have demonstrated that women with PCOS performed worse than healthy controls on select cognitive tests such as executive function, specifically working memory (Huddleston et al., 2022). Despite this, few rodent models of PCOS successfully replicate cognitive deficits seen in humans. To address this gap, we modeled aspects of PCOS in female adolescent rats by administering dehydroepiandrosterone (DHEA), an androgen known to induce PCOS. The groups were subcutaneously injected daily with either 6mg/kg of DHEA (experimental) in sesame oil, or pure sesame oil (control). Injections began when rats were 40 days old and lasted for 25 days. After treatment, rats were characterized as PCOS phenotype (PCOS) or normal phenotype (NORM) based on the Rotterdam criteria. In the last week of treatment, subjects were tested in the Y-Maze, a model of spatial working memory. We hypothesized that animals that developed a PCOS phenotype would display decreased spontaneous alternations in the Y-Maze. In this pilot study, we found a moderate effect size in the hypothesized direction (Cohen's d = 0.62). Future experiments will have a larger sample size to adequately test our hypothesis. This work will allow for a better understanding of the consequences of PCOS on spatial working memory and elucidation of mechanisms underlying its effects.

Keywords: PCOS; Cognitive Impairment; Spatial Memory

Mentor(s):

Kimberly Kinzig (HHS)

Other Acknowledgement(s):

Erisa Met Hoxha (Office of the Provost)

**Poster Presentation Abstract Number: 1454**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# ECELabs.io

Mathematical/Computation Sciences

Author(s):

William Lee† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Junfei Li (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1455**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Adaxial versus Abaxial Translocation in Dicots for Organic Nanocarriers Produced via FNP

Life Sciences

Author(s):

Laurian Kate Lien† (Agriculture|Engineering)

Abstract:

[Abstract Redacted]

Keywords: Nanocarriers; Translocation; Flash NanoPrecipitation; Agrochemicals; Palladium metalloporphyrin

Mentor(s):

Kurt Ristroph (Engineering); Lucas Johnson (Agriculture)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1456**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Vascular Dysfunction in Prader Willi Syndrome: Novel Insights into an Uncommon Disease

Life Sciences

Author(s):

Wesley Matthew Lin† (DSB|JMHC)

Abstract:

[Abstract Redacted]

Keywords: Coronary; Vascular; Dysfunction; iPSC; Genetic

Mentor(s):

Cody Juguilon (Stanford University)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1457**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Resistor Analysis Android Application

Innovative Technology / Entrepreneurship / Design

Author(s):

Emily Loiselle† (Engineering|JMHC); Joseph Huang† (Engineering); Nandini Mukul Pande† (Science); Rahul Sasi Menon† (Science|Graduate); Chaeeun Kim† (Engineering)

Abstract:

Resistors are essential components used in almost all electronic circuits to control the flow of electric current. Resistors are typically marked with color bands that indicate their resistance value, which can be calculated by interpreting the sequence of these bands. Manual identification, however, can be error-prone and time-consuming. This project aims to develop an Android application that uses image processing techniques to automate the identification and calculation of a resistor's value.

Through the application, users can capture an image of a resistor using the device’s camera and upload it to a server via Android's Volley library. The server, running a PHP script, initially processes the image using a combination of thresholding and segmentation to isolate the resistor body. Brightness adjustments are then applied to normalize the image’s pixel values, followed by the use of the nearest neighbors algorithm to determine the band colors accurately. The resistance value is then calculated based on the identified color bands, following international standards, and returned to the application to be displayed to the user.

This application provides a unique solution to determine resistor values using image processing techniques while aiming to improve the speed and accuracy of resistor identification for users.

Keywords: Image Processing; Mobile Application; Android; Computer Vision

Mentor(s):

Edward J Delp (Engineering); Carla Zoltowski (Engineering); Fengqing Zhu (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1458**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Evolutionary and demographic rescue of Daphnia pulex

Life Sciences

Author(s):

Alberto Lopez Martinez Rojas†; Anna Alysse Kavanaugh† (Science|JMHC)

Abstract:

Factors such as pollution, habitat loss, interactions with non-native species and climate change can contribute to population declines and lead to the local and global extinctions of species. Species extinctions may also be exacerbated by demographic, environmental and genetic factors (such as inbreeding or loss of genetic diversity). Given the relationship between variables contributing to population decline, there are two strategies that can mitigate the rate in which occurs: demographic rescue and evolutionary rescue. Demographic rescue occurs when new individuals are introduced to a declining population, which can prevent extinction by allowing enough time for the small population to overcome the intrinsic rate of decrease. Evolutionary rescue occurs when adaptive genetic response enables a population to recover from population decline due to environmental change. This study aims to understand how the outcomes and contributions of evolutionary rescue and demographic rescue differ when rescuing a population from extinction. We intend to use different Daphnia pulex genetic lines stressed with a high level of salinity to investigate whether the application of demographic rescue, evolutionary rescue, or their combination results in different outcomes in terms of halting population decline and restoring the population.

Keywords: [no keywords provided]

Mentor(s):

Mark R Christie (Science)

Other Acknowledgement(s):

Allison Macrae Nalesnik (Science)

**Poster Presentation Abstract Number: 1459**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Combine Harvester Compatible with Integrated Agrivoltaics Architecture and System

Innovative Technology / Entrepreneurship / Design

Author(s):

Adam Timothy Mack† (Engineering)

Abstract:

Following the research and ideation of agrivoltaics, herein a design for an autonomous, electrified combine harvester is included. This design considers the weight change due to electrification, the required battery system for electrification and the necessary technology accompanying the solar topology. The design allows fields to serve a double purpose: generating renewable, clean energy through the use of advanced solar panels and still producing crops (corn in this instance) using the same plot of land. The design utilizes the framework of a patented solar topology from Purdue and considers ongoing development of corn breeds designed to grow and produce in this altered environment.

Keywords: [no keywords provided]

Mentor(s):

Muhammad A Alam (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1460**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Wearable System for Tracking Stroke Rehabilitation Progress

Innovative Technology / Entrepreneurship / Design

Author(s):

Elias Malak† (Engineering); Taran Reddy Kamireddy† (Engineering); Nicholas John Albrecht‡ (Engineering); Nadia Bailen Boluda‡ (Engineering); Samarth Bhat‡ (Engineering); Cooper Lee Cotton‡ (Engineering); Lara Nour Courgi‡ (Engineering); Luke Davis‡ (Engineering); Tamara Shakri Houran‡ (Engineering); Pratika Kumar‡ (Engineering); Jakob Eric Mikolajczyk‡ (Engineering); Gema Roselyn Parra‡ (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Hand Assessment; Stroke; IMU; Goniometer

Mentor(s):

Ken Yoshida (Engineering); Steve Higbee (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1461**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Changes in development and metabolism in an inducible lignin-modified Arabidopsis mutant

Life Sciences

Author(s):

Eleanore Margaret Malinowski† (Agriculture)

Abstract:

Lignin is a product of phenylpropanoid metabolism that is crucial for plant structure and development, but it hinders the use of plant materials in biofuel production, the pulp and paper industry, and as feedstocks for animals. These applications could all benefit from engineered lignins that are easier to degrade; however, modifying lignin often negatively impacts plant development. The combination of overexpressing the gene F5H and disrupting the genes CADC and CADD cause dwarfism, sterility, and lateral root deficiency. To study the developmental defects in these plants, we implemented an inducible system which uses the steroid dexamethasone (DEX) to overexpress F5H. We first examined the strength of the inducible construct to phenocopy cadc cadd plants overexpressing F5H by quantifying lateral root deficiencies and dwarfism. To quantify the timing of metabolic changes after induction, we tracked the accumulation of phenylpropanoids syringin and sinapolymalate. Finally, we analyzed the sensitivity of the mutant to varying amounts of DEX by generating a dose response curve to optimize induction conditions. These results reveal an optimal time to conduct RNA sequencing experiments to identify potential genes responsible for dwarfism. Our work provides a new way to study growth defects of plants with modified lignin.

Keywords: Lignin; Phenylpropanoids; Biochemistry; Plant Biology; Arabidopsis

Mentor(s):

Clint C S Chapple (Agriculture); Chase Taylor Hearn (Interdisciplinary & Special Programs)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1462**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Enhancing Obstacle Detection in Mobility Canes Through Haptic Feedback and Relative Positioning

Innovative Technology / Entrepreneurship / Design

Author(s):

Hannah Jordan Margulis† (Engineering|JMHC)

Abstract:

White mobility canes serve as an essential tool for individuals with visual impairments, aiding in the detection of obstacles through physical contact. Enhancing a mobility cane with haptic feedback, improves a users' ability to avoid and detect obstacles before cane contact with the obstacle occurs. However, resolving the processing delays between the distance sensor and comprehension of the haptic feedback is crucial for effective operation. To address this distinct haptic signals are utilized in different zones (left, right, and center) during the cane sweep corresponding to the user's spatial orientation. By integrating an Inertial Measurement Unit (IMU) and enhancing an attitude and heading reference system via sensor fusion and a Proportional-Integral (PI) feedback controller, cane positioning within these zones can be determined. Through testing and modification accuracy of the position was improved through the use of further sensor filtration leading to an accurate preliminary position determination system.

Keywords: Visual Impairment; Haptic Feedback; Assistive Technology; Spatial Orientation; Sensor Fusion

Mentor(s):

Frederick Prete (Lake Forest College)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1463**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Exploring The Impact of Hallucinogens on Sexual Fluidity: A Comprehensive Literature Review

Social Sciences / Humanities / Education

Author(s):

Grayson Montgomery McCard† (HHS)

Abstract:

[Abstract Redacted]

Keywords: Hallucinogen Use; Sexual Fluidity

Mentor(s):

Jennifer Lynn Brown (HHS); Luis A Gomez (HHS); Stephen Allan Paul Beegle (HHS)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1464**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Guiding Hope with AI to Support Military Survivors

Innovative Technology / Entrepreneurship / Design

Author(s):

Mihir Menon† (DSB); Albert Joseph Burton† (DSB); Varun Anand† (DSB); Owen Kenneth Schafer† (DSB)

Abstract:

[Abstract Redacted]

Keywords: Data Mining; AI; LLMs; Data for Good; Grief Journey

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1465**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Examining Stereotyping and Gender Bias in STEM fields

Social Sciences / Humanities / Education

Author(s):

Leah Margaret Miles† (Liberal Arts); Jessica Susan Wallace† (HHS)

Abstract:

With more women entering STEM (science, technology, engineering, mathematics) fields, there are reports that many women still experience discrimination and stereotyping. Recent studies have explored both overt and covert biases among males toward their female peers and documented several disconcerting trends in STEM environments (i.e., males consistently undervalue females' cognitive skills and achievement). Of additional concern, these biases have consequences for women's career choices, opportunities, and STEM involvement. There is evidence, for example, that women who experience peer judgment, despite outperforming

their male peers (Defne et al.,2022), suffer psychological damage, resulting in both low interest and confidence to succeed in STEM fields (Bloodhart et al.,2020; Burns et al.,2016; Cyr et al., 2024; Ireland et al., 2018; Kessels, et al., 2015). We examined the implication of gender bias and how it disproportionately affects girls' anxiety. We analyzed studies that evaluated a wide array of age groups, ranging from elementary students to undergraduates and women in STEM-related careers. This review addresses these critical issues while also focusing on studies that consider the issues within the gender binary (male, female) identification utilized in previous research. We synthesize evidence from studies that examined the connections between gender, discrimination, and participation in STEM fields with quantitative and qualitative research methods to understand discrimination in the STEM field. Additional research is needed to examine issues of bias and stereotyping in STEM school and work environments for individuals outside the gender binary.

Keywords: Gender; STEM; Education; Discrimination; Women

Mentor(s):

Panayota Y Mantzicopoulos-James (Education)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1466**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Open-Source EDA Tools for ASIC Design: Enabling Undergraduate Tape-Out Opportunities

Physical Sciences

Author(s):

Rafael Monteiro Martins Pinheiro† (Science); Miguel Isrrael Teran† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: ASIC Design; EDA Tools; Open-Source; Tape-Out; OpenLane

Mentor(s):

Mark Johnson (Engineering); Timothy Francis Hein (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1467**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# A Novel Early-Warning System for Wound Infection Detection: Harnessing the pH-Sensitive and Antibacterial Properties of Curcuma Longa

Life Sciences

Author(s):

Ishita Mukadam† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Antibacterial Infection; Early Detection; Wound Healing; Curcuma longa, Turmeric; Bandage

Mentor(s):

Mrudula Mukadam (Maharishi International University)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1468**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Determining mechanisms that underly Alzheimer's Disease induced changes in circadian behavior

Life Sciences

Author(s):

Iris Georgina Ocegueda Medina†

Abstract:

[Abstract Redacted]

Keywords: Alzheimer; Circadian Rhythms; Tau; Drosophila; Locomotor Activity

Mentor(s):

Vikki Marie Weake (Agriculture)

Other Acknowledgement(s):

Makayla Nicole Marlin (Agriculture)

**Poster Presentation Abstract Number: 1469**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Comparative Performance of Urea-Gypsum Cocrystals

Physical Sciences

Author(s):

Tovia Grace Owens† (Agriculture|Engineering)

Abstract:

Leaching of fertilizers from agricultural land is a major source of fresh and saltwater pollution in the United States. Many attempts to address this directly reduce the solubility of the fertilizers, often either through mechanical compaction or the application of a variety of potentially polluting chemical coatings. An emerging alternative method is cocrystallization - a technique used widely in pharmaceutical applications to alter specific properties of compounds, often solubility. Chemical compounds are bonded together to form a crystalline lattice which inherits certain properties from the active and coforming reactants. Cocrystal studies have been performed on agricultural materials with the intention of reducing their solubility for fertilizer application. The study currently being performed is a plant study to evaluate the impacts of applying urea-gypsum cocrystal fertilizer compared with standard urea fertilizers. Pre-prepared urea-gypsum cocrystal powder, technical urea, and urea mixed with gum are formed into compacts using an MTS machine. Twenty pots of ACRE silt loam will be prepared. Each fertilizer will be applied, in compact form, to five pots each. The pots will also be treated with constant amounts of phosphorous and potassium. Then, corn will be started in each pot and thinned down to one plant per pot. The size of the plants will be tracked at routine intervals along with the chlorophyll content of the leaves. At the end of the experiment the nitrogen uptake and nitrogen use efficiency will be calculated from the plant biomass.

Keywords: Plant Study; Nitrogen Leaching; Fertilizer Development

Mentor(s):

Rose Prabin Kingsly Ambrose (Engineering)

Other Acknowledgement(s):

Vidya Kanaganamaradi Nagaraju (Agriculture)

**Poster Presentation Abstract Number: 1470**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Exploring How HPV Vaccine Education Impacts Health Behaviors and Attitude on a College Campus

Social Sciences / Humanities / Education

Author(s):

Caroline Rhea Packee† (Science); Emma Swanson† (HHS); Avery Grace Brubaker† (HHS); Evan Graham Coblentz‡ (Agriculture|JMHC)

Abstract:

Background: Human papillomavirus (HPV) is the most common sexually transmitted disease among people ages 15-24. Intervention through an increase of HPV vaccination and education can decrease occurrence of related diseases.

Objective: No-cost vaccine clinics on a college campus can eliminate barriers preventing people from receiving vaccinations and provide HPV education. Survey data will be analyzed to understand factors related to HPV vaccine uptake.

Methods: A no-cost vaccine clinic in September 2024 recruited attendees to participate in a voluntary, one-time, online survey. Questions asked about likelihood to receive the HPV vaccine, recommend it to others, and rank the importance of potential consequences after HPV infection (genital warts and cancers). Analysis performed using IMB SPSS Statistics (Version 27).

Results: Of the total sample (n=308), the participants had a mean age of 19.5 years (range: 18-25) and 48% (n=144) identified as female, 28% (n=82) male, and 24% (n=71) unspecified. The largest number of participants reported cervical cancer as the most important disease prevented by the HPV vaccine (n=63, 21.6%) while vulvar cancer was ranked least important (n=3, 1%). After viewing potential diseases prevented by the vaccine, participants indicating they were ‘highly likely to recommend the HPV vaccine’ increased by 13% from 38% to 51%.

Conclusions: To increase vaccine uptake in 18-25 year olds, it is critical to emphasize the fact that HPV causes cervical cancer over vulvar cancer. Without education on the benefits of the HPV vaccine, people may dismiss its importance on their health.

Keywords: HPV; Vaccination; Cervical Cancer

Mentor(s):

Monica Kasting (HHS); Shandey Derisa Malcolm (HHS); Samantha L. Ky (HHS)

Other Acknowledgement(s):

Trexie M Rudd (Pharmacy); Abigale Louise Fritsch (Pharmacy)

**Poster Presentation Abstract Number: 1471**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Mechanisms of miRNA Packaging into EVs in Non-Small Cell Lung Cancer

Life Sciences

Author(s):

Aadya Pandey† (Science)

Abstract:

Lung cancer accounts for a fifth of all cancer-related deaths. The 5-year survival rate for metastasized lung cancer is 7%, highlighting the importance of timely diagnosis. Extracellular vesicles (EVs) play an important role in intercellular communication, with those originating from cancer cells fostering the establishment of a metastatic microenvironment, facilitating tumor progression. EVs have been observed to carry various cargoes, one of which is microRNAs (miRNAs) which are a biologically important molecule in the regulation of gene expression. In general, some subsets of miRNAs are downregulated in cancer cells as compared to normal cells. MiRNA expression is dysregulated in cancer cells through a variety of mechanisms like deletion of genes, abnormalities in miRNA biogenesis machinery, and epigenetic changes. Small RNA sequencing data on EV- miRNA content isolated from cancer and normal cell lines uncovered that the miRNAs that were observed to be downregulated in the cancer cells were also seen to be upregulated in in the EVs released by those cells. This allowed us to infer a new mechanism of miRNA downregulation in the cells where a cell could be ridding itself of a subset of miRNAs by selectively exporting them out through EVs.

Knowledge gaps remain regarding the mechanism by which the miRNAs are loaded into the EVs. To address this, we focused on miRNA sequence motifs and further analysis highlighted a prominent presence of a “MUGGG" sequence motif in the miRNA population within the cancer cell derived EVs. miR200b-5p and miR-122 were among the top candidates featuring this classic motif. A mutation was induced in this motif which led to downregulation of these miRNAs in the EVs and their retention within the cells, highlighting the necessity of the MUGGG motif for encapsulation of the miR200b-5p and miR-122into EVs. Elucidating the mechanisms of loading will further our understanding of microRNA biology in general and also help understand how it ties into cancer progression. This can help further the development of miRNA therapeutics for various cancer types, leading to great strides being made towards treatment of a condition affecting millions.

Keywords: MicroRNAs; Lung Cancer; Extracellular Vesicles

Mentor(s):

Andrea L Kasinski (Science); Samira Piltan (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1472**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Understanding Student Engagement and Response with Traditional and Virtual Reality Learning Environments

Innovative Technology / Entrepreneurship / Design

Author(s):

Kiersten Mackenzie Penquite† (Engineering|JMHC)

Abstract:

Virtual reality (VR) is a quickly growing technology that is being utilized in many fields such as entertainment, education, health care, and remote collaboration through more immersive experiences. Yet, due to accessibility limitations and lack of instructional materials, little is known as to best practices for learning with and through VR. As such, this study aimed to determine the effective application of VR in the classroom compared to a traditional teaching experience. The forty students involved in the study all spent three weeks participating in traditional and VR learning environments and were asked to compare the two experiences at the end of each week. These responses were then analyzed in context of three categories: (1) Self Efficacy, (2) Seeing Value, and (3) Supportive Environment. This allowed for an understanding of how the students felt using VR technology as opposed to learning through traditional teaching methods. Student responses in all three weeks were mixed in terms of appreciating the use of VR and preferring traditional teaching methods. However, there was a gradual shift in student responses to acknowledge the benefits of VR as they became more familiar with it. Understanding student's inclination to use VR technology could allow education institutions to predict the success of possible implementation of VR technology into the classroom.

Keywords: Virtual Reality Learning; Educational Technology; Student Responses

Mentor(s):

Lisa B Bosman (Polytechnic)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1473**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Patterns in Grief

Innovative Technology / Entrepreneurship / Design

Author(s):

Marili Carmen Perez† (DSB); Aryan Pratik Kodial† (DSB); Cole Bushell† (DSB); James William Pope† (DSB)

Abstract:

[Abstract Redacted]

Keywords: Data Mining; AI; LLMs; Data for Good; Grief Journey

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1474**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Evaluation of Online Nutrition Education Materials for Hispanic/Latino Individuals with Chronic Kidney Disease

Life Sciences

Author(s):

Sophia Pirela† (HHS)

Abstract:

[Abstract Redacted]

Keywords: Potassium; Diet; Kidney Disease; Cultural; Education

Mentor(s):

Annabel Biruete (HHS)

Other Acknowledgement(s):

Patricia Marie Wolf (HHS); Brandon M Kistler (HHS)

**Poster Presentation Abstract Number: 1475**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Silver leakage in Commercially-Available and Pt-Wire Tip Electrodes: An in Vitro Toxicity Study

Physical Sciences

Author(s):

Sadie A Poirier† (Science|JMHC); Yashvi Choudhary‡ (Science)

Abstract:

[Abstract Redacted]

Keywords: Bioelectrochemistry; Cellular Viability; Silver Toxicity; Electrochemistry; Breast Cancer

Mentor(s):

Vanshika Gupta (Science); Jeffrey Edward Dick (Science)

Other Acknowledgement(s):

Dane Christophe Wagner (Science); Samuel Patrick Nortz (Science)

**Poster Presentation Abstract Number: 1476**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Farming the Future: Combining Solar Energy and Agriculture Through Agrivoltaics

Innovative Technology / Entrepreneurship / Design

Author(s):

Jeeranun Poopanead† (Polytechnic)

Abstract:

Agrivoltaics, the integration of solar photovoltaic (PV) systems with agricultural practices, presents a promising solution to enhance land use efficiency while addressing pressing challenges in food security and climate change. This innovative approach offers several benefits, including increased farm profitability through diversified income streams from both crop sales and solar energy generation, improved microclimates that enhance crop health, and significant water conservation by reducing evaporation rates. However, agrivoltaics also faces challenges such as limited light availability for crops due to shading, high initial investment costs for installation, and community resistance stemming from misconceptions about its impact on traditional farming. Additionally, compatibility issues between selected crops and solar panel configurations can complicate successful implementation. Future research opportunities in agrivoltaics are abundant, focusing on comprehensive data collection from operational projects

Keywords: Solar Energy; Agriculture; Electricity Generation; Crop Production; Climate Change

Mentor(s):

Lisa B Bosman (Polytechnic)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1477**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Simulating Laser-Based CubeSat Communication: The IRIS-Comm Mission

Innovative Technology / Entrepreneurship / Design

Author(s):

Sudarmadhi Rabindran† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Laser Communication; Data Transmission; InterSatellite Communication; Space Communication Networks

Mentor(s):

Alexey Shashurin (Purdue University); Steven M Pugia (Engineering); Keegan Franics Chavez (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1478**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Measuring the Effects of Cultural-Identity Audio Biography on Depression, Loneliness, and Anxiety

Life Sciences

Author(s):

Ana Elena Pasion Rojas† (HHS)

Abstract:

[Abstract Redacted]

Keywords: Asian American; Music Therapy; Depression; Loneliness; Indiana

Mentor(s):

Stewart C Chang Alexander (HHS); Pamela Sari (VP Diversity & Inclusion)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1479**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Demands and resources of a long-standing bring-your-pet-to-work-program: A constant comparative analysis

Social Sciences / Humanities / Education

Author(s):

Braxton J Schieler† (Science|JMHC)

Abstract:

[Abstract Redacted]

Keywords: Veterinary Medicine; Mental Health; Bring-Your-Dog-To-Work; Job Demands-Resources Model

Mentor(s):

Leanne Nieforth (Vet Med)

Other Acknowledgement(s):

Niwako Ogata (Vet Med)

**Poster Presentation Abstract Number: 1480**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Mechanical Testing Standards for Tendon - Are they Equivalent?

Life Sciences

Author(s):

Sarah Schloff† (Engineering)

Abstract:

Tensile testing of tendon is used to characterize the mechanical properties of the tissue, however, a standardized method has not been determined. Currently, dog-bone shaped coupons are considered the “gold standard” for tensile mechanical testing due the uniform strain along the gauge length and subsequent fracture point in the gauge midpoint. This study compared the reproducibility and accuracy of tensile testing of Superficial and Deep Digital Flexor Tendon (SDFT and DDFT) with coupon geometries defined by 3 ASTM standards, 2 ISO standards, and 2 independently published protocols. Simulations of the tensile behavior of tendons were done in ABAQUS (SIMULIA) with a non-linear elastic model for all geometries. With these, strain maps over time and stress strain curves during elastic deformation were compared. Simulations showed that the circular gauge section concentrated stress at a single point, possibly caused by a stress riser created at the non-curved intersection between the grip and gauge section, which would lead to inaccurate measurements. Dog-bone geometries had differing elastic moduli, which could be a result of mechanical properties of tendon being non-linear and anisotropic due to the aligned fibers of the matrix. By examining the FEA of each standard, the results of ex-vivo mechanical testing can be estimated, which will then be validated to determine which geometry should be used in future studies.

Keywords: Orthopedics; Regenerative Medicine; Tissue Engineering; Tendon

Mentor(s):

Dianne Little (Vet Med); Paula A Sarmiento Huertas (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1481**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Reconstruction and Characterization of Copper Wick Structure

Physical Sciences

Author(s):

Sophia Isabella Schroer† (Engineering|JMHC)

Abstract:

[Abstract Redacted]

Keywords: Two-Phase Jet Impingement Cooling

Mentor(s):

Tiwei Wei (Engineering)

Other Acknowledgement(s):

Yubo Song (Engineering)

**Poster Presentation Abstract Number: 1482**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Comparative Neurobehavioral Effects of Chlorpyrifos Exposure in Pon-1 (-/-) and Wildtype Rat Models

Life Sciences

Author(s):

Sofia Schumann† (HHS); Dia Dipen Jhaveri‡ (Science)

Abstract:

Chlorpyrifos (CPF) is an organophosphate pesticide (OP) that has been used globally in agriculture. Research indicates that it has had adverse impacts on human health due to inhibition of acetylcholinesterase which leads to cholinergic effects. The EPA in August 2021 announced to ban the use of CPF in food production, but the ban got reversed and is still used widely in America today. Epidemiological and laboratory investigations have established a correlation between environmental exposures and the onset of Parkinson's Disease (PD). The impact of genetic variations in PD-related genes on dopaminergic neurotoxicity has not been thoroughly investigated.

Paraoxonase 1 (Pon1) is an enzyme that plays a crucial role in the detoxification of certain xenobiotics, like the CPF oxon which is neurotoxic. Pon1 acts to break the CPF oxon down into less toxic substances, reducing its harmful effects on the nervous system. Polymorphisms in Pon1 further increases PD risk from CPF exposure. A comprehensive understanding of

Keywords: Pesticide; Neurobehavioral Study; Neurotoxicology; KO Rat Model; Chlorpyrifos

Mentor(s):

Jason R Cannon (HHS); Reeya Tanwar (HHS); Fatema Mustafa Currim (HHS)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1483**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Characterizing Gamma Delta-APC T cells involved in Colorectal Cancer (CRC) risk associated Inflammatory Bowel Disease (IBD)

Life Sciences

Author(s):

Sydnie Alexandria Scozzaro† (Science|JMHC)

Abstract:

Colorectal cancer (CRC) is the second leading cause of cancer-related deaths in the United States. Patients with chronic intestinal inflammation, such as those with inflammatory bowel disease (IBD), are at a significantly higher risk for developing CRC due to increased levels of inflammation for long durations of time. Given the risk that IBD patients are 6 times more likely to develop CRC, the growing number of new diagnoses (70,000 new cases reported each year), and the inconsistent clinical outcomes of current treatment options, there is a major unmet need to understand the cellular players in IBD pathophysiology to develop more effective treatments and stem the development of CRC. One major innate-like immune cell type implicated in IBD is gamma delta T cells, which position themselves at barrier sites of the body to either prevent or drive inflammation. In previous work, the Olson Lab showed that gamma delta T cells might contribute to IBD development by acting as antigen-presenting cells (APCs) through upregulating major histocompatibility complex II (MCHII) and CD86 to present foreign antigens to activate other adaptive immune cells (i.e., CD4 T cells) and trigger an inflammatory immune response. While it is clear that gamma delta T cells may act as an unconventional type of APC in certain environments, the signals required to induce MHCII/CD86 on gamma delta T cells are unclear. Therefore, this project aims to identify the signals, such as bacterial components or cytokines, that adorn gamma delta T cells with classical APC properties in IBD.

Keywords: [no keywords provided]

Mentor(s):

Matthew Olson (Science); Nicole L Anderson (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1484**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Kidney Xenotransplantation to Combat the Organ Crisis

Social Sciences / Humanities / Education

Author(s):

Hallie Grace Seasor† (HHS)

Abstract:

[Abstract Redacted]

Keywords: Xenotransplantation; Kidney; Porcine; Organ Shortage

Mentor(s):

Carla B Rosell (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1485**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Reference Point Indentation Methodology with Chicken Tibiae

Life Sciences

Author(s):

Dylan Wade Seets† (Science)

Abstract:

The BioDent Reference Point Indentation (RPI) from Active Life Scientific can provide minimally destructive information about bone strength. However, our research team is the first to use the machine on chicken bones. Chicken bones are more fragile than typically used mammalian bones, causing us to suspect that the recommended settings of 10 Newtons (N) may be too destructive a force. Fifty excised and cleaned chicken tibiae of 45 week old laying hens were indented with the RPI machine at 2, 4, 6, 8, and 10 N; above 10 N cannot be done with currently used RPI software. Tibiae were measured and indented at midpoint then 2 mm towards proximal and distal ends with the standard 10 loading cycles at 2 Hz frequency. Indentation Distance Increase (IDI), being the difference between the first and last indentation distance, was evaluated as it has been an indicator of bone resistance. Linear regression was performed on log-transformed data followed with Tukey HSD test for means separation. Largest IDI values were from 10 N; though the IDI values of 8 and 6 N were similar ($P < 0.001$). Smallest values came from 2 N. Having large and small IDI values is not the focus, but instead having consistent values. Largest variability in values came from 10 and 2 N with 8 N showing the least variability. Based on these results, further testing with 5, 7, and 9 N will be performed to identify if 8 N is truly the most optimal RPI setting for chicken tibiae.

Keywords: Reference Point Indentation; Bone; Laying Hens; Tibiae; Methodology

Mentor(s):

Darrin M Karcher (Agriculture); Sara Elizabeth Cloft (Agriculture)

Other Acknowledgement(s):

Brittney Joy Emmert (Agriculture)

**Poster Presentation Abstract Number: 1486**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# How can simultaneous environmental stimuli be leveraged to influence NPC behavior in Unreal Engine?

Mathematical/Computation Sciences

Author(s):

Sarah Michelle Sewell† (Engineering); Leo Chen† (Engineering); Sun Hong H Park† (Polytechnic); Ata Ulas Guler† (Engineering); Rachel Wingyan Ho† (Engineering)

Abstract:

This research project investigates how simulations can model human reactions to the environment and external stimuli. By combining artificial intelligence and Non-Player Characters (NPCs) within the Unreal Engine software, this project aims to simulate how crowds and individuals respond to multiple simultaneous environmental stimuli.

We will accomplish this by utilizing Unreal Engine's Environmental Query System (EQS). Currently, NPCs are capable of detecting environmental odors and generating randomized personality traits that determine how the smell will affect their actions. We plan to introduce a similar system for light (taking advantage of Unreal Engine's built-in light sources), which will run simultaneously with the smell system. The NPC will then use the EQS to generate a set of points, grade each point based on the scoring system, and finally select a point to move to- ensuring that NPCs prioritize the most relevant stimuli.

This movement of NPCs is currently being tracked by a rudimentary heatmap system. The data is saved to a custom storage which can later be loaded, highlighting high-use areas of a space. Eventually, we hope to export the data to csv files to integrate the system with external software.

This predictive simulation has many uses across fields such as architecture, landscape architecture, planning, industrial engineering, and civil engineering, where it could be used to optimize metropolis designs and refine commuting systems. In the future, we aim to implement more environmental factors, such as wind speed, sound, and temperature, to simulate with each NPC.

Keywords: Environmental Query System (EQS); Non-Player Characters (NPCs); Heat Maps; Unreal Engine

Mentor(s):

David Michael Barbarash (Agriculture)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1487**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Evaporator Test Section to Accurately Characterize Zeotropic Working Fluids

Innovative Technology / Entrepreneurship / Design

Author(s):

Samantha Marcelle Sima† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Joshua Michael Cox (Engineering); Riley Bradley Barta (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1488**
*Presentation Time: Session 3: 12:00pm-1:00pm*

## R&D Airframe Abstract

Innovative Technology / Entrepreneurship / Design

Author(s):

Tamir Sklansky† (Engineering); Timber Michael Bionda† (Engineering); Elijah Temesgen Ponds† (Engineering); Ron Cheng Xuan Chay† (Engineering); Robert Henry Walch† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Niall Patrick Moloney (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1489**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Audio detection of Cicadas using LEAF

Mathematical/Computation Sciences

Author(s):

Dhruv Soni† (Science|JMHC)

Abstract:

Insect biodiversity is critical for ensuring the achievement of SDG Goal 15: Life on Land since insect biodiversity plays a crucial role in the sustainable management of our ecosystems and can serve as an indicator of the health of the greater ecosystem and the terrestrial biodiversity present. However, little is known about the insect biodiversity between farming practices. In this study, we investigate insect biodiversity using Acoustic Recording Units (ARUs) that have been placed in 17 farms that represent a gradient of conventional to sustainable farming practices across three midwestern states: Indiana, Illinois, and Iowa. The data for this study is verified by entomologists or research-grade audio recordings are collected from iNaturalist. In this study, we use LEAF, a novel, learnable Deep Learning frontend, in the detection of Magicicada septendecim and Magicicada cassini. To achieve this task, audio files are segmented into 3-second chunks and then processed as testing data for our model. We aim to learn whether conventional farming practices impact insect presence and biodiversity more in comparison to sustainable farming practices.

Keywords: Cicada Detection; Deep Learning; Machine Learning; Audio Detection; Artificial Intelligence

Mentor(s):

Kristen Marie Bellisario (JMHC)

Other Acknowledgement(s):

Christine Harrison Elliott (Agriculture)

**Poster Presentation Abstract Number: 1490**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Academic Procrastination in College: Contributing Factors and Purdue's Support Resources

Social Sciences / Humanities / Education

Author(s):

Robert Allan Soohey† (Exploratory Studies)

Abstract:

[Abstract Redacted]

Keywords: Procrastination; College; Purdue; Resources

Mentor(s):

Michael Douglas Johnson (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1491**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Characterization of Ceramic Interfaces in Mycoponics™: Optimizing Fungal Growth for Space Applications

Life Sciences

Author(s):

Anna Marie Sorg† (Agriculture)

Abstract:

This study investigates the biophysical material interface crucial to the performance of the Mycoponics™ system, a novel substrate-free cultivation method for fungal biomass and mushroom production in space environments. 12-inch ceramic tubes were manufactured with commercial ball clay and paper to produce 4 sets of tubes with varying porosity; the 4 sets of tubes included 5% paper, 10% paper, 15% paper, and 20% paper. To find the optimal characteristics of the clay interface for mycelial growth, multiple experiments were conducted on the manufactured tubes as well as a commercial tube to compare various hydraulic and physical properties. To test for moisture content within the tubes, moisture profiles were mapped using a high-precision capacitive moisture analyzer. There was a conclusive trend between the amount of paper percentage and moisture content, as the paper percentage increased, so did the overall water content within the tubes with the 5% tubes having an average of 16% water content, and the 20% tubes having 23% water content. Water flux was quantified through time-resolved gravimetric analysis, while water retention was assessed by monitoring mass changes during controlled drying cycles. Water retention was highest at 199.3 g in the commercial tube, and had a proportional relationship to the increase of paper percentage in the 12-tubes. Brunauer-Emmett-Teller (BET) analysis assessed specific surface area, critical for nutrient delivery efficiency. The inclusion of activated carbon within the tubes significantly improved mycelial consistency, likely due to enhanced water distribution, as confirmed by growth assays. SEM microscopy revealed a porous distribution of <100 nm across all formulations. In future experiments, Pleurotus ostreatus will be used to evaluate mycelial growth across different clay formulations over a 10-week period. The results are projected to conclude the optimal characteristics for enhanced mycelial growth and consistency on substrate. The <100 nm pore distribution, water retention, and moisture content, coupled with the inclusion of activated carbon, provides an ideal environment for nutrient delivery and moisture regulation. These findings contribute to the development of efficient, substrate-free fungal cultivation systems for sustainable food and biomaterial production in space, addressing critical challenges in long-duration missions and extraterrestrial habitats.

Keywords: Hydroponics; Fungus; Ceramics

Mentor(s):

Alexander Baena (Agriculture); D. Marshall Porterfield (Agriculture)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1492**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Mapping and Quantifying Surface Textures across the Medusae Fossae Formation, Mars

Physical Sciences

Author(s):

Christina Michelle Sowinski† (Science|JMHC)

Abstract:

The Medusae Fossae Formation (MFF) is an enigmatic geologic formation on the equator of Mars that displays several unique aeolian features such as yardangs, ripples, and V-shaped depressions that we call “scour pits.” Lying to the east of the MFF is Olympus Mons, the largest volcano in the Solar System. The areas surrounding Olympus Mons contain many of the same features as the MFF, as well as massive landslides. Due to these many features, the surfaces of the MFF and Olympus Mons have a variety of different textures that can tell us about the geologic and climatic history of Mars. In order to identify features and textures, we are using Mars Reconnaissance Orbiter (MRO) Context Camera (CTX) images (~6m/pixel) of Mars. We are mapping each texture where they appear in the MFF or Olympus Mons. We are using ArcHydro’s Terrain Ruggedness Index (TRI) tool on Digital Elevation Models (DEMs) to quantify the various surface textures. We are also quantifying the textures using data from MRO’s Shallow Radar (SHARAD) to calculate the surface roughness at radar scales across these same regions. Our new map and quantified surface textures will provide insight into the geologic history of Mars.

Keywords: Mars; Geology; Radar; GIS; Mapping

Mentor(s):

Ali Bramson (Science); Santa Lucia Perez Cortes (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1493**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# One Offender and 500 Victims: Examining How Victim Behaviors Influence Grooming Strategies

Innovative Technology / Entrepreneurship / Design

Author(s):

Caroline Marie Sponhauer† (Liberal Arts); Brycen Jesse Baldwin† (Polytechnic)

Abstract:

Internet grooming is the process by which an adult builds an emotional bond with a minor over the internet for the purpose of exploiting them. Some child sex offenders use grooming tactics to manipulate minors into meeting in-person for sexual activities (i.e., contact child sex offenders). This study examined social media direct messages between one contact offender and 500 victims to learn how victims' behavior affects the way that offenders talk, manipulate, and exploit children from online platforms. First, we mapped each conversation using O'Connell's (2003) five stages of grooming (e.g., Friendship, Relationship, Risk Assessment, Exclusivity, and Sexual) and coded for the presence of victim high-risk behaviors (e.g., sending a sext first) and self-disclosures (e.g., vulnerabilities shared about oneself). Preliminary findings suggest that contact offenders change their grooming methods depending on how a victim responds or discloses information about themselves. This study provides a unique in-depth case study of how one offender learned over time through his communication with over 500 potential victims; how his grooming strategies changed, and how he responded to victim self-disclosures and high-risk behaviors. By understanding contact offender grooming behaviors, law enforcement can create more realistic undercover profiles and respond in a more realistic manner in their covert chat operations.

Keywords: Child Sexual Exploitation; Grooming; Contact Offender; Chat Analysis

Mentor(s):

Kathryn Seigfried-Spellar (Polytechnic)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1494**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Compression Molding of Hybrid Continuous and Long Discontinuous Carbon Fiber Reinforced Thermoplastics for Enhanced Structural Performance

Innovative Technology / Entrepreneurship / Design

Author(s):

Robert Patterson Stewart† (Engineering); Isaiah Maningas† (Engineering); Jason Jaesung Lew† (Engineering|JMHC)

Abstract:

The purpose of this study is to investigate the improvement in structural performance of parts molded with a hybrid of continuous and long discontinuous carbon fiber reinforced thermoplastics. Pin brackets were manufactured with the hybrid material form as well as only with long discontinuous carbon fiber with the goal of characterizing the improvement in structural properties gained through the insertion of small fraction of continuous fiber reinforcement in areas where structural properties were needed. Mechanical tests were conducted to determine the ultimate strength of the brackets. Initial results of brackets made from long discontinuous fiber revealed that failure was driven by the knit line formed where two polymer streams converge during the molding process. To address this, preforms of continuous fiber tape were placed at these locations during manufacturing to enhance the structural characteristics of the bracket. The long discontinuous fiber chosen for this study is a cost-effective alternative to traditional prepreg platelets with better scalability for mass production. This process could prove particularly beneficial in automotive and aerospace sectors which value strong, lightweight, and cost-effective components.

Keywords: Carbon Fiber; Composites; Manufacturing; Molding; Discontinuous Fiber

Mentor(s):

Eduardo Barocio Vaca (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1495**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Information modality and willingness to engage in prosocial behavior

Social Sciences / Humanities / Education

Author(s):

Amrit Subramanian† (DSB|JMHC); Ariana Raquel Morton* (HHS); Luke Harrison Huff* (HHS); Nathan Joel Benjamin* (HHS); Eliana Raina Romero* (HHS); Mary Clare Schofield* (HHS); Ethan Thomas Stark* (HHS)

Abstract:

This study explored the relationship between acquisition of knowledge via different modalities and one's willingness to engage in prosocial behavior. Data were obtained from 269 undergraduate students enrolled in Purdue's introductory psychology course. Participants were randomly assigned to one of three experimental conditions: (1) experiencing a 20-minute award-winning virtual reality (VR) film, "Traveling While Black" in VR; (2) listening to the audio only from the same film; or (3) listening to audio from a 20-minute film regarding automotive history. "Traveling While Black" is a virtual reality film that examines racism and places the viewer in situations to learn of the personal experiences of Black individuals who experienced prejudicial behavior. One of the underlying research hypotheses guiding the study was whether increased immersion (watching in VR vs. only hearing its content) leads to increased empathy. Past research has shown that increased empathy predicts higher willingness to engage in prosocial behavior. Thus, we hypothesized there would be spillover from increased empathy produced by VR, leading participants who experienced "Traveling While Black" through VR to exhibit greater willingness to engage in prosocial behavior than in the other conditions, as demonstrated via their self-reported responses immediately after the experience. Data analyses revealed significantly higher empathy was generated in the VR conditions compared to the other conditions, but no significant difference in overall prosocial behavior. Ancillary analyses revealed a marginal effect only for blood donation.

Keywords: Social Psychology; Virtual Reality

Mentor(s):

Christopher R Agnew (HHS)

Other Acknowledgement(s):

Taylor Mary Himes (HHS)

**Poster Presentation Abstract Number: 1496**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# SAI: Integrating Cognitive, Social, and Engineering Principles for Large-scale Planning of Public Charging Infrastructure

Mathematical/Computation Sciences

Author(s):

Meghna Swaminathan† (Science); Juan Pablo Loaiza Ramirez‡

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Torsten Reimer (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1497**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Integration of Autonomous Racing Systems

Innovative Technology / Entrepreneurship / Design

Author(s):

Benjamin Thomas Sykes† (Engineering); Rohin Rajesh Nair† (Engineering); Emily Song† (Engineering); Aroldo Fernando Lugo Quintanilla† (Engineering); Alexander Popescu† (Engineering); Shreya Shrikrushna Pulujkar† (Engineering)

Abstract:

In our modern world there is a need for sustainable, safe, and economical transportation for the masses. Developing these solutions requires vast amounts of resources like funding and space for testing. F1Tenth, an international community of researchers, engineers, and autonomous systems enthusiasts, provides a scaled autonomous vehicle framework to safely test new concepts in this field.

The F1Tenth platform integrates a complex sensor array on top of a high-performance RC-style drivetrain. These sensors are built around an NVIDIA Jetson TX2 compute module, which will run our team's software. Its software architecture is comprised of perception, planning, and control modules. Perception modules take input from the real world and present it to the planning modules to evaluate and respond to with the control modules.

We aim to use these scaled vehicles to test modern autonomous operations in a safe, economic way that enables an agile development process. F1Tenth specifically uses the ROS2 framework, which

Keywords: System Integration; Autonomous Vehicles; ROS2; F1Tenth; Computer Vision

Mentor(s):

Samuel Labi (Engineering); Sashank Modali (Engineering); Richard Osita Ajagu (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1498**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Multifunctional Materials in Aerospace Applications to Drone Landing Gear

Physical Sciences

Author(s):

Tatiana Varela† (Engineering); Pranav Singh† (Engineering|JMHC); Ananya Prasad† (Engineering|JMHC); Lainie Jane Rapp† (Engineering); Colby Strohl† (Engineering); Bella Irma Schaetzle† (Engineering); Clara Marie Anne Goffioul† (Engineering); Simran Nadig† (Engineering|JMHC); Praneel Madhuvanesh‡ (Engineering); Nathanael Adrian Lorincz‡ (Engineering)

Abstract:

Multifunctional materials can strengthen a material's capabilities by incorporating multiple functionalities into a single component. This is beneficial in weight-conscious aerospace applications, such as quadcopter drones. This study investigates replacing the landing gear of a commercially available quadcopter with 3D-printed piezoresistive material. Piezoresistive materials change resistance as they are deformed, so measuring the resistance of the landing gear will give information about its strain state and therefore the condition of the component. First, a dry mixing process will be developed to homogeneously disperse carbon nanofibers (CNFs) within polylactic acid (PLA), a common 3D printing filament. The PLA-CNF mixture will then be extruded into filament for additive manufacturing. Using this filament, a dog-bone specimen will be 3D printed for material characterization through mechanical and electrical testing. Following the material characterization, the landing gear will be 3D modeled, 3D printed, and mounted to the drone. Lightweight circuitry will monitor resistance changes in the self-sensing landing gear during the takeoff and landing of the drone, in which strain and the onset of damage accumulation from cyclic loading can be measured. An Arduino, powered by the quadcopter drone’s battery, will collect and store resistance data from the landing gear. If this technology is suitable for the health monitoring of the landing gear of a quadcopter, further research will apply this technology to large-scale rotorcraft.

Keywords: Multifunctional Materials; Quadcopter Drones; Additive Manufacturing; Conductive Nanofillers; Structural Health Monitoring

Mentor(s):

Tyler N Tallman (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1499**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Effects of Extracurricular Involvement at Purdue University

Social Sciences / Humanities / Education

Author(s):

Nathaniel Thomas Waninger† (Exploratory Studies)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Michael Douglas Johnson (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1500**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Influence of Various Social Relationships on Gifted Adolescents' Academic Interests: A Qualitative Study

Social Sciences / Humanities / Education

Author(s):

Jack William Ev Weston† (HHS)

Abstract:

[Abstract Redacted]

Keywords: Interest; Social Relationships; Gifted Adolescents

Mentor(s):

Nielsen Pereira (Education); Tugce Karatas (Education)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1501**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Impact of Novel Type V-A Anti-CRISPR on Plasmid Topology & Cas12a Cleavage In-Vitro to Elucidate Mechanism of CRISPR-Cas12a Inhibition

Life Sciences

Author(s):

Gwyneth Wong† (Science)

Abstract:

CRISPR-Cas is a highly sophisticated antiviral defense system found in roughly 40% of bacterial genomes. The basis of this system is the acquisition of phage DNA into a CRISPR array in the bacterial genome, thereby protecting the bacterium against future infections by the same phages. Today, CRISPR gene editing is being repurposed to tackle problems ranging from crop quality to human disease. CRISPR specificity – the mitigation of off-targets, unintentional gene cleavages made by the Cas protein, is of significant concern. Anti-CRISPRs (Acr) are inhibitor proteins encoded by bacteriophages that can evade CRISPR-Cas systems through various mechanisms depending on the Acr; some can mimic, enzymatically modify, or block some component of the system. It is crucial for us to study Acrs as they are natural off-switches for CRISPR-Cas proteins that are capable of editing genes. In this project, we aim to biochemically characterize AcrVA3, using AcrVA3.1, a less toxic ortholog, found in Moraxella bovoculi whose mechanism of CRISPR-Cas12a inhibition has not yet been studied. Here we present preliminary data suggesting that AcrVA3.1 encodes a nickase capable of changing plasmid conformation from supercoiled to open circle. We hypothesized that the purpose of this property is to protect the bacterial host plasmid from Cas12a binding and cleavage, which we subsequently gained insight into through Cas12a cleavage assays.

Keywords: CRISPR-Cas System; Anti-CRISPRs; Genome Editing; Bacteriophage; DNA Topology

Mentor(s):

Indranil Arun Mukherjee (Science)

Other Acknowledgement(s):

Leifu Chang (Science)

**Poster Presentation Abstract Number: 1502**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Aluminum Nitride Interposer for Enhanced Heat Dissipation

Innovative Technology / Entrepreneurship / Design

Author(s):

Yun-Jen Wu† (Engineering); Isabel Alejandra Arias Zambrano† (Engineering); Jenna Marie Marquette† (Engineering); Jack Valenti† (Engineering); Henry Qin† (Engineering)

Abstract:

Advanced Packaging & Heterogeneous Integration (APHI) is an advanced fabrication technique to integrate multiple chip-like components into a package to minimize its size and weight, particularly in the aerospace industry. The HILEOS (Heterogeneously Integrated Low-Earth-Orbit Sensors) project focuses on designing and developing a 2.5D planar packaging solution by heterogeneously integrating a photosensor and a D-latch memory using various substrate materials.

For this project, the Aluminum Nitride (AlN) sub-team plans to use AlN as the integration substrate, leveraging its distinct properties as a ceramic material such as excellent electrical insulation, high thermal conductivity, and low dielectric loss. These characteristics make AlN an ideal candidate for successfully integrating various components into compact, lightweight packaging, particularly suited for high-power radio frequency applications such as radars and transceivers.

Our team's primary research focus is to demonstrate that AlN substrates are a viable alternative to silicon substrates. To achieve this, the team developed a process that begins with using a fiber laser to create through-holes in the AlN substrate. Simultaneously, a titanium or chromium seed layer is deposited onto a silicon handling wafer. The chiplets are then positioned in the through-holes, with the AlN interposer bonded to the silicon handling substrate. Next, a nickel or copper bonding layer is electroplated onto the seed layer to secure the chiplets, and the handling wafer is removed. Finally, interconnects are formed through photolithography, metallization, and the lift-off process.

This project demonstrates that current semiconductor processing techniques can achieve 2.5D heterogeneous integration of multifunctional, compact devices within a research cleanroom. Future efforts will focus on conducting electrical and radiation testing to evaluate both initial performance and long-term reliability, as well as documenting procedures upon successful completion.

Keywords: Semiconductor; Advanced Packaging; Heterogeneous Integration; Interposer

Mentor(s):

Saeed Mohammadi (Engineering); Peter Bermel (Engineering); Tiwei Wei (Engineering); Rahim Rahimi (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1503**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# SoCET QSPI Validation Process

Innovative Technology / Entrepreneurship / Design

Author(s):

Yilin Xu† (Engineering); Eshan Mathur† (Engineering); Atharva Umesh Bhide† (Engineering); Armaan Kanchan† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Johnathan Hong (Engineering); Cole Aaron Nelson (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1504**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Teacher-Student Relationships, Student Support, and ELL Students' School Outcomes

Social Sciences / Humanities / Education

Author(s):

Yage Zhang† (Education)

Abstract:

English Language Learners (ELLs) encounter unique challenges in American schools. Aside from the language barriers they face, most of ELLs also come from different cultural backgrounds. To make classrooms inclusive environments, teachers need to be aware of the diverse backgrounds ELLs bring to the classroom and to build supportive relationships with all students. This literature review examines studies that focus on the contributions of teacher-student relationships to ELLs' academic success. Previous studies suggested that ELLs value their academic, linguistic and cultural environments, and that they appreciate teachers who are strict as well as understanding (Diaz et al., 2016). In fact, the teacher-student relationship plays a key role in moderating ELLs' less positive views of the larger school environment (Yough et al., 2024). Moreover, positive-teacher relationships are directly linked with ELLs' academic achievement. Additional research confirms that the relationships that teachers build with their ELL students matter. Relationships have important consequences for ELLs' academic well-being and achievement (Guerrettaz et al., 2022, Torres et al., 2023). Though it is helpful that existing studies address different aspects of the ELL experience, greater specificity is needed on how teachers may support ELLs in their classrooms. In this critical review I addresses this issue in order to: (a) contribute to greater understanding of the unique schooling challenges ELLs face in the United States; and (b) identify relational processes and strategies to equip in-service and pre-service teachers so they can better support students with diverse linguistic backgrounds.

Keywords: English Language Learners; Student Support; Teacher Education; Teacher-Student Relationship

Mentor(s):

Panayota Y Mantzicopoulos-James (Education)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1505**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Photomechanical Materials Research in Printmaking & Letterpress

Fine Arts

Author(s):

Francille Zhuang† (Science|JMHC)

Abstract:

Professor Jennifer Scheuer and Undergraduate Francille Zhuang are studying the best conditions for translating tonal artistic imagery through photomechanical printmaking methods. Each process involves exposing UV light to a plate or screen light through a drawing. The exposure will create a positive/negative surface that when be inked, will translate into a range of values on paper. The research investigates factors such as digital image processing, exposure length, exposure methods, and paper type in consideration of line weight, and value range. Thus, to achieve a detailed, tonal image, printmakers first should exaggerate the darkest values, and moderate the lightest, before condensing all into a bitmap. To expose a photopolymer, a pre-exposure may be needed to reduce exposure time, and to expose high-mesh silkscreens, exposure time should be dropped significantly to render more image information. As opposed to other art mediums, access to printmaking knowledge is more limited: many techniques and skills are only passed from mentor to student, and published instructions on the breadth and potential of the mediums are comparably rare. In addition, studies to create high quality plates/screens that are faithful to hand-drawn tonal imagery are often not publicly presented, so most artists create work through individual trial and error.

Keywords: Photomechanical Materials; Printmaking; Fine Arts

Mentor(s):

Jennifer Scheuer (Liberal Arts)

Other Acknowledgement(s):

Jonathan P Moore (JMHC)

**Poster Presentation Abstract Number: 1506**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Micro-Precision Constitutive Characterizations of High-Temperature Solder Interconnects and Circuit Board Specimen Design for Electromigration Testing

Physical Sciences

Author(s):

Brendan Duffy† (Engineering|JMHC); Hannah Y Chun* (Engineering); Rongkai Yu* (Engineering)

Abstract:

In heterogeneously-integrated electronic packages, solder joint reliability is paramount to device longevity. High-temperature SAC-based alloys proffer unique advantages as solder interconnects for System-in-Package assemblies; however their viscoplastic nature complicates the standardization of their constitutive characteristics. For a better understanding of SAC-based stress-strain behavior, a closed-loop control micro-precision tester will be utilized to induce double-shear on a novel high-temperature solder. 3D-printed capacitance-sensor mounts will be designed, implemented, and validated to characterize creep and monotonic behavior for the solder at various deformation ranges. Commonalities among sample responses will facilitate analysis of the composition's constitutive behavior and evidence the consistency of the micro-precision testing environment. In a separate endeavor, circuit board test samples will be researched for a new testing device to evaluate electromigration in lead-free microbump interconnects. An according test specimen design will ensure that the new device can be leveraged for better comprehension of solder resistance to electromigration phenomena.

Keywords: Heterogeneous Integration; Advanced Packaging; Solder; Micro-Precision Testing; Characterization

Mentor(s):

Sean Yenyu Lai (Engineering); Ganesh Subbarayan (Engineering)

Other Acknowledgement(s):

Shubhra Bansal (Engineering); Amy M Marconnet (Engineering)

**Poster Presentation Abstract Number: 1507**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Semiconductor Advanced Packaging using Two-Photon Lithography

Innovative Technology / Entrepreneurship / Design

Author(s):

Jack Rearden Ferlazzo† (Engineering|JMHC)

Abstract:

[Abstract Redacted]

Keywords: Two-Photon Lithography; Image Projection-Based Printing; Semiconductor Packaging; Cost-Effectiveness

Mentor(s):

Xianfan Xu (Engineering); Ishat Raihan Jamil (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1508**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Surface Curvature Use for the Mitigation of Thermal Grease Pump-Out

Physical Sciences

Author(s):

Nolan Parker Gronowski† (Engineering)

Abstract:

The purpose of this study is to apply spherical surface curvatures with minuscule bow-heights to the top and bottom surfaces that surround a type of thermal interface material (TIM), thermal grease, to mitigate the degradation of this TIM over time. Thermal grease is commonly used inside electronic packages, such as CPUs and GPUs, as an interface between the processor die and the heat spreader. This study mimics this by applying thermal grease to an aluminum block that continuously cycles between 45°C and 110°C every 15 minutes for 6 days. As the aluminum block continually expands and contracts due to temperature cycling, this induces pump-out and degradation in the thermal grease which lowers its effectiveness in transferring heat. The top surface, which is composed of a glass lens that is either flat, concave, or convex, is used to either mitigate or increase the rates of pump-out in the thermal grease. Qualitative results gathered from videos have shown that a concave top surface, which represents the heat

Keywords: Thermal Interface Material; Pump-Out Degradation; Package; Heat Transfer

Mentor(s):

Ritwik Vijaykumar Kulkarni (Engineering); Amy M Marconnet (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1509**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Exploring 2D Tellurium for Advanced Pressure Sensors in Extreme Underwater Environments

Innovative Technology / Entrepreneurship / Design

Author(s):

Remley Grace Hooker† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Peide Ye (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1510**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Pre-processing User Interface for Package Design and Co-design of EDA Tool

Mathematical/Computation Sciences

Author(s):

Robert Scott Richards† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: GUI; Translation; Discretization; Package; PDE

Mentor(s):

Liang Pan (Engineering)

Other Acknowledgement(s):

Ashwin R Kidambi (Engineering)

**Poster Presentation Abstract Number: 1511**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Topology optimization of flow structures for cooling multi-chip modules

Innovative Technology / Entrepreneurship / Design

Author(s):

Jonathan Samuel Ryan† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Thermal Management; Topology Optimization

Mentor(s):

Justin Weibel (Engineering)

Other Acknowledgement(s):

Boyu Duan (Engineering)

**Poster Presentation Abstract Number: 1512**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Micro-Nano-Ordered LSMO-Au VAN Growth for Chemical Sensors

Innovative Technology / Entrepreneurship / Design

Author(s):

Allison Nobuko Scher† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Vertically Aligned Nanocomposite; Plasmonic; Shadowmask; PLD

Mentor(s):

Haiyan Wang (Engineering); Benson Qun Tsai (Engineering); Jialong Huang (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1513**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Impact of Slot Liner Compression and Wire Geometry on the Total Thermal Resistance in the Electric Motor's Stator-Winding Assembly

Innovative Technology / Entrepreneurship / Design

Author(s):

Lindsay Kathryn Sutherland† (Engineering|JMHC)

Abstract:

The rise in electric motors, driven by the electric vehicle and renewable energy industries, demands effective thermal management solutions for their safe and reliable performance. Minimizing the thermal resistance of the stator-winding assemblies of motors is crucial for efficient heat dissipation. Slot liners are electrically insulating sheets that separate current-carrying copper wires from the motor's metallic stator to prevent shorting. This study experimentally examines the impact of slot liner compression and wire geometry on the winding-slot liner-stator thermal resistance by utilizing commercial slot liners like Nomex® and TufQuin®. Stator-winding assemblies are constructed by stacking a copper piece with wire-shaped ridges, a slot liner, a stator, and a reference material. The copper side is heated, and the reference material side is cooled, inducing a temperature gradient. Different experiments are performed with varying compression strains in the slot liner and wire geometries. The resulting two-dimensional, steady-state temperature maps are captured using infrared (IR) microscopy. These maps are then analyzed in MATLAB to calculate the total thermal resistance across the stator-winding assembly. Results indicate that the total thermal resistance of the assembly decreases with increased slot liner compression and decreased inter-wire spacing. This research provides insight into how compression and geometric factors can affect total thermal resistance. By changing the packaging of wires to decrease inter-wire spacing and using flexible slot liners, the total thermal resistance in the stator-winding assembly can be reduced, enhancing the thermal management of electric motors.

Keywords: Electric Motors; Slot Liner; Thermal Resistance; IR Microscopy; Wire Packaging

Mentor(s):

Amy M Marconnet (Engineering); Shanmukhi Sripada (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1514**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Photoluminescence Spectroscopy Probing Defects in Ultrathin Transition Metal Dichalcogenides (TMD)

Physical Sciences

Author(s):

Bradon Rowan Timms† (Engineering|JMHC)

Abstract:

Ultrathin transition metal dichalcogenides (TMDs) are now included in the digital logic roadmap for semiconductor companies like Intel and IMEC as well as being considered for photonics. Real-world implementation means interrogating how fabrication changes the performance of these devices. For example, recent studies have shown that strain significantly impacts the mobility of TMD devices. Other studies have shown how fabrication alters the luminescent properties of these materials. For this reason, we have leveraged photoluminescence spectroscopy to assess the defect evolution in TMD photonic and logic devices. In doing so, the project will assess how next generation packaging and processing will impact this nascent class of devices.

Keywords: Semiconductors; TMD; Spectroscopy; Defects

Mentor(s):

Thomas Edwin Beechem (Engineering); Walter J Smith (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1515**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Thermo-Mechanical Reliability of Bismuth Solders for High Temperature Packaging

Physical Sciences

Author(s):

Kyle J Wiegand† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Alloys; Semiconductors; Bismuth; Soldering; Structural Dimensionality

Mentor(s):

Shubhra Bansal (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1516**
*Presentation Time: Session 3: 12:00pm-1:00pm*

# Thermal Transport in 3D Printed Packaging Materials

Physical Sciences

Author(s):

Noah James Willis† (Engineering)

Abstract:

Thermal management solutions, such as heat sinks, heat exchangers, and cold plates, are critical for modern electronics and semiconductor devices. Additive manufacturing (AM) offers unprecedented design flexibility for these systems, yet there is limited information on how printing parameters and thermal history influence the thermal conductivity of packaging materials through microstructural optimization. This project investigates the relationship between laser printing parameters, specifically laser power and speed, and the resulting microstructure to optimize thermal transport properties.

Our approach centers on controlling the grain size by varying power density, hypothesizing that lower power density reduces grain size, thereby affecting both the mechanical and thermal properties of the printed material. A series of test samples will be fabricated with diverse microstructures, followed by detailed thermal conductivity testing. Using infrared (IR) microscopy, we will measure temperature gradients under steady-state conditions. With the assumption of negligible convection and one-dimensional heat flow, we will utilize IR imagery to extract key thermal parameters and analyze the heat transport performance across samples.

The goal of this study is to identify which laser parameters yield optimal grain structures for improved conductivity, thereby enhancing the performance of additively manufactured thermal packaging components. The results of this research will contribute to the growing body of knowledge on microstructural control in 3D-printed materials and provide practical insights for the design of high-efficiency thermal management solutions in advanced packaging applications.

Keywords: Additive Manufacturing; 3D Printing; Thermal History; Power Density

Mentor(s):

Amy M Marconnet (Engineering); Luz Sotelo (Engineering)

Other Acknowledgement(s):

Harshith Kumar Adepu (Engineering)

**Poster Presentation Abstract Number: 1600**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Exploring the Interplay Between Teamwork and Intercultural Competence in STEM Education

Social Sciences / Humanities / Education

Author(s):

Jessica Josephine Adams† (HHS|JMHC); Charis Abigail Armstrong† (Liberal Arts|JMHC); Camden Jeffrey Love† (DSB|JMHC)

Abstract:

[Abstract Redacted]

Keywords: Intercultural Competence; Team Regulation; Team Behavior; First-Year Students

Mentor(s):

Aparajita Jaiswal (Purdue University); Devang Atul Patel (Polytechnic)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1601**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Earth Remote Sensing with Signals of Opportunity

Physical Sciences

Author(s):

Ishaan Krishna Agrawal† (Engineering); Aaron David Slamovich† (Engineering); Elle S Case† (Engineering); Maxim Nickolas Yamilov† (Engineering)

Abstract:

The purpose of this study is to discover whether the Swarm constellation's signals can be used to analyze soil moisture, which is useful for short-term predictive crop growth or even long-term climate studies. To do this, we used the Orbitron Satellite Tracking system to find times that the Swarm satellites revolve over West Lafayette, Indiana, and then collect and analyze their signal.

To collect data, we built antennae that could receive signals from a large range. We targeted a 137 MHz signal, as Swarm satellites operate on this frequency. From a high and unobstructed vantage point, we could use the satellite path from Orbitron to point the antennae and obtain a signal from the satellite. If the path we calculated matched where we pointed the antenna, we could receive a strong signal. So far, we have taken one satellite signal. The result from this excursion was a beacon signal that we concluded was from an Orbcomm satellite. We attempted to catch some Swarm and National Oceanic and Atmospheric Administration (NOAA) signals as well, but were initially unsuccessful and are experimenting with finding prediction times from their two-line elements.

A downside to this method was that the majority of the time, we could only catch weak, stray, or completely irrelevant signals that would interfere with the Swarm satellites. This error could be solved by taking into consideration other types of satellites, namely NOAA and Orbcomm satellites, and making sure that their paths do not intersect the paths we hope to target.

Keywords: Remote Sensing; Signals of Opportunity; Signal Processing; System Tool Kit

Mentor(s):

James Garrison (Engineering); Jordan Joseph Alexander (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1602**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# LGBTQ+ Community in Education: Teach Love Not Hate

Social Sciences / Humanities / Education

Author(s):

Eva Catherine Albrecht† (Education)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Carla B Rosell (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1603**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Measurement of rare phosphoinositide lipids in Ras mutant cell membranes

Life Sciences

Author(s):

Alex James Alonzo† (Science|JMHC); Jennifer Caraballo‡ (University of Puerto Rico, Mayaguez)

Abstract:

[Abstract Redacted]

Keywords: Phosphoinositide; PI(4,5)P2; Ras; Cancer; TIRF

Mentor(s):

Shalini T Low-Nam (Science); Joy Wu (Science); Vinay K Menon (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1604**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Data Mining with R

Innovative Technology / Entrepreneurship / Design

Author(s):

Jaden R Azar† (DSB); Darren Ng† (DSB); Jari L Warner† (DSB)

Abstract:

[Abstract Redacted]

Keywords: Data Mining; AI; LLMs; Data for Good; Grief Journey

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1605**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Walkable Cities: The American Dilemma – An Exploratory Study

Social Sciences / Humanities / Education

Author(s):

Amartya Bagchi† (Engineering)

Abstract:

The contemporary vision of an ideal metropolis almost always imagines a highly interconnected public transportation system that makes walking an obvious choice – something that is true just about everywhere except America. Even for distances as short as a few blocks, Americans show a higher preference for driving than any other country. There is still a lack of major incentive for most to abandon the ingrained notion of 'car culture', even in cities with well-established public transit infrastructure. This disregard for walking has resulted in several drawbacks, ranging from the current climate crisis to health complications on the individual level. Apart from the point of view of sustainability alone, the need for walkable cities permeates far beyond just New York City, Chicago, or San Francisco, as the threat of gridlock becomes ever more of a menace to city life. Through this exploratory study, I seek to analyze the reasons behind why American cities are the way they are, and to what extent can walkability be implemented and be beneficial to the average citizen. Whether through reformed urban planning or through a gradual shift away from the reliance on cars, I hope to demonstrate that the liveability of cities can be drastically improved if everyone just chooses to commute by walking or public transit when practical.

Keywords: Walkability; Walkable Cities; Public Transit; Exploratory Study; Preliminary Research

Mentor(s):

Carla B Rosell (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1606**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Building Barriers: Natural Variation Contributes to Reproductive Isolation in Arabidopsis thaliana

Life Sciences

Author(s):

Ava Grace Barnes† (Agriculture)

Abstract:

[Abstract Redacted]

Keywords: Plant Biology; Plant Reproduction; Membrane Proteins; Test Crossing; Molecular Biology

Mentor(s):

Leonor Maria de Fatima Chagas Boavida (Agriculture)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1607**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Phone Usage and Study Habits

Social Sciences / Humanities / Education

Author(s):

Hannah Grace Barsoum† (HHS)

Abstract:

In a time inundated by technology, it is important to review its effect on our lives. For students, it can be hard to see its indirect impacts on our success. Current research shows that while technology does have positive effects, it has also been found to negatively affect behavior and outcomes in college students (Rozgonjuk et al, 2018). The purpose of this exploratory research study is to examine the attitudes and behaviors of college students when studying. This project aims to show a pattern in how phone usage affects academic success in college students by surveying 100* Purdue University students about their feelings towards their distractibility and focus when they interact with their phones while working or studying. Additionally, multi-tasking while working is a contributor to lower academic success (Zhao, 2023)(Junco et al., 2012). Because of this, this project implemented a covert observation of Purdue University students in popular study environments around campus to track how often they interacted with devices for non-educational purposes. Early survey results suggest that while there was no strong correlation between GPA and phone usage, students report that their phones made them feel more distracted while studying. Preliminary results in the observation show high amounts of interaction with non-educational devices. The survey and observation conglomerate to provide a clearer view of the current status of this issue. This project has the potential to better understand the study and work environment of Purdue University and elicit further research in the field of technology and academics.

Keywords: [no keywords provided]

Mentor(s):

Michael Douglas Johnson (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1608**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# A Genomic Analysis of Global House Dust Mite Allergen Diversity

Life Sciences

Author(s):

Sarah M Bennett† (Science|JMHC)

Abstract:

[Abstract Redacted]

Keywords: House-Dust Mites; Allergens; Genomic Sequencing

Mentor(s):

Qixin He (Science); Pavel Borisovich Klimov (Science)

Other Acknowledgement(s):

Bradley Keith Broyles (Science)

**Poster Presentation Abstract Number: 1609**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Online Visualization of Earth History

Innovative Technology / Entrepreneurship / Design

Author(s):

Leyton Drew Bostre† (Engineering); Michael Robert Knaack† (Engineering); Samyukta Balaji† (Engineering); Aditya Krishnan Sivathanu‡ (Engineering); Kevin Ming Chang‡ (Engineering)

Abstract:

Our project is to enhance the accessibility to the public for visualization of Earth's fascinating history of the evolution of its life, climate, geography, regional geology and many other aspects using a standardized geologic time scale.  A stand-along Java package called TimeScale Creator, which was also largely developed by Purdue students, has allowed geologists to plot and gather data of different time periods and ages, plus the ability to import region-specific data packages and one's own datasets. Our web version offers greater convenience, thereby eliminating the need for users to download software or to continuously update to access the latest features and datasets. Our current web version has nearly all user-interfaces and functions of the original Java software; but our goal is to create a more intuitive interface for a user to create and modify charts and other graphics. TypeScript with React and Java are utilized to meet this goal.

Keywords: Geologic Time Scale; Data Visualization; React; Java; Web Accessibility

Mentor(s):

James G Ogg (Science); Aaron C Ault (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1610**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Hope through horses: equine-assisted learning for veterans with post-traumatic stress disorder

Social Sciences / Humanities / Education

Author(s):

Caleb Buening† (Science|JMHC)

Abstract:

Recent literature suggests that equine-assisted learning may have potential as a complementary intervention when confronting post-traumatic stress disorder (PTSD) in veterans. Equine-assisted learning is an intervention that teaches horsemanship to benefit the health and wellbeing of participants. The aim of this pilot study was to quantify the potential impact that an equine-assisted learning program has on the mental and social health of veterans. Using standardized mental and social health assessments, including the PTSD Checklist (PCL-5) and Patient-Reported Outcomes Measurement Information System (PROMIS) surveys, we collected quantitative data from before and after the veterans participated in an 8-week equine-assisted learning program. To date, 19 surveys have been recorded. Once all data is collected, each standardized health assessment will be analyzed with paired t tests. Results are forthcoming and will contribute to our understanding of the potential equine-assisted learning has as an intervention option for veterans with PTSD.

Keywords: Military Veterans; Equine-Assisted Services; Animal-Assisted; PTSD; Complementary Intervention

Mentor(s):

Leanne Nieforth (Vet Med)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1611**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Utilizing Machine Learning methods to assist TAPS services

Innovative Technology / Entrepreneurship / Design

Author(s):

Ru Yi Cai† (DSB); Anurag Koripalli† (DSB); Christopher Raymond† (DSB)

Abstract:

[Abstract Redacted]

Keywords: Data Mining; AI; LLMs; Data for Good; Grief Journey

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1612**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# SoC Verification: Verifying design of Digital GPIO Multiplexer

Mathematical/Computation Sciences

Author(s):

Siddarth Balaji Calidas† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Vishnu Chaithanya Lagudu (Engineering); Isaac P Hagedorn (Engineering); Mark Johnson (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1613**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Classifying Grief Stages for Appropriate Care through Data Mining Methods

Innovative Technology / Entrepreneurship / Design

Author(s):

Gabriel John Carlson† (DSB); Sanjay Kandadi† (DSB); Natasha Lynn Kiel† (DSB); Rixi Zeng† (DSB)

Abstract:

[Abstract Redacted]

Keywords: Data Mining; AI; LLMs; Data for Good; Grief Journey

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1614**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# The Assembly of Modified Coiled-Coil Peptides into Nanotubes with Encapsulated Cargo

Physical Sciences

Author(s):

Wyatt Tristan Carter† (Agriculture)

Abstract:

Peptide biomaterials are an emerging technology that have many applications in regenerative medicine. Peptides self-assemble into various structures at the microscale and nanoscale level, including spheres, tubes, crystals and disks. In one example, the trimeric coiled-coil peptide TriNL undergoes hierarchical assembly to form nanotubes with an extensive interior cavity. This cavity incorporates fluorescein-labeled anionic dextrans via ionic interactions with the growing nanotubes. Due to the level of cationic amino acids within the TriNL sequence, only negatively charged cargo has been incorporated within the nanotube to date. The aim of this research is to modify the sequence of TriNL to replace specific cationic amino acids with neutral ones, thereby changing the overall charge of the nanotubes to improve the scope of encapsulated cargo.

In this work, two modified TriNL peptides were designed, TriNL-K3Q and TriNL-K28Q. The modified peptides have replaced positively charged lysine (K) with neutral glutamine (Q) at the 3rd position for K3Q and 28th position for K28Q. Both peptides were prepared using solid phase peptide synthesis, purified using RP HPLC and characterized using MALDI-TOF MS. Each peptide has been observed to form nanotubes using scanning electron microscopy. The K3Q nanotubes were found to be about 5 ?m long and 1 ?m wide, whereas the K28Q nanotubes were about 30 ?m long and 1 ?m wide. Experiments are underway to evaluate the encapsulation of differently charged dextrans within the nanotubes. The development of peptide nanotubes capable of carrying therapeutic biopolymers may have many applications in drug delivery and storage.

Keywords: Peptide; Biomaterials; Coiled-Coil

Mentor(s):

Jean A Chmielewski (Science); Anna Pavlishchuk (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1615**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Electric Vehicles for Indiana: Trends and Future Outlook of Current Fleet & Infrastructure

Innovative Technology / Entrepreneurship / Design

Author(s):

Ana Victoria Castro Herrera† (Tecnológico de Costa Rica)

Abstract:

As the United States pivots to greener ventures, the transition from internal combustion engine vehicles to electric battery-powered ones is making its way into the everyday life of Hoosiers. Analysis of the current charging infrastructure in place in the state of Indiana via data analytics and simulation helped determine the current charging capacity and anticipate what the drivers would need in the next 6 years according to different forecasting techniques.

Using the official data of the Indiana State Government and the Department of Energy of the United States, the predominance of passenger vehicles was identified as well as 4 main clusters of electric vehicles' registration. The charging stations present in each zone of interest were then used in accordance with the number of level 2 (LV 2) charging docks available to simulate current demand. Thereafter, a forecast was produced to predict the increase in electric vehicle registration in the next six years for all of Indiana. Such a forecast was then used to anticipate the growth in the charging station in each cluster for that same time period.

Final results showed that 93.28% of all passenger type electric vehicles were registered in the central region of Indiana, with the counties of Marion & Hamilton possessing 76.3% of the total. Whereas for charging stations, a total of 540 docks were mapped out with an average distance of 17.21 miles in between and this translated into an average usage of 77.57% of resources available for LV 2 charging docks.

Keywords: Electric Vehicles; Charging Infrastructure; Indiana; Data Analytics; Forecast

Mentor(s):

Dutt Jagdish Thakkar (DSB)

Other Acknowledgement(s):

Steven R Dunlop (DSB)

**Poster Presentation Abstract Number: 1616**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# QDILink

Mathematical/Computation Sciences

Author(s):

Harnoor Cheema† (Engineering); Jacob Chappell‡

Abstract:

One of the methods for continuing scaling post-Moore's Law is by combining multiple silicon chiplets into one unit. QDILink is intended to serve as a communication pathway between these dies. Most of the current solutions that are used employ a synchronous communication protocol, however QDILink has a quasi-delay insensitive protocol that is not effected by timing differences across the link.

By using a QDI protocol, there is no need for any analog circuit design for the link to function, which is important as analog circuits are very process dependent, potentially requiring a significant amount of design work for each different chiplet that is connected to the system. QDILink can also perform processing while the data is in transit by adding calculation stages into its internal pipeline. This moves part of the routing and data transmission logic into the link itself, increasing the flexibility of implementations to have different data transmission requirements. Beyond this, QDILink does not require either chiplet to be a synchronous system, enabling the use of a wider set of chiplets compared to the synchronous protocols.

The verification process of the synchronous interface was completed during the previous semester, finalizing the logic that will be used. Currently, schematics for each component of this interface are being created and intensively tested. Once the mixed signal simulations prove to be fully functional, chip integration can start. The systems that will use QDILink will be a version of the SoCET Team's AFTx line of system on chips, along with other projects that require a simple, reliable, and flexible communication protocol.

Keywords: Heterogenous Integration; Computer Architecture; Chiplets; SoCET

Mentor(s):

Mark Johnson (Engineering); Timothy Francis Hein (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1617**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Data for Good - Data Dream Team

Innovative Technology / Entrepreneurship / Design

Author(s):

Susan Chen† (DSB); Maddie Jo Musser† (DSB); Himanshu Niraj Sethia† (DSB); Shuoming Yu† (DSB)

Abstract:

[Abstract Redacted]

Keywords: Data Mining; AI; Data for Good; LLM; Grief Journey

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1618**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Exploration of Magnetic Properties in Novel Triangular Quantum Magnets

Physical Sciences

Author(s):

Piyush Dnyaneshwar Chhallare† (Science)

Abstract:

[Abstract Redacted]

Keywords: Quantum Spin Liquid; Crystal Flux Growth; Antiferromagnetic Ordering; MPMS; PPMP

Mentor(s):

Bishnu Prasad Belbase (Science); Arnab Banerjee (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1619**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# The Housing Crisis At Purdue

Social Sciences / Humanities / Education

Author(s):

Andres Carlos Corona† (HHS)

Abstract:

The housing crisis affects many universities across America, Purdue included. In this exploratory research project, I examine the housing crisis at Purdue to see if Purdue's current steps toward a solution are effective. My study seeks to better understand the potential causes and consequences of the housing crisis, such as increased student enrollment, rising rental prices in nearby areas, and limited on-campus housing availability. This project presents preliminary findings from a 15-question survey administered to freshman students at Purdue University to gauge their opinion and knowledge of the housing crisis and whether or not they were affected. This research aims to contribute to the understanding of this issue by sharing the perspective of students affected by the housing crisis.

Keywords: [no keywords provided]

Mentor(s):

Michael Douglas Johnson (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1620**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Simulating Granular Materials to Characterize the Effect of Particle Shape on Pore Interconnectivity and Mass Transport

Life Sciences

Author(s):

Ashton Isaiah Cotton† (Engineering|JMHC)

Abstract:

Granular hydrogels are a type of biomaterial composed of small, discrete particles aggregated via packing. Changes in the size, shape, and composition of these particles can influence overall material properties, such as porosity and mechanical strength, which are important for tissue engineering applications. However, it can be challenging and time-consuming to design and fabricate new particle shapes at a large scale. The goal of this project is to use simulation software as a predictive tool to investigate how particle shape may impact the structural properties and mass transport through granular materials.

Using Blender simulation software, we created particles with six unique shapes (spheres, rods, cylinders, stars, cubes, and ellipsoids) organized into a granular system. Then simulated the mobility of beads smaller in size than the interstitial pores through the granular system. We will extract this data from simulation results using Blender and then utilize MATLAB for processing and analysis, enabling us to gain deeper insights into the relationship between particle morphology and mass transport behavior in these hydrogels. In future work, we plan to quantify parameters such as pore size distribution, porosity, and connectivity within the granular hydrogel systems and examine the implications of these matrices in real-life scenarios, including their interactions with biological tissues. We will utilize this data to better understand and optimize the performance of hydrogel-based materials in various biomedical and tissue engineering applications. Overall, this research sheds light on the intricate interplay between particle morphology, pore characteristics of resulting granular systems, and mass transport behavior within hydrogel-based biomaterials, offering valuable guidance for the design of next-generation tissue and biomaterial engineering frameworks.

Keywords: Biomaterials; Granular Hydrogels; Cellular Invasion; Porosity; Tissue Regeneration

Mentor(s):

Taimoor Hasan Qazi (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1621**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Learning Russian Vocabulary through the Stories of Russian Fencers

Social Sciences / Humanities / Education

Author(s):

Tishia Talia Darmawan† (DSB|JMHC)

Abstract:

Supplementing the learning of a language through engagement with pre-existing interests is a proven way to accelerate growth. Connecting the target language with well known areas results in better focus during absorption and greater recall rates. This research presents fencing terminology in Russian with a shared focus on the economics behind the Russian fencing industry. It draws on the historical and present fencers of Russia for their economic placement as a result of their sports career. By following Olympian Sergey Bida, Coach Sergey Danilov, and international fencer Timur Safin through history and their journey to the top, an overview of the industry's profitability is drawn. To better engage in the athletes' pasts, Russian sources will be compared to English sources supplementing my language learning as well as decreasing bias between sources. Defining fencing and its strategies in Russian then showcasing Russian fencers will expand on the linguistic, economic, and societal aspects of this presentation. As a whole, the information reflects the prioritization of fencing within Russian culture and its engagement with other languages to create their own terms in Russian.

Keywords: Fencing; Russian Language; Sports; Economics; Translation

Mentor(s):

Olga Lyanda-Geller (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1622**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Formation and characterization of transgenic lines of SMAX1a and SMAX1b mutants in Petunia hybrida

Life Sciences

Author(s):

Maria Fernanda Delgado Taboada† (Agriculture)

Abstract:

[Abstract Redacted]

Keywords: Petunia hybrida; Volatile Organic Compounds

Mentor(s):

Natalia Doudareva (Science); Matthew Edward Bergman (Agriculture)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1623**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Understanding the Energy Use and Carbon Emissions of Training Autonomous Vehicles

Mathematical/Computation Sciences

Author(s):

Sarah Z Deniz† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Sustainability; Carbon Emissions; Autonomous Vehicle

Mentor(s):

Kendrick Clay Hardaway (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1624**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Lipidomic Analysis of Crocosphaera subtropica ATCC 51142 Under Diurnal Light-Dark Cycle and Nitrogen Conditions

Life Sciences

Author(s):

Aryaman Dewan† (Science); Malyka Ram† (Agriculture|Engineering); Priyanshu Datta Roy† (Agriculture|Engineering|JMHC); Rishabh Kottakota* (Science)

Abstract:

C. subtropica ATCC 51142, a unicellular, nitrogen-fixing cyanobacterium, adapts to various environmental conditions, making it a promising candidate for bioenergy production. C. subtropica are gram-negative bacteria whose lipid-rich cell wall is essential for energy storage, membrane integrity, and stress response, yet the lipidome of C. subtropica remains uncharacterized. This study aims to explore the impact of nutrient availability and diurnal light-dark cycles on lipid metabolism using untargeted lipidomics. Cells will be harvested 6h into both the light-dark phases after two weeks of growth under 12h light-dark cycles with and without nitrate supplementation.

Preliminary data is expected to reveal significant shifts in lipid profiles across light-dark periods and nitrogen availability. Under nitrate-limited conditions, we anticipate increased synthesis of storage lipids like triacylglycerols, supporting energy production during nitrogen fixation. Conversely, nitrate presence may reduce this need. Membrane lipid composition is expected to vary between light-dark phases, suggesting dynamic adjustment for optimized photosynthesis and nitrogen fixation. Our proteomics results showed extensive regulation of nitrogen-fixing pathways, with nitrogenase enzymes upregulated under dark and nitrogen-fixing conditions. We also observed 5 proteins (sqdB, cce_3547, cce_2731, sqdX, and fadD) involved in lipid metabolism changing significantly, prompting further investigation into lipidome changes in response to these growth conditions.

We will combine these lipid profiles with our existing proteomics data to gain deeper insights into C. subtropica's lipid regulatory mechanisms. This knowledge will be critical for optimizing lipid production in cyanobacteria, with potential applications in biofuel development, emphasizing the important role of lipid metabolism in renewable energy research.

Keywords: Crocosphaera subtropica ATCC 51142; Diurnal Light-Dark Cycle; Bioenergy Applications; Lipid Profile; Lipidomics

Mentor(s):

Uma K Aryal (Vet Med)

Other Acknowledgement(s):

Punyatoya Panda (Vet Med); Rodrigo Mohallem Ferreira (Vet Med); Anup Bhusal (Vet Med)

**Poster Presentation Abstract Number: 1625**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# The Emergency Access and Ground-Link Explorer (EAGLE)

Innovative Technology / Entrepreneurship / Design

Author(s):

Harman Kaur Dhillon† (Engineering); Madison Taylor Beaudry† (Liberal Arts); Collin Hoffman† (Engineering|JMHC); Rohan Suraj Desai† (Engineering); Aditya Sarwaikar‡ (Engineering); Alexander David Perry‡ (Engineering); Aryana Isabelle Deshpande‡ (Engineering); Christopher David Butler‡ (Engineering); Tryston Frederick Espiritu‡ (Engineering); Junhee Lim‡ (Science); Weijing Sebastian Chen‡ (Engineering); Logan Paul Hussein‡ (Engineering)

Abstract:

Drones have proven essential in helping first responders navigate various emergencies. From wildfires to hydroelectric attacks to urban disasters, unique emergencies need creative solutions to help save lives and provide necessary aid to first responders. When used as an emergency surveying module, a drone can return essential numerical data and maps to first responders so they can assess, interpret, and act according to reliable knowledge of the emergency. IoT devices, being the source of much of this data, can be crucial access points. The Emergency Access and Ground-Link Explorer (EAGLE) drone utilizes state-of-the-art technologies to help identify, read, and return data from IoT devices periodically to first responders near ground control. The EAGLE drone and its supporting software and features developed by the team at Purdue UAS Research and Test Facility (PURT) ensure cybersecurity best practices while supporting documentation addresses AI and supply chain risks.

Keywords: 3D Navigation; Cybersecurity; Radio Mapping; Unmanned Aerial Systems; First Responders

Mentor(s):

James Michael Goppert (Engineering)

Other Acknowledgement(s):

Chase Ja-ok Loeb (Engineering)

**Poster Presentation Abstract Number: 1626**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Documenting the Effectiveness of Environmental Education Lessons in Third Grade Classrooms

Social Sciences / Humanities / Education

Author(s):

Sabina Kaur Dhindsa† (Liberal Arts)

Abstract:

I propose to examine elementary school students' responsiveness to an environmental education unit and its influence on their awareness of Earth conservation. This project builds on prior research demonstrating the effectiveness of early environmental education in promoting pro-environmental behaviors (Chawla & Cushing, 2007; Evans et al., 2016). My goal is to document 3rd graders' developing understandings as a result of their participation in an inquiry-based sustainability-focused unit, taught over a 2-week period. The unit comprises two lessons that address water conservation, recycling, and biodiversity. The lessons are developed by the researcher in collaboration with participating classroom teachers to ensure alignment with the 3rd grade science curriculum. Teachers will play an active role, delivering the lessons in their classrooms, using inquiry-based strategies to facilitate discussions and help students construct meaningful understandings of the content.

Quantitative data will be gathered on pre- and post-lesson assessments of students to assess shifts in their environmental knowledge. The assessments will be developed by the researcher and are sensitive to the specific concepts and learning outcomes targeted in the 2-lesson unit. In addition, lessons will be videotaped to document the implementation of instructional activities and students' engagement with the lessons. Follow-up interviews with the teachers will be conducted to gain insights into the lessons' effectiveness and offer recommendations for improving future environmental education initiatives.

The goal of this study is to provide a deeper understanding of how early environmental education can be structured to maximize its impact on children's long-term sustainability knowledge and practices.

Keywords: Education; Environmental Education; Elementary Schools; Curriculum

Mentor(s):

Panayota Y Mantzicopoulos-James (Education)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1627**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Automated Journey Mapping: Empowering Survivor Support

Innovative Technology / Entrepreneurship / Design

Author(s):

Brandon Michael Dries† (DSB|JMHC); Yalan Mai† (DSB); Aidan Daniel Manickam† (DSB); Michelle Zi Jun Pan† (DSB)

Abstract:

[Abstract Redacted]

Keywords: Data Mining; AI; LLMs; Data for Good; Grief Journey

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1628**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Streamlining Proteomics Data Analysis: An R Shiny-Based Application with Statistical Step Recommendations for Enhanced Workflow Accuracy

Innovative Technology / Entrepreneurship / Design

Author(s):

Vatsal Sanjeevkumar Dudhaiya† (Engineering); Tingyu Yin† (Science)

Abstract:

The complex data generated by mass spectrometry (MS) requires several critical processing steps to ensure accurate and precise interpretation, leading to potentially life-saving conclusions. Traditional platforms, such as Perseus and MSstats, though widely used and customizable, require users to manually select each step in the workflow. This manual process increases the risk of human error and inaccuracy in downstream analyses and results. To address these challenges, we are developing an application tailored for proteomics that gives subsequent recommended steps based on statistical assumptions while also offering workflow flexibility. The data undergoes several downstream analysis stages, including transformation, case-control grouping, and filtering to remove entries with more than 30% NaN values. The workflow also includes normalization (either against a single protein or via median normalization) and offers various imputation methods to handle missing data, streamlining the analysis and improving reproducibility. With its integration into the R Shiny framework, this application delivers all of these features through an intuitive, user-friendly interface. Finally, we applied this new platform to analyze plasma samples from patients with Alzheimer's disease.

Keywords: Mass Spectrometry; R-Shiny; Smart Recommendations; Statistical Analysis; Proteomics Data Analysis

Mentor(s):

Marco Hadisurya (Agriculture)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1629**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Left Waiting: Barriers and Facilitators to Early Prenatal Care Access through the Experience of Pregnant People in Indiana

Social Sciences / Humanities / Education

Author(s):

Alexandra Sophia Finlayson† (HHS)

Abstract:

[Abstract Redacted]

Keywords: Prenatal Care; Healthcare; Health Outcomes; Pregnant People; Barriers

Mentor(s):

Kathryn Jean LaRoche (HHS)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1630**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Maternal Fetal Medicine Practice under Abortion Bans: A Study Protocol

Social Sciences / Humanities / Education

Author(s):

Isabella Marie Ford† (Science); Elissa Maria Finnessy† (HHS)

Abstract:

[Abstract Redacted]

Keywords: Qualitative; Abortion; Reproductive Health; Public Health

Mentor(s):

Kathryn Jean LaRoche (HHS)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1631**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Isolation of Novel Bacteriophage Natlani from Arthrobacter Globiformis

Life Sciences

Author(s):

Natalia Brynn Gaffney† (Agriculture); Leilani Grace Agngarayngay† (Agriculture|Engineering); Alexis Lucille Ador Bernal‡ (Agriculture|Engineering)

Abstract:

Bacteriophage, a type of virus that attacks specific bacteria to replicate its own DNA, can be utilized in several biotechnological contexts, from medical purposes such as phage therapy to agricultural enhancements to food safety and more. This research is focused on discovering a novel bacteriophage, Natlani, to pursue its bioinformatics and future usage. The research was conducted using aseptic techniques. Firstly, the phage was collected from a soil sample was isolated with a compatible bacteria, Arthrobacter globiformis. In order to achieve purification, serial dilutions were performed, and a lysate was collected. Lastly, to find a suitable titer for DNA extraction, this lysate was amplified. The lysate will be used to synthesize samples for characterization in order to select a genome for sequencing. Additional steps involve DNA extraction of the characterized genome, and lastly microscopy to pursue a study of its morphology, drawing conclusions of the function and application of this phage. This phage was archived into the SEA-PHAGES database under the name Natlani at Purdue University and the University of Pittsburgh. As the research on bacteriophage has been conducted within the frame of phage therapy and medical implications, it is hoped that through the next steps of DNA extraction, microscopy, and bioinformatic investigation, it will promote the usage of bacteriophage in this field.

Keywords: [no keywords provided]

Mentor(s):

Kari L Clase (Engineering); Julia Ann Simler (Agriculture); Amanda K Limiac (Engineering)

Other Acknowledgement(s):

Aaron J Gin (Purdue University); Ruba Ahmad Qwai Alajlouni (Agriculture)

**Poster Presentation Abstract Number: 1632**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Sleep and College Students: Exploring the Impact of Sleep Deprivation

Social Sciences / Humanities / Education

Author(s):

Renato Mauricio Gardella† (HHS)

Abstract:

Sleep deprivation has become a prevalent issue among college students, significantly affecting both mental health and academic performance. This exploratory research explores the relationship between sleep deprivation and its impact on cognitive functioning and emotional well-being. It also discusses the relevance of napping and other daily common behaviors among college students. To see how this translates to the Purdue community, a comprehensive survey has been made collecting data on students' sleep patterns, mental health status, and academic outcomes. These findings are analyzed in conjunction with statistics from Purdue's Counseling and Psychological Services (CAPS) to assess the extent to which sleep deprivation correlates with reported issues such as anxiety, depression, and academic difficulties. This research highlights the critical role of adequate sleep in maintaining students' mental health and academic success. The insights gained underscore the need for targeted interventions to improve sleep hygiene, which could enhance both cognitive performance and emotional resilience among college students. Further research is essential to develop strategies that effectively address sleep-related challenges in academic environments.

Keywords: Mental Health; Sleeping Habits; Academic Success; Sleep Deprivation

Mentor(s):

Michael Douglas Johnson (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1633**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Avionics Software Development for the FEMTA Suborbital Flight Experiment

Innovative Technology / Entrepreneurship / Design

Author(s):

Mahineer Ghosh† (Engineering); Varun Rajesh† (Engineering); Makeda Teshome Duey† (Engineering); Ansh Alpesh Kothari† (Engineering|JMHC)

Abstract:

The Film-Evaporation MEMS Tunable Array (FEMTA) project focuses on developing a micro propulsion thruster system using ultrapure deionized water as a propellant, designed for nanosatellite attitude control. The main objectives of the software team are to develop programs that will reliably save and protect experiment data, and read onboard sensors during flight to detect flight progression. The team is developing Arduino C++ code for the Adafruit Adalogger Feather M0 to manage sensor polling, data logging, and control operations for the FEMTA thruster. The code collects sensor data from onboard accelerometers and pressure sensors, using the I2C serial protocol, and logs this data to an SD card for future analysis. A vibration recorder is also used to save data in emergency situations, such as electronics failure. The software algorithm takes this sensor input to determine the flight stage (ascent, zero-gravity, descent) and conducts corresponding control of flow solenoid valves depending on the readings. To accurately detect the flight stage, the team is developing data smoothing and filtering algorithms, such as moving average filters and Kalman filters, to handle noise. These algorithms enable control over the thruster in varying flight stages, particularly by detecting critical transitions during the suborbital flight. Key focus areas include ensuring that the logging format and frequency are robust and optimized for the mission. The team's commitment to achieving efficient control with minimal processing overhead is essential to ensure the success of the FEMTA suborbital experiment.

Keywords: FEMTA; Avionics; Arduino; Space; Satellite

Mentor(s):

Jesus Adrian Meza Galvan (Engineering); Steven M Pugia (Engineering); Anthony G Cofer (Engineering); Alina Alexeenko (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1634**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# An in vivo assessment of cardiac biomechanical remodeling during chronic hypertension in murine pregnancy with 4D ultrasound

Life Sciences

Author(s):

Sarah Elizabeth Grev† (Engineering); Samantha Stebbings* (Engineering|JMHC); Jake Anthony Castro* (Engineering); Nadia Hayes Wheeler* (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Hypertension; Pregnancy; Cardiac Remodeling; Biomechanics; Ultrasound

Mentor(s):

Craig Goergen (Engineering); Elnaz Ghajar-Rahimi (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1635**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Bridging the Global Digital Divide: A Path Toward Inclusivity

Social Sciences / Humanities / Education

Author(s):

Aakrit Gupta† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Carla B Rosell (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1636**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Integrating Perspective-Taking into Undergraduate Curriculum

Social Sciences / Humanities / Education

Author(s):

Laura Evelyn Harriss† (Agriculture|JMHC); Ian McGill† (Science|JMHC); Elizabeth Darlene Gray† (Liberal Arts|JMHC)

Abstract:

[Abstract Redacted]

Keywords: Perspective-Taking; Intercultural Competence; Undergraduate Students; Learning Outcomes; Perspective Shifts

Mentor(s):

Aparajita Jaiswal (Purdue University)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1637**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Using rapid qualitative analysis to inform a community-engaged cervical cancer screening intervention for people experiencing homelessness

Social Sciences / Humanities / Education

Author(s):

Abigail Marie Higgins† (HHS); Arshia Bhuvana Rama† (Science); Lauren M Hopkins† (Science)

Abstract:

Traditional qualitative analysis, while valuable in providing rich understandings of people's lived experience, can be resource and time intensive, which is challenging for time-sensitive and action-oriented research. Rapid qualitative analysis is an increasingly popular approach to facilitate timely intervention development. We applied this approach to expedite the development of a cervical cancer education and screening navigation intervention, as part of a community-engaged study aimed at addressing cervical cancer disparities among people experiencing homelessness (PEH). Specifically, we sought to identify, and communicate to community partners, key findings from in-depth interviews with PEH related to their attitudes and experiences with cervical cancer screening. The rigor of traditional methods was maintained yet streamlined by summarizing audio-recordings of 30 interviews using a template organized by 12 domains of interest, reviewing summaries for consensus, and compiling summaries into matrices for synthesis. Key findings highlighted cervical cancer knowledge, screening barriers and facilitators, and willingness to try alternative screening methods believed to improve access, such as self-sampling. These were compiled into summary reports and presentations to 1) inform a human-centered design workshop with PEH to further explore motivators and concerns of self-sampling, and 2) provide real-time updates during community advisory board meetings to refine key components of our intervention design including healthcare navigation and education for PEH. By utilizing rapid qualitative analysis, we produced actionable deliverables for our partners to effectively advance to intervention development and implementation. Rapid qualitative analysis offers a valuable tool for producing timely results and should be considered for iterative, time-sensitive community-engaged research.

Keywords: Cervical Cancer; People Experiencing Homelessness; Qualitative Research; Community-Engaged Research

Mentor(s):

Lara Nicole Balian (HHS); Rebecca A Ziolkowski (HHS); Natalia Maria Rodriguez (HHS)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1638**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Granzyme A in CD4+ and CD8+ T Cells as a Crucial Link to Gut Microbiota Interaction and Antimicrobial Regulation

Life Sciences

Author(s):

Margaret Sarah Holcomb† (Science)

Abstract:

Granzyme A (GzmA), a serine protease primarily produced by immune cells, has traditionally been linked to immune-driven cell death of tumor and virus-infected cells. However, emerging evidence highlights its broader role in inflammatory processes and immune dysregulation. In conditions such as graft-versus-host disease (GVHD) following cancer immunotherapy, GzmA expression is significantly elevated, with T cell-derived GzmA playing a crucial role in disease severity. Our findings suggest that GzmA interacts with disease-associated microbiota, potentially enhancing their ability to trigger intestinal inflammation and exacerbate GVHD. The primary objectives of this study were to identify the main source of GzmA in the small intestine and to explore its role under normal conditions. While CD4+ and CD8+ cells expressing GzmA are essential for maintaining baseline GzmA levels, they are not the predominant producers. Instead, gamma delta T cells and NK cells appear to be the primary sources of GzmA in the intestine. Additionally, we observed a strong link between GzmA levels and the expression of antimicrobial peptides such as Reg3b, Reg3g, and Lyz1, which are involved in regulating gram-negative and gram-positive bacteria within the gut microbiome. This led us to hypothesize that GzmA plays a crucial role in antimicrobial regulation in the gut. Our qPCR analysis revealed significantly lower expression of these antimicrobial peptides in germ-free mice and mice with a knockout of GzmA in CD4+ and CD8+ T cells compared to wild-type controls, suggesting that CD4+ and CD8+ cells expressing GzmA are vital for the production of some antimicrobial peptides.

Keywords: GzmA; Antimicrobial Peptides; Regulation; T Cells

Mentor(s):

Matthew Olson (Science)

Other Acknowledgement(s):

Jenny Alejandra Rodriguez Osorio (Science)

**Poster Presentation Abstract Number: 1639**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Cultivating Mindfulness in Engineering Study Abroad

Social Sciences / Humanities / Education

Author(s):

Julia Hopper† (Science|JMHC); Jack Rearden Ferlazzo† (Engineering|JMHC); Ashley Jo Schafer† (DSB|JMHC); Vidya Reddy Madana‡ (Science)

Abstract:

[Abstract Redacted]

Keywords: Mindfulness Practices; Intentionality; STEM; Study Abroad; Reflection

Mentor(s):

Aparajita Jaiswal (Purdue University)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1640**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Determination of cyclical patterns in bobcat movement in relation to seasonal flooding along the Wabash River and its tributaries

Life Sciences

Author(s):

Sierra Hunnicutt† (Science|JMHC); Antonia Christina Alexiou† (Science|JMHC); Katie Luo Hong* (Agriculture); Abigail Rose Malott* (Agriculture|JMHC); Sabrina Michelle Hardy* (Science|JMHC)

Abstract:

Rivers and tributaries offer natural corridors for wildlife that allow them to travel without encountering natural barriers like farmland or urban cities. However, river fluctuations due to the change of seasons and weather alter the geography of the river corridors in a cyclical pattern. During wet periods, high water levels may restrict terrestrial animal movement and impede river crossings, while dry periods with low water levels make for critical corridors for terrestrial animals. Studies on small terrestrial mammals have observed cyclical cycles in movement attributed to water levels in flood plains, specifically that small mammals leave only when forced to and typically return to their original habitats once the water levels have receded. Bobcats (Lynx rufus) have historically held a crucial position in the Indiana ecosystem as prominent predators, and previous research from Hifi lab have obtained photographic evidence of bobcat movement along the Wabash River and its tributaries. While not particularly attracted to water, bobcats have been observed to use waterways for catching prey, defecation, and play with noticeable lack of hesitance. This study will attempt to define or reject a cyclical pattern in bobcat movement along the Wabash River and its tributaries through the use of camera trap data from September 2023 to the present. As climate change is expected to further impact riverbed flooding, it is crucial to understand how seasonal flooding impacts wildlife movement, especially in viable wildlife corridors. In this study, we hypothesize finding a pattern in the bobcat sightings correlating to river flooding which renders a few of our chosen study sites inaccessible for terrestrial animals, specifically in that the bobcats will return to the river corridors when water levels are low as opposed to establishing a new route outside of flooding dangers.

Keywords: Wildlife Corridor; Bobcat; Cycle; Biodiversity; Flooding

Mentor(s):

Kristen Marie Bellisario (JMHC)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1641**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# TAPS Military grief aid

Innovative Technology / Entrepreneurship / Design

Author(s):

Evan Mcpherson Hunt† (DSB); Jiwon Christopher Moon† (DSB); Christopher David Pontious† (DSB); Aochuan Shen† (DSB)

Abstract:

[Abstract Redacted]

Keywords: Data Mining; AI; LLM; Data for Good

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1642**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Phylogenetic Reconstruction of Tyrosine Kinase Evolution

Life Sciences

Author(s):

Rachel Marie Isaac† (Science|JMHC)

Abstract:

A central question in evolutionary biology is how chance and contingency influence evolution's outcomes. This question remains unresolved, in part, because it requires observing the repeated evolution of a trait, yet most traits have evolved only once. One exception is the independent evolution of tyrosine kinase (YK) activity. In this study, we identified the likely origins of YK activity by constructing a phylogenetic tree of kinases both with and without YK activity. We then identified candidate substitutions underlying YK activity by reconstructing ancestral sequences near the origins of YK. We focused on mitogen-activated protein kinase kinases (MAP2Ks), which can phosphorylate tyrosine, serine, and threonine residues—and used MAP3Ks as an outgroup, as they only phosphorylate serine and threonine. Sequences of kinase domains were obtained using the National Center for Biotechnology Information’s BLAST tool, and maximum likelihood was used to construct the tree, which includes over 4,000 sequences spanning eukaryotes. We then used our phylogeny and a model of sequence evolution to reconstruct ancestral sequences where YK activity likely emerged. Ancestral sequences were compared to identify substitutions responsible for YK activity. The sequences analyzed for YK activity have high posterior probabilities ranging from 0.85 to 0.89, indicating a good phylogenetic signal for reconstruction. By identifying and comparing substitutions responsible for YK activity in MAP2Ks with other independent emergences of YK, this study provides insights into the reproducibility of the evolutionary processes that led to YK activity and offers broader implications for understanding evolution.

Keywords: Evolution; Phylogenetics; Ancestral Sequence Reconstruction

Mentor(s):

Brian Patrick Ha Metzger (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1643**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# The Feasibility of the General Application of CRISPR Gene Editing Technology in the Treatment of Sickle Cell Disease

Social Sciences / Humanities / Education

Author(s):

Rishi Krishnan Iyer† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Carla B Rosell (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1644**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Testing the Snowball Earth hypothesis: Is there evidence for low-latitude glaciation? Geologic analysis of the Konnarock Formation, VA

Physical Sciences

Author(s):

Lauren Elizabeth Johnson† (Science|JMHC); Bethany Ruth Remian‡ (Science); Nicholas Ryan Borders‡ (Science|JMHC)

Abstract:

The Snowball Earth hypothesis suggests that our entire planet was covered by ice at least twice in its geologic history and that these climatic events were important for the evolution and diversification of life. A test of this hypothesis is that there should be a global-distribution of low-latitude glacial deposits. The purpose of this study is to analyze the Konnarock Formation of Virginia, establish an age for the Konnarock Formation, and determine if it was deposited during one of the Snowball Earth glaciation events. Our analysis consists of field work, measured stratigraphic sections, lithofacies descriptions, petrology of hand samples, petrographic analysis of thin sections, and zircon U-Pb geochronology of ash beds. The lithofacies descriptions of the Konnarock Formation are consistent with a glacial depositional environment. Glacial dropstones in collected hand samples and micro-dropstones in thin sections support this claim. Sedimentary features known to be associated with glacial depositional environments are also present in our measured sections and collected samples. Zircon U-Pb geochronology on volcanic ashes is ongoing and potentially will provide precise ages of the Konnarock Formation. Results thus far support a glacial depositional environment for the Konnarock Formation. If the ages determined from zircon U-Pb geochronology coincide with a major Snowball Earth glaciation event, then the hypothesis that glaciations during this time extended into the lower latitudes will be better established. These conclusions will have implications for the development of life on Earth.

Keywords: Snowball Earth; Geology; Sedimentary; Glacial

Mentor(s):

Kenneth D Ridgway (Science); Brandon Matthew Keough (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1645**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Electric Vehicle Charging Infrastructure Growth

Social Sciences / Humanities / Education

Author(s):

Arnav Juneja† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Carla B Rosell (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1646**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Spectral Analysis of Type Ia Nebular Supernovae

Physical Sciences

Author(s):

Akshith Karri† (Science)

Abstract:

Type Ia Supernovae are the most common type of Supernovae across the universe and are crucial tools for measuring cosmological distances. After the initial explosion, the gas around the ejecta cools down over time. During this nebular phase, cooling helps us observe the core of the ejecta, and we can measure the emission spectra of this core. These emission spectra can be used to infer a large variety of ejecta properties, ranging from temperature, density, and range of velocities exhibited by different gasses. However, these supernovae are known to show a large variety in their atomic spectra. This project aims to make a model by fitting the spectrum with six Gaussian curves for Iron, Nickel, and Calcium doublet emissions. The new model is expected to better describe the behavior of nebular phase supernovae while accounting for the previously ignored presence of Calcium, giving more details on the behavior of the gases, and can help better understand the variety in the spectra of Type Ia Supernovae.

Keywords: Supernova; Type Ia Supernova; Nebular Supernovae; Supernova Spectrum; Spectral Analysis

Mentor(s):

Abigail Polin (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1647**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Utilizing an Inducible System to Determine the Role of PP2A-B56a Activation in PDAC

Life Sciences

Author(s):

Emma Frances Kay† (Science); Ella Rose Deanne Chianis‡ (Science)

Abstract:

Pancreatic Ductal Adenocarcinoma (PDAC) has the worst 5-year survival rate of all major cancers, therefore there is an urgent need for further investigation and research. 90% of PDAC tumors are driven by a mutation in KRAS. Protein Phosphatase 2A (PP2A) is a serine/threonine phosphatase that can negatively regulate downstream effectors of KRAS. Because of this, PP2A is highly important when considering potential PDAC therapeutic strategies. The PP2A complex is made up of 3 subunits: scaffolding (A), regulatory (B), and catalytic (C). There are many different regulatory B subunits, and the function of the PP2A complex is determined by which particular B subunit is incorporated into the complex. Much remains unknown about the various regulatory B subunits and their effects on PP2A activation and function. The B subunit, B56a, was previously described as a tumor suppressor, but our lab found that, in PDAC, B56a overexpression promotes tumorigenic phenotypes by inducing the EGFR signaling pathway. In these studies, we have also found that stable overexpression of B56a does not completely phenocopy pharmacological activation of PP2A-B56a. We hypothesized that the cells were adapting to stable B56a overexpression. To test this, we created an inducible B56a cell line where the expression of B56a is controlled by doxycycline. The inducible system matches the phenotypes of both stable and pharmacological B56a overexpression. Additionally, long term induction of B56a results in increased B56a expression over time.

Keywords: [no keywords provided]

Mentor(s):

Brittany Lee Allen-Petersen (Science); Claire M Pfeffer (Science); Brittany Nicole Heil (Science)

Other Acknowledgement(s):

Sydney Joann Clifford (Science)

**Poster Presentation Abstract Number: 1648**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Modeling Deformable Cells Using Spherical Harmonics

Mathematical/Computation Sciences

Author(s):

Alexander G Kelley† (Science)

Abstract:

Understanding the shape of deformable cells is crucial for advancements in lab-on-chip technology, which relies on precise manipulation of cellular structures. This study presents an approach to modeling the shapes of deformable cells using linear combinations of spherical harmonics. Spherical harmonics are a set of orthogonal polynomial functions that are made up of the Legendre Polynomials. A key challenge addressed in this work is ensuring the modeled cells maintain a constant volume, an essential biological constraint. To enforce this volume conservation, we must propose an additional constraint on the linear combination of spherical harmonic coefficients. When computing the volume, we encounter the issue of negative radii in certain regions. This requires us to account for these cases to ensure the accuracy of our volume integrals. The volume integral is derived and used to plot the shapes of deformed cells that maintain constant volume. To validate our volume integral, we employ a Monte Carlo integration method to verify that the deformed cells maintain a constant volume.

Keywords: Mathematical Modeling; Applied Mathematics; Spherical Harmonics

Mentor(s):

Kaitlyn T. Hood (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1649**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Investigating the Impact of Student Organizations at Purdue University

Social Sciences / Humanities / Education

Author(s):

Robert Jake Kennedy† (Exploratory Studies)

Abstract:

My exploratory study examines the benefits of student organizations at Purdue University, focusing on their impact on students' academic success, social engagement, and career readiness. Utilizing surveys and semi-structured interviews, data was collected from a diverse group of students across various majors and organizations. The survey ultimately measures perceived benefits in three key areas, while interviews provided deeper insights into personal experiences and skill development. Additionally, the research incorporated evidence from credible outside sources, improving my analysis with established theories on student involvement and engagement. This preliminary research indicated how active participation in student organizations correlates with better academic performance, greater social connections, and valuable career related skills such as leadership, teamwork, and effective communication. Participants noted the significant social support these organizations provide, promoting a sense of belonging and community. Academically, many students highlighted the opportunities for collaborative learning and peer mentorship. From a career perspective, students reported that their involvement facilitated networking opportunities and the development of practical skills necessary to succeed in a work environment. This research highlights the various ways student organizations benefit Purdue students, offering insights that can inform future students about the importance of involvement. The evidence also provides recommendations for maximizing the benefits of student organizations at Purdue.

Keywords: Student Organizations; Purdue University; Academic Success; Social Engagement; Career Readiness

Mentor(s):

Michael Douglas Johnson (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1650**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# WileECoyote Bacteriophage Isolation and DNA Extraction

Life Sciences

Author(s):

Sreesha Vedavalli Kidambi† (Agriculture|Engineering); Jamie Youngjin Cho† (Agriculture|Engineering); Jason England Thiagarajan† (Agriculture|Engineering)

Abstract:

Purdue University students have participated in the SEA-PHAGES program since 2010 through the ABE226 Biotechnology Lab class. Through this program, students isolated over 51 bacteriophages (phages) from soil samples in Fall 2024. One group of three students isolated the phage 'WileECoyote.' To accomplish this, soil samples were purified through the use of sterile filters. The purified solution was then plated and incubated, using Arthrobacter globiformis as the host bacteria. WileECoyote's plaque morphology was roughly 1mm-2mm in diameter and clear. Resulting phages were isolated using several rounds of serial dilution. Soil sample collection and purification was an individual activity, but after phages were isolated, students worked in groups of three or four. Students then created and flooded webbed plates, and collected lysate for titer calculations and archival of samples. The titer of WileECoyote's lysate was 2E10 pfu/mL, which allowed it to be archived without any amplification. Students also extracted DNA from phages and observed the concentration of phage DNA in the resulting solution using spectrophotometers. This was accomplished by viewing the sample solution under a spectrophotometer several times, and then taking the average of the results after removing outliers. All phages isolated in Fall 2024 have been named by students and added to the PhagesDB SEA-PHAGES database. The project is ongoing, and several phages will be selected for DNA sequencing and genome annotation in coming months.

Keywords: Bacteriophage; SEA-Phages

Mentor(s):

Kari L Clase (Engineering); Ruba Ahmad Qwai Alajlouni (Agriculture)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1651**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# ECE270 Expander

Mathematical/Computation Sciences

Author(s):

Seeun Kim† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Minh Nam hoang Nguyen (Engineering); Junfei Li (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1652**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# The Design and Optimization of Delta-Sigma Analog-to-Digital Converters

Innovative Technology / Entrepreneurship / Design

Author(s):

Erik Kocinare† (Engineering); Thomas Allen Greer† (Engineering)

Abstract:

Analog-to-Digital Converters (ADCs) are the bridge between analog electronics and digital electronics. They come in various types, including Flash, Successive Approximation Register (SAR), and Delta-Sigma, and they come in various types, including flash, Successive Approximation Register (SAR), and Delta-Sigma. Delta-Sigma ADCs are commonly used in high-resolution and high-speed applications due to their unique architecture, which combines delta modulation (tracking the difference between signals) and sigma modulation (integrating these differences).

The performance of a Delta-Sigma ADC relies heavily on the design and optimization of its modulators, particularly the operational amplifiers (op-amps) within them. Achieving sufficient, or even optimal, ADC performance requires the optimization of these op-amps and the precise placement of microelectronic components, such as transistors, down to the micrometer scale. Key parameters, like speed, power consumption, and linearity, must be carefully balanced to meet performance targets, making the design process highly complex. This research explores the challenges and methodologies for optimizing Delta-Sigma ADCs, with the goal of enhancing efficiency, resolution, and speed in demanding applications.

Keywords: Analog to Digital Converters; Operational Amplifiers; Electrical Engineering

Mentor(s):

Archana Dharanipragada (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1653**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Association between the comprehensiveness of tobacco and nicotine regulations on their usage among youth and adults in each state in the U.S.

Life Sciences

Author(s):

Yen-Hsi Lai† (HHS)

Abstract:

Tobacco use is a major preventable cause of death in the US leading to approximately 20% of mortality issue. Governments have implemented comprehensive tobacco control laws to address this issue. This study evaluates whether more comprehensive tobacco control laws are associated with lower smoking rates across all the US states. 2022 State tobacco/nicotine laws were collected from the Centers for Disease Control and Prevention (CDC) and the American Lung Association (ALA). 2022 State-level youth and adult tobacco and nicotine use rates were retrieved from ALA. Tobacco/nicotine laws were rated from 0 (weak) to 8 (strong) according to their relative stringency. Bivariate linear regression analysis was employed to evaluate the association between stronger tobacco/nicotine laws on youth and adult smoking/nicotine use rates. Findings show that each additional tobacco/nicotine law is negatively associated with adult smoking rate ($B=-1.05$, $p<0.001$); adult nicotine use rate ($B=-0.41$, $p<0.01$); youth smoking rate ($B=-0.47$, $p<0.05$); and youth nicotine use rate ($B=-2.0$, $p<0.001$). These findings could support the need for stricter tobacco legislation as an effective public health strategy, guiding policymakers toward better regulation to reduce smoking rates, particularly in states with high smoking/nicotine-use rates.

Keywords: Public Health Legislation; Tobacco Control Policy; Nicotine Regulation; Law Comprehensiveness; Youth and Adult Smoking

Mentor(s):

Omobukola Otoise Usidame (HHS)

Other Acknowledgement(s):

Siqi Yang (HHS)

**Poster Presentation Abstract Number: 1654**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Analyzing Hamming Weight Attacks for Cryptographic Security on SoCET's AFT

Mathematical/Computation Sciences

Author(s):

Andrew James Larkins† (Engineering); Connor Ethan Behrend† (Engineering|JMHC); Michael Lee† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Verification

Mentor(s):

Burkay Sahin (Engineering); Jingbo Wang (Engineering); Mark Johnson (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1655**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Reanalysis of the Higgs Boson Discovery through the 2 Electron 2 Muon Channel

Physical Sciences

Author(s):

Jordan Larson† (Science|JMHC); Vitor Limas Schein† (Science); Justin Harrison Rothenberg† (Science); Tyler Mitchell† (Science); Aneesh Sai Katkam† (Science)

Abstract:

[Abstract Redacted]

Keywords: Higgs Boson; CERN; Standard Model; ZZ Channel

Mentor(s):

Andy Jung (Science); David Alan Ruiter (Science); Santosh Bhandari (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1656**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Heterogeneously Integrated low earth orbit sensor using polyethylene terephthalate (PET)

Innovative Technology / Entrepreneurship / Design

Author(s):

Kyung Jun Lee† (Engineering); Chun-Kang Huang† (Engineering); Daeun Kim† (Engineering); Tzu-Yun Liu† (Engineering)

Abstract:

The purpose of this research to design flexible and cost-effective chips that can be used for low-Earth orbit satellites. The chips will be fabricated using polyethylene terephthalate substrates, which provide durability and flexibility to withstand mechanical stress in space environments. The goal is to make reliable chips for satellite manufacturers and operators so that their products meet industry standards while keeping production costs low.

Experiments will be conducted to evaluate the mechanical properties of PET, focusing on stress, strain, and thermal resistance. The prototype will be tested under simulated low-orbit conditions to determine its durability and functionality. The results of these tests will guide improvements in material selection and electrode printing techniques, leading to a final optimized design.

Ultimately, the development of this chip could provide satellite manufacturers with a durable and cost-effective alternative for space electronics, contributing to more efficient satellite operations and cost savings.

Keywords: Heterogeneous Integration; Advanced Packaging; PET

Mentor(s):

Peter Bermel (Engineering); Mukerrem Cakmak (Engineering); Saeed Mohammadi (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1657**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Data-Driven Approach for Identifying Grief Stages in Military Survivors Using AI and Cloud Services

Innovative Technology / Entrepreneurship / Design

Author(s):

Chi Lin† (DSB); Aruneeth Ranjan Sil† (DSB); Sanjana Chinthalapalli Mohan† (DSB)

Abstract:

[Abstract Redacted]

Keywords: Data Mining; AI; LLMs; Data for Good; Grief Journey

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1658**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Community Revitalization through Empowerment and Inclusive Environments

Social Sciences / Humanities / Education

Author(s):

Leo Pearson Malachowski† (Engineering|JMHC); Bridget Katherine Heindl† (Liberal Arts|JMHC); Ayden Timothy Fahey‡ (Science|JMHC); Jennifer Lilian Yang‡ (Engineering|JMHC)

Abstract:

Community revitalization focuses on improving both the physical and social fabric of neighborhoods to enhance quality of life. This project examines how revitalizing communities can create spaces where families feel safe, empowered to thrive, and connected through shared interests and values. One of the core strategies focuses on community revitalization through the construction of affordable housing tailored to meet both the familial and financial needs of residents. By designing homes according to each homeowner's preferences, a sense of ownership, belonging, and emotional well-being is promoted—turning houses into homes.

Throughout the implementation of this strategy, Veenhoven's four qualities of life serve as a guiding framework: livability of the environment, life-ability of the individual, external utility of life, and inner appreciation of life. The research involves a multi-method approach, including door-to-door outreach, in-depth interviews, and structured surveys, to capture residents' perceptions of what makes a neighborhood safe and inclusive and how their new environments support these needs.

Initial findings draw on post-occupancy evaluations, indicating that while Habitat for Humanity (H4H) partner families value both their homes and the knowledge they gain through the building process, some express dissatisfaction with the neighborhood itself.

A significant milestone of this project has been the collaboration with the first homeowner and Habitat for Humanity, which has strengthened community engagement and project development. By honoring the homeowner's vision for her home's exterior, a sense of ownership and connection was fostered, transforming her house into a place of pride and belonging.

Keywords: Neighborhood Revitalization; Quality-of-Life; Community Engagement; Affordable Housing

Mentor(s):

Jason Ware (JMHC)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1659**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Analyzing bobcat presence based on nocturnal prey occupancy in mixed forest habitats

Life Sciences

Author(s):

Abigail Rose Malott† (Agriculture|JMHC); Katie Luo Hong* (Agriculture); Sierra Hunnicutt* (Science|JMHC); Sabrina Michelle Hardy* (Science|JMHC); Lukas Benjamin Kraft* (Agriculture|JMHC)

Abstract:

Bobcats (Lynx rufus) are cryptic animals that are mostly active during the night and rely on prey animals for their survival. Common species that are consumed by bobcats include raccoons (Procyon lotor), opossums (Didelphis virginiana), and white-tailed deer (Odocoileus virginianus). Through the use of habitat analysis and camera trapping, this research aims to assess the presence of bobcats in relation to the nocturnal presence of common prey species.

We have placed camera traps at 24 different sites displaying a range of habitat types, using bobcat feces as an attractant. Studies have found that bobcat feces also attract opossums and raccoons, which makes these species optimal for the purpose of this research, as they will be encouraged to approach deployed camera traps. By examining the habitat qualities of sites with known bobcat presence, we selected a range of similar sites to compare the occupancy of nocturnal prey species in bobcat-preferred habitats. Through the use of visual data provided by camera traps from September 2023 to April 2024, we can assess the occupancy of nocturnal prey species statistically and compare the results across sites with and without known bobcat residence. This can be done by creating graphs that show the overlap in species presence during different times in the day and analyzing the data using nonparametric statistical methods. We predict that a higher presence of nocturnal prey will correlate with known bobcat presence in our sites with mixed forest habitats.

Keywords: Bobcat; Nocturnal; Camera Trap; Mixed Forest; Habitat Selection

Mentor(s):

Kristen Marie Bellisario (JMHC)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1660**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Treatment of Rheumatoid Arthritis using Folate-Dexamethasone Drugs

Life Sciences

Author(s):

Charles W Mann† (Pharmacy|JMHC); Ananyaa Chaitanya Baindur† (HHS)

Abstract:

Rheumatoid Arthritis (RA) is an autoimmune disease characterized by chronic inflammation of the joints, often also leading to damage in connective tissues in other organs as well. The inflammation associated with RA is a result of the overactivation of immune cells such as M1 macrophages which secrete many inflammatory cytokines like TNF-????, IL-1, and IL-6. This overactivation can lead to tissue damage, thus treatment of RA must be able to induce a switch from M1 to M2 macrophages, which produce anti-inflammatory cytokines and promote tissue remodeling and immune regulatory functions. Such treatments are currently being done through steroids such as dexamethasone, which induces a phenotypic change from the proinflammatory M1 macrophage to the anti-inflammatory M2 macrophage. While steroids have been lifesaving for the treatment of RA, the side effects can be quite severe such as the development of type II diabetes, skin and muscle atrophy, and bone mass reduction. Additional side effects linked to excessive steroid use includes an increase in fatty acids in the bloodstream, as well as Cushing's Disease, which results in increased adipose tissue around the face and trunk. By exploiting the folate receptors on M1 macrophages which are highly expressed on activated macrophages at sites of inflammation, targeted delivery of steroids can be done, thus leading to a reduction of these side effects and therefore better outcomes for the patients. This study analyzed the effectiveness as well as potential side effects of 2 targeted steroids against the commonly used dexamethasone using a mouse model.

Keywords: Autoimmune Disease; Steroids; Folate Receptors; Rheumatoid Arthritis; Targeted Drug Delivery

Mentor(s):

Philip S Low (Science); Mahesh Kumar Rao Yelineni (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1661**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Phytomining as Ancestral Knowledge in Colombian Gold Mining

Social Sciences / Humanities / Education

Author(s):

Alex Mauricio Marin Villanueva† (Universidad Nacional de Colombia)

Abstract:

[Abstract Redacted]

Keywords: Phytomining; Ancestral Knowledge; Yarumo mucilage; Sustainable Gold Mining; Sustainability

Mentor(s):

Dutt Jagdish Thakkar (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1662**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Study on Methods for Object Detection within Cryo-Em Dataset

Life Sciences

Author(s):

Anika Mathur† (Science); Jiwon Seo† (Science); Samskrithi Sivakumar† (Science); Charles Chen† (Science); Sein Kim† (Science)

Abstract:

[Abstract Redacted]

Keywords: Cryo-Electron Microscopy (Cryo-EM); Machine Learning; Faster Region-Based Convolutional Neural Networks (Faster R-CNNs); Template Matching; K-Means

Mentor(s):

Brett A Meyers (Centers & Institutes); Pavlos Vlachos (Engineering); Lauren Ann Metskas (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1663**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Periodical Cicadas and the Effects of Herbicide Use

Life Sciences

Author(s):

Keith Meyers† (Science|JMHC); Zhixin Cai* (Science|JMHC)

Abstract:

The genus Magicicada contains six species of insects, commonly referred to as periodical cicadas due to their periodic, synchronized life cycles that contain either 13-year or 17-year juvenile stages. Periodical cicada nymphs emerge from the soil from April to June in Eastern North America and live as adults for six to eight weeks. In the last 30 years, herbicide use in the United States has increased in both agricultural and natural land management, and may have implications for periodical cicada emergence patterns. While herbicides have played a critical role in meeting global food supply demands, they can have negative effects on soil and ecosystem health. Glyphosate, the primary ingredient in RoundUp, is one of the most commonly used herbicides across the United States and reduces reproduction rates in burrowing earthworms. In order to study the effect of glyphosate on periodical cicada emergence patterns, audio recordings captured by citizen scientists were used to indicate presence or absence of periodical cicadas in counties in Indiana and Illinois. The estimated use of glyphosate on agricultural land in pounds per square mile was last measured in 2017. During that time, the cicada nymphs of the 2024 emergence season were underground and possibly exposed to the herbicide. In order to study the effects of glyphosate on periodical cicada emergences, the number of emergence events in each county was compared to the estimated amount of glyphosate applied to agricultural fields in that county over a one year period.

Keywords: Cicada; Periodical; Herbicide; Glyphosate

Mentor(s):

Kristen Marie Bellisario (JMHC); Christine Harrison Elliott (Agriculture)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1664**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Does the gender of a child influence a parent's use of management language?

Social Sciences / Humanities / Education

Author(s):

Maggie Brinn Miller† (HHS); Divya Tarika Durai† (HHS)

Abstract:

Gender differences in math learning appear as early as kindergarten (Penner & Paret, 2008). Parents can enhance children's math learning during shared activities by supporting their autonomy with management language, such as directing them to find patterns. However, parents may approach autonomy support differently depending on the child's gender. We investigated if children's gender was associated with parents' use of management language during shared math-based activities. Parents and preschoolers were recorded over Zoom engaging in laundry and grocery sorting activities together in which they were instructed to play with them however they liked. Participants were assigned to two conditions: a Math condition (n = 35) where they received math tip cards to incorporate math concepts into the activities, and a Control condition without tip cards. Videos were transcribed and parent management language was coded using a scheme from Clements et al. (2021) to determine the frequency of management language used by parents with boys (n = 30) and girls (n = 40). Preliminary findings with a subset of the sample (n = 18) indicate that parents with boys (n = 7,M = 49.43,?SD = 22.04) had more management language utterances than parents with girls (n = 11,?M = 23.68,?SD = 11.50). Our final analysis will look at gender comparisons for the entire sample and examine whether emphasizing math in the activity affects gender differences in management language. Though the implications of this study are multifaceted, we speculate that parent gender may play an important role in shaping parent management language.

Keywords: Parent Management Language; Autonomy Support; Gender; Math Talk; Early Childhood

Mentor(s):

Sarah Eason (HHS); Salvador Roberto Vazquez (HHS); Siqi Zhang (HHS)

Other Acknowledgement(s):

Can Carkoglu (HHS)

**Poster Presentation Abstract Number: 1665**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Role of beneficial fungi on polyphenol content and antioxidant activity of potato tubers

Life Sciences

Author(s):

Ashley Zaira Mohammed† (Agriculture|JMHC)

Abstract:

Potatoes (Solanum tuberosum L.) are considered a common staple food source worldwide. Due to their nutrient content and versatility, potatoes are also widely used in the food industry. Previous studies have shown that treatment with beneficial fungi, intended for crop yield enhancement, can impact tuber polyphenol content and antioxidant activity. In this study, three potato varieties – Yukon Gold (YG), Dark Red Norland (DRN), and Adirondack Blue (AB) – were treated with different mycorrhizal fungi (Control, AGTIV, PA127B, CR3116A), Trichoderma harzianum (RS), which is considered a biocontrol fungus, and AGTIV+RS to assess the impact of these soil microorganisms on tuber bioactive compounds. The potatoes were grown in two fields to assess the role of different soil locations. The experimental results suggest that treatment and location had a significant impact on polyphenol content in YG, but only location had a significant impact on antioxidant activity. AGTIV and PA127B had the most significant impacts on total phenolic content and antioxidant activity, respectively, while no treatments significantly impacted AB and DRN. In AB and DRN, location significantly impacted polyphenol content. Location and treatments had no significant effect on the antioxidant activity of AB and DRN. These results suggest that the impact of fungal treatments depends on the potato variety and location. Further studies should focus on how the soil type affects the benefits of fungi on different potato varieties.

Keywords: [no keywords provided]

Mentor(s):

Lavanya Reddivari (Agriculture); Heather R Milliron (Agriculture)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1666**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Investigating Technological Solutions for Environmental Challenges and Sustainable Development in Airports

Innovative Technology / Entrepreneurship / Design

Author(s):

Kamanda K Mosongo† (Polytechnic|JMHC)

Abstract:

Airport planning increasingly requires a focus on how emerging technologies can enhance sustainability and mitigate environmental impacts. While numerous studies have examined sustainability in airports, they often lack a comprehensive analysis of technology's role in these efforts. This research aims to address this gap by exploring two key questions:

1. What perspectives do industry stakeholders hold regarding the potential of emerging technologies to mitigate environmental impacts in airport operations?

2. In what ways are various technologies utilized to inform and enhance the long-term planning processes of airport projects, and how do these technologies influence decision-making?

Although technology presents significant opportunities for sustainable development, it also introduces challenges, such as high costs, rapid obsolescence, and ethical considerations surrounding sourcing. This study investigates how environmentally friendly technologies can be effectively integrated into airport planning. Through a review of relevant literature, interviews with airport executives on their use of sustainable technologies, and analysis of updated airport manuals and SOPs, the research will highlight differences and similarities among various airport hubs.

The findings will provide insights into how airports can successfully incorporate sustainability into their planning processes. Ultimately, this research will contribute valuable information for future airport planning initiatives, guiding efforts to better integrate environmental considerations and technology in the industry.

Keywords: Environmentalism; Sustainability; Airport Planning; Technology; Planning

Mentor(s):

Caroline Kathure Marete (Polytechnic)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1667**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# COVID-19 Effects On Pedestrians

Mathematical/Computation Sciences

Author(s):

Piotr Stanislaw Nabrzyski† (Engineering); Keegan Brenner Harris† (Science); Shlok Ashish Sheth† (Science); Joonyeoup Kim† (Engineering); William Benjamin Tao† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: SVM; Pedestrians; HOG; Classification; COVID-19

Mentor(s):

Edward J Delp (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1668**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Thrombus Characterization in Abdominal Aortic Aneurysm and Aortic Dissection Models Using Histology and Scanning Electron Microscopy

Innovative Technology / Entrepreneurship / Design

Author(s):

Niharika Narra† (Engineering|JMHC)

Abstract:

[Abstract Redacted]

Keywords: Aortic Aneurysms; Aortic Dissections; Cardiovascular Imaging

Mentor(s):

Cortland Hannah Johns (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1669**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Exploring Study Abroad Through Transformative Learning: Insights from Engineering Undergraduates

Innovative Technology / Entrepreneurship / Design

Author(s):

Jack Robert Nelson† (Agriculture|JMHC); Katherine Josephine Cheh† (DSB|JMHC); Akshat Garg† (Polytechnic|JMHC)

Abstract:

[Abstract Redacted]

Keywords: Intercultural Competency; STEM; Study Abroad

Mentor(s):

Aparajita Jaiswal (Purdue University)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1670**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Effects of BMI on Alpha Band Activity between Obese and Non-Obese Individuals During Resting EEG

Life Sciences

Author(s):

Jillian G O'Flaherty† (Other)

Abstract:

Obesity has been linked with sub-optimal brain function. Variations in BMI are associated with alteration in desynchronization patterns in brain oscillations derived from resting electroencephalogram (EEG), with higher body weight or obese individuals showing larger power of oscillations at alpha frequency band compared with their lower body weight or non-obese counterparts. Given that alpha band activity has an inverse relationship with cortical activation, these findings suggest that obesity may be related to lower resting brain activation. However, it is unclear if the relationship between weight status and EEG alpha activity was confounded by cardiorespiratory fitness, a known contributing factor of cognitive and brain health. The purpose of this study was to investigate the difference in resting EEG alpha activity between obese and non-obese young adults while controlling for cardiorespiratory fitness.

Our study grouped 22 participants into obese (21.9 ± 2.7 yr, female = 3) and non-obese (22.8 ± 2.8 yr, female = 3) groups while matching sex, age, and cardiorespiratory fitness. Cardiorespiratory fitness was estimated by the maximum oxygen consumption (V?O2max) using a treadmill-based modified Balke Protocol. The alpha frequency band was defined as brain oscillations at 10-13 Hz and the power of alpha activity was estimated using resting EEG recorded during the eye-closed and eye-open conditions.

The results showed significantly higher alpha power during the eye-closed condition that the eye-open condition in both the obese and non-obese groups, with the largest vision-related difference being observed in the occipital region. Using the occipital electrodes as the region of interest, the obese group showed smaller alpha power during the eye-open condition compared to the non-obese group while no such between-group difference was found during the eye-closed condition. These results demonstrates that obese individuals displayed higher activation in the occipital cortex compared with the non-obese participants when the environmental visual input was presented, suggesting a negative influence of obesity on resting visual neural efficiency.

Keywords: Electroencephalography; Obesity; Brain Oscillation; Cortical Activation

Mentor(s):

Shih-chun Kao (HHS)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1671**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Crystallization of Complex between Nucleolin Protein and MYC Promoter G-quadruplex DNA

Life Sciences

Author(s):

Rio Ohtake† (Pharmacy|JMHC)

Abstract:

[Abstract Redacted]

Keywords: MYC; G-quadruplex; Nucleolin; Crystallization; Anticancer

Mentor(s):

Luying Chen (Pharmacy)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1672**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# AIM: Mus2Vid

Mathematical/Computation Sciences

Author(s):

Jonathan Aimison Oppenheimer† (Science); Henry Hengyi Tsay† (Science); Lucas Tan† (Science); Thanmaya Pattanashetty† (Science); Shiva Sai Vummaji‡ (Science); Tim Nadolsky‡ (Science); Chiho Song‡ (Science); Liam Matthew Stonestreet‡ (Science); Haichang Li‡ (Polytechnic)

Abstract:

[Abstract Redacted]

Keywords: Music Visualization; Hearing Accessibility; Generative Artificial Intelligence; Stable Diffusion; Audio Feature Extraction

Mentor(s):

Yeon Ji Yun (Liberal Arts); Yung-Hsiang Lu (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1673**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Big Higgs Digs Sig Figs

Physical Sciences

Author(s):

Cadance William Lucas Ormsby† (Science|JMHC); Sri Krishna Teja Mannava† (Science); Abhiansh Parwal† (Science); Erlin Daniel Pineda Hernandez† (Science)

Abstract:

[Abstract Redacted]

Keywords: Higgs Boson; TDM323; Physics

Mentor(s):

David Alan Ruiter (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1674**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Stress and its Effect on the Mental Health of College Students

Social Sciences / Humanities / Education

Author(s):

Nina Jo Parham† (Exploratory Studies)

Abstract:

This exploratory research project investigates the stress experienced by college students and its significant impact on mental health. The research aims to answer the question, “How is chronic stress affecting college students and their mental and physical health?” through an examination of multiple reliable sources and an analysis of the support offered by Purdue University’s therapeutic resources. Additionally, I will explore the contributing factors to academic stress, such as increased responsibilities, poor time management, and transitional challenges faced by first-year students. Incidence rates indicate that over 60% of college students feel overwhelmed by academic responsibilities, with a Gallup poll revealing that 66% of students reported experiencing stress and 51% felt worried throughout the day. To better understand this issue, I administered a 10-question survey to students at Purdue that gathered data on “Is going to CAPS help you with your academics.” This research is important because CAPS provides professional support for managing stress, anxiety, depression, and other mental health issues. This project underscores the widespread nature of stress among students and emphasizes the urgent need for effective mental health support within academic settings. By addressing these issues, institutions can better support student well-being and academic success.

Keywords: [no keywords provided]

Mentor(s):

Michael Douglas Johnson (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1675**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Investigation of Adhesive Joints in Printed Autoclave Tooling

Innovative Technology / Entrepreneurship / Design

Author(s):

Paul Kyu-Hwan Park† (Polytechnic); Caden Cole Cowles‡ (Polytechnic)

Abstract:

Additively manufactured fiber-reinforced composites are widely used in composite part manufacturing tooling due to reduced lead time, cost, and labor in tool manufacturing. In tool fabrication, due to the limited dimensional capacity, large tooling must be printed in sections and joined together. Adhesives are commonly used because of their simple application process and ability to achieve a vacuum-sealed surface. The manufacturing process often requires curing cycles with temperatures up to 180 °C. During the cure cycle, a mismatch between the coefficients of thermal expansion (CTE) of the base substrate and the adhesive can cause failures in the adhesive joints. These failures not only compromise the structural integrity of the tool but create air pathways that affect the vacuum seal. Therefore, this research investigated the influence of thermal cycles on adhesive joints within additively manufactured fiber-reinforced composites. To quantify the integrity of adhesive joints, mode I interlaminar fracture toughness was measured using the double cantilever beam (DCB) fracture test. The test specimens were printed with polyethersulfone (PESU) reinforced with 25% by weight of carbon fiber. The fracture toughness of the test specimens was analyzed throughout 10 thermal cycles, and the influence of repeated thermal cycles on the adhesive integrity was investigated.

Keywords: Adhesives; Composites; Tooling; Additive Manufacturing; 3D Printing

Mentor(s):

Garam Kim (Polytechnic); Jacob Robert Montrose (Polytechnic); Eduardo Barocio Vaca (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1676**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Revolutionizing Real Time Healthcare with Artificial Intelligence: Addressing the Scope of Artificial Intelligence in Improved Patient Outcomes

Social Sciences / Humanities / Education

Author(s):

Harshitha Pathania† (Liberal Arts)

Abstract:

This paper aims to explore the intersection of two emerging fields- Artificial Intelligence and Healthcare, with special emphasis on the enhancement of enhanced patient outcomes by using Artificial Intelligence. It examines current research, interviews of healthcare professionals and case studies to briefly discuss the current and predicted applications of Artificial Intelligence, followed by the challenges, thereby assessing the role of Artificial Intelligence in Improved Patient Outcomes by providing a comprehensive review. This assessment can be further developed to help bridge the gap between technological advancements and equal and accessible healthcare. It can also result in significantly improving the experience of both patients and healthcare professionals. Specified research in areas like tailoring Artificial Intelligence for data analysis, patient engagement and different clinical settings can be developed on this comprehensive review. The purpose is to carry out an investigation so that the myths and fears surrounding this topic do not undermine the potential of this revolutionary technology.

Keywords: Artificial Intelligence; Healthcare; Improved Patient Outcomes

Mentor(s):

Beth Elly Baumgartner (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1677**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# From Minuscule to Monumental: Assessing Nanotechnology

Social Sciences / Humanities / Education

Author(s):

Vishwajit Laxmanrao Patil† (Engineering)

Abstract:

Cancer causes 7.6 million deaths each year around the globe (Gmeiner and Ghosh, 111). Current treatment methods for diseases like cancer have limited effectiveness including causing numerous harmful side effects. Nanotechnology has emerged as a transformative force in the medical field, offering innovative solutions to treat a range of diseases. In this exploratory research project, I investigate how nanotechnology based treatments are potentially more effective than traditional approaches. I also acknowledge the drawbacks of this technology and provide recommendations to maximize the benefits and minimize the risks and constraints. To investigate this topic, I have conducted a preliminary literature review involving recently published peer-reviewed studies and popular sources. The research highlights key advantages of using nanotechnology to treat diseases like targeted drug delivery and reduced side effects, nanoparticles' ability to cross biological barriers, eradication of virus reservoirs and many more. Despite these promising advances, nanotechnology has its own set of limitations including potential toxicity of nanoparticles, possible unexpected immune responses and affordability of the treatment. Ultimately, this research underscores the need for further, in-depth research and clinical trials on humans to minimize the drawbacks associated with nanotechnology.

Keywords: Nanotechnology; Disease; Treatment

Mentor(s):

Carla B Rosell (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1678**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Dissociating the Influence of Music and Video Game Experience on Visual Attention

Social Sciences / Humanities / Education

Author(s):

Mohammad Pehlari† (HHS); Carly Grace Booth* (HHS); Vineeth Surya Narra* (HHS); Grace Maria Moorman* (HHS); Lucy Pauline Murphy* (HHS); Jackson Tyler Wrubel* (HHS|JMHC); Mary Aileen Jann* (Science|JMHC)

Abstract:

A number of studies have shown that playing action video games leads to improved aspects of cognition, such as perception, attention, and faster response times. Similarly, studies have also shown that learning to play a musical instrument leads to improved aspects of some of the same cognitive domains. However, there have not been many studies directly comparing cognitive benefits of these activities within the same study. In the current pre-registered study, we investigated the influence of self-reported video game and music experience using a cross-sectional research design. Participants were recruited from the introductory psychology classes at a large, public Midwestern university. In an initial session conducted online, participants completed self-report questionnaires about their current and prior video game and music experience and ability. In a subsequent in-person session, participants completed multiple computerized tasks to assess visual perception (Useful Field of View Task) and visual attention (Simon Task, Spatial Stroop Task). These tasks have been used in prior studies examining video game and music benefits. Finally, the Advanced Measures of Music Audiation (AMMA) was used to assess participants' musical aptitude, as a means to supplement and confirm their self-reported music ability. The results are discussed in relation to the previous literature on cognitive enhancement.

Keywords: Music; Video Game; Visual Attention; Reaction Time

Mentor(s):

Thomas S Redick (HHS); Alexa Kristina Bushinski (HHS)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1679**
*Presentation Time: Session 4: 1:30pm-2:30pm*

## Classifying grief stages with survey data

Innovative Technology / Entrepreneurship / Design

Author(s):

Ricardo Andres Pena Rojas† (DSB|JMHC); Matthew Mellor Pierce† (DSB); Bradley J White† (DSB); Lejia Zhou† (DSB)

Abstract:

[Abstract Redacted]

Keywords: Data Mining; AI; LLMs; Data for Good; Grief Journey

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1680**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Bubble Nucleation Drives Droplet Coalesence

Physical Sciences

Author(s):

Lillian Faith Pierce† (HHS)

Abstract:

[Abstract Redacted]

Keywords: Electrochemiluminescence; Bubbles; Droplets; Precipitation; Microscopy

Mentor(s):

Brady Robert Layman (Science); Megan Leigh Hill (Science); Jeffrey Edward Dick (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1681**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# The Effect of Differing Doxorubicin Concentrations on Human Cancer Strains

Life Sciences

Author(s):

Aditya Pillai† (Science|JMHC)

Abstract:

This study investigates the effect of Doxorubicin, a chemotherapy drug, on the proliferation of various human malignant peripheral nerve sheath tumour cell lines . A dose-response assay was used to expose the cells to different concentrations of the chemotherapeutic for 120 hours (5 days), then an MTT proliferation assay was used to measure cell growth. The results from the experiments show that the proliferation of the cells gradually decreases with the increase in concentration until a critical value is hit, after which there is a dramatic drop in cell viability. This response to the chemotherapeutic drug can be visualised by generating a dose response curve with the data collected from the MTT assay. These graphs can be used to estimate the IC50 value of each drug-cell line pair, these values tell us how much of the drug is needed to inhibit the growth of the cancers by half. For this project I have conducted experiments to determine the IC50 value for five human cell lines. The human cell line selection consists of HEK293T (embryonic kidney cells) ST8814 (MPNST), sNF96.2 (MPNST ), STS26T (MPNST) and T265 (MPNST). Each experiment consisted of three trails and the experiments for some lines were repeated multiple times to ensure the accuracy of the values produced. The purpose of this project is to determine if the cancer cells are more sensitive to the chemotherapeutic than non-cancer cells.

Keywords: Human Cancer; Mammalian Cell Culture; Chemotherapy; Doxorubicin

Mentor(s):

GuangJun Zhang (Vet Med); Dingxun Wang (Vet Med)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1682**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Sickle Cell and Family Planning: An Indiana Study Protocol

Life Sciences

Author(s):

Alana Powell† (HHS)

Abstract:

[Abstract Redacted]

Keywords: Reproductive Justice; Sickle Cell Disease; Indiana

Mentor(s):

Kathryn Jean LaRoche (HHS)

Other Acknowledgement(s):

Fatimah Bisola Lawal (HHS); Anayra Maldonado Quiles (HHS); Kayra Gizem Ucpinar (HHS); Oluwapamimo J Fafowora (Office of the Provost)

**Poster Presentation Abstract Number: 1683**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# What Motivates Undergraduate Students to Enroll in Death Education Courses?

Social Sciences / Humanities / Education

Author(s):

Isyss Mystique Pranger† (Liberal Arts)

Abstract:

[Abstract Redacted]

Keywords: Death Education; Death and Dying; Thanatology; Student Motivation; Enrollment

Mentor(s):

Heather L Servaty-Seib (Office of the Provost); Panayota Y Mantzicopoulos-James (Education)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1684**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Urban Fire Zones: Simulation and Planning

Mathematical/Computation Sciences

Author(s):

Mridu Prashanth† (Science)

Abstract:

Urban regions in the Wildland Urban Interface (WUI) consist of a complex collection of buildings and trees. These urban areas are hence at high risk of fires due to their connections to fuel sources. They not only contain significant property but also host human life, increasing the potential for catastrophic losses in the event of a fire. In order to curb the effects of fires in the WUI, we curb the fire spread. To this end, studying the configurations of buildings and trees in the region is a rewarding – albeit challenging – task. It aids us in making observations about which configurations inhibit and which promote the growth of fires. We employ a computational fluid dynamics simulator to simulate fire spread in different urban layout configurations under various environmental conditions (speed and direction of wind, start locations of fire, etc). Further, we study the correlation between the risk of fire spread as identified by benchmark datasets and the structural configuration layouts for buildings and trees. This is done using various top-down and bottom-up clustering methods applied on building and tree networks that are represented using graphs. Our results highlight certain urban layouts that are most aggravating to fire spread. Our methods hence involve computer graphics simulation tasks and statistical analysis tools to identify urban layout configurations that curb fire spread. We report the most prominent results in urban modeling and simulation.

Keywords: Simulations; Urban Planning; Fire Zones; Wildland Urban Interfaces; Urban Layouts

Mentor(s):

Daniel G Aliaga (Science); Aniket Bera (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1685**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Exploring Fantasy Enactment and Self-Disclosure Themes in Offender-to-Offender Communication: A Comparative Study of Adult and Peer-to-Peer Groomer Digital Evidence

Innovative Technology / Entrepreneurship / Design

Author(s):

Reeya Ramasamy† (Polytechnic)

Abstract:

According to a study published in the Journal of the American Medical Association Network Open, one in six US children experience online sexual abuse. With a growing number of cases, the concept of harmful sexual behavior is becoming more prevalent. While prior work has examined online sexual abuse processes occurring between an adult and a minor, peer-to-peer grooming between minors has recently garnered attention. This case study compares the differences in fantasy enactment and negotiation in offender-to-offender communication in both minor peer-to-peer grooming and adult online sexual grooming scenarios, which has yet to be studied. This case study covers two separate cases: one in which adult offenders discuss online sexual abuse and one in which minor offenders discuss online sexual abuse. The adult offender cases include two chats between two adults regarding child online sexual grooming, while the peer-to-peer grooming covers 10 chats between two minors. This case study analyzes the differences in fantasy enactment and self-disclosure themes between adult offenders and peer-to-peer groomers to gain a deeper understanding of these dynamics in offender-to-offender chats involving child sexual abuse. By understanding these dynamics, researchers and law enforcement can develop more effective intervention and prevention strategies tailored to the specific communication patterns and motivations of different offender groups. With more than 33% of sexual offenses against children being committed by other children, it is important to further understand the fantasy enactment and discussions that take place in peer-to-peer grooming to reduce this statistic.

Keywords: Peer Grooming; Online Sexual Abuse; Case Study

Mentor(s):

Kathryn Seigfried-Spellar (Polytechnic); Tatiana Ringenberg (Polytechnic)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1686**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Identifying Novel Phages Infecting Arthrobacter globiformis

Life Sciences

Author(s):

Emily Joy Reeves† (Agriculture); Ally Morgan Wigand† (Agriculture|Engineering)

Abstract:

[Abstract Redacted]

Keywords: Bacteriophage; SEA-Phages; Arthrobacter globiformis; Temperate Phage

Mentor(s):

Aaron J Gin (Purdue University)

Other Acknowledgement(s):

Amanda K Limiac (Engineering)

**Poster Presentation Abstract Number: 1687**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# SoCET MITLL Tapeout

Innovative Technology / Entrepreneurship / Design

Author(s):

Alexander Repikov† (Engineering|JMHC); Robert Yida Zhang† (Engineering|JMHC); Nathan Nanchuen Yu† (Engineering); Moe Wai Yan Myint† (Engineering); Fatma Mohamed Ahmed Youssef Alagroudy† (Engineering); Yara Ahmed Mohamed Abbas† (Engineering); Khoi Anh Nguyen† (Engineering)

Abstract:

The primary goal of this project is to take the design for the AFTx07, a chip that was designed by the SoCET digital design team, and convert that into a state where it can be sent out and manufactured (this process is called a “tape-out”).

Specifically, we would like to implement the MITLL 90 nm PDK. This set of libraries converts the more abstract design of a semiconductor chip into a physical layout that can then be fabricated. Previously, we used a different PDK (SkyWater 130 nm), and this will be the first ti me that we are using this new process on this design. The new MITLL PDK is built around smaller transistors, which are inherently more efficient. Additionally, because everything is smaller, we can fit more things (such as more memory) on a chip of the same size, improving performance even further.

Implementing the PDK involves many different sections, all of which must work together effectively for a successful tape out. Some examples include planning where on the chip everything goes, placing all the different logic gates around the chip, connecting all those different gates together, optimizing the design for lower power consumption and increased performance, and validating that everything works as expected.

Keywords: SoCET; Tapeout; Semiconductor

Mentor(s):

Timothy Francis Hein (Engineering); Mark Johnson (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1688**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Customer Feedback Analysis Using NLP Techniques

Innovative Technology / Entrepreneurship / Design

Author(s):

Joshua Michael Ringler† (DSB); Matthew P Russell† (DSB); YoonJeong Choi† (DSB); Bocheng Wang† (DSB); Jonathan Damin Shi† (DSB); Sahil Maurice† (DSB)

Abstract:

This project uses natural language processing (NLP) techniques and data mining approaches to develop machine learning models that classify customer comments for a packaging company. By analyzing existing customer feedback and associated labels, we automatically categorize comments based on their sentiment, topic, or relevance.

The core methods involve data preprocessing steps, including text normalization, tokenization, and feature extraction using techniques like TF-IDF or word embeddings to transform the raw text into structured inputs suitable for machine learning algorithms. Support Vector Machines (SVM) and Random Forest classifiers are employed for classification tasks. Additionally, K-Nearest Neighbors (KNN) clustering is used to explore groupings within the data, helping refine the understanding of comment structure and customer concerns.

The project aims to improve the efficiency and accuracy of comment classification by training models on historical customer data and applying them to new feedback. This has the potential to streamline customer service operations and enhance business decision-making. Model performance will be evaluated using precision, recall, F1 scores, and other relevant metrics, with cross-validation techniques ensuring robustness and generalization.

Keywords: AI; Machine Learning; LLM; Text Mining; Natural Language Processing

Mentor(s):

Xing Wang (DSB); Wenyong Xu (DSB)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1689**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Understanding the domains responsible for in planta localization of a Ralstonia core effector protein

Life Sciences

Author(s):

Mateus Rocha Ripari† (Agriculture); Paula Natalia Natalia Paez Monroy† (Universidad Nacional de Colombia); Erica Kaser* (Agriculture); Keila Aika Keikilani Jellings* (Science); Elise Bennett* (Utah Valley University)

Abstract:

Breeding for crop varieties resistant to globally significant pathogens — such as Ralstonia solanacearum — is necessary to prevent yield losses and ensure food security. The study of effector proteins used by Ralstonia to modulate plant immune responses, is essential for this effort. RipU is a core effector protein which aids in Ralstonia virulence and is conserved across 95% of Ralstonia strains. Characterizing core effectors can promote generating host resistance to multiple Ralstonia strains at once. Understanding effector localization in the plant cells and the protein domain responsible for such localization is a key aspect of effector studies. In this project, we explore the in-planta localization of RipU effectors from two strains of Ralstonia — K60 (RipU_K60) and GMI1000 (RipU_GMI1000) — as well as the protein domains responsible for the observed localization. Previous work shows that RipU_K60 co-localizes with actin and microtubule markers, destabilizing the cytoskeleton structure of the host. Interestingly, our preliminary findings suggest that RipU_GMI1000 can be observed localizing to chloroplast-like organelles. To explore the domains responsible for this observable difference, truncations of the full-length proteins will be created. Transient expression assays will be performed in Nicotiana benthamiana leaves, followed by confocal microscopy and image analysis. ?

?

Keywords: Ralstonia; Effectors; Bacteria; Plants; Microscopy

Mentor(s):

Abigail Keelin Rogers (Interdisciplinary & Special Programs)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1690**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# How does learning with and through VR impact student-pertained motivation to learn?

Innovative Technology / Entrepreneurship / Design

Author(s):

Aishani Sakalabhaktula† (Engineering)

Abstract:

This paper explores how learning through Virtual Reality (VR) impacts student motivation compared to traditional in-person instruction. Despite VR's growing use in industries, its application in education remains underexplored. The study focused on a three-week module where students received identical lessons in both VR and in-person formats, with this paper reporting on findings from the first week.

After the lessons, students reflected on their experiences, and NVIVO software was used to analyze these reflections, revealing themes of engagement and learning preferences. Feedback highlighted a preference for in-person learning, citing the familiar environment and opportunities for peer interaction. Students felt in-person classes allowed better information retention but noted they could be boring and prone to distractions.

In contrast, VR was seen as novel and engaging, with students reporting greater focus due to the immersive nature of the headset. However, negative aspects included a lack of behavioral control, limited interaction, and technical difficulties such as nausea.

The findings suggest that while VR offers the potential for enhancing subjects like astronomy through immersive learning, there are significant challenges in its current form. Educators should carefully consider these limitations when integrating VR into their teaching strategies.

Keywords: Virtual Reality; Learning; STEM; Education Tech; Engagement

Mentor(s):

Lisa B Bosman (Polytechnic)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1691**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Floating Point Unit on RISC-V

Innovative Technology / Entrepreneurship / Design

Author(s):

Justin Sanchez† (Engineering); Duc Pham Minh† (Engineering); Jain Iftesam† (Engineering); Saandiya KPS Mohan† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: RISC-V; FPU; CPU; Single Precision; IEEE-754

Mentor(s):

Om P Kotwal (Engineering); Cole Aaron Nelson (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1692**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Machine Learning for Depth Estimation for Autonomous Driving Vehicles

Mathematical/Computation Sciences

Author(s):

Sarah Sawhney† (Engineering); Ian Tseng† (Engineering); Chien Chou Ho† (Engineering); Jiali Shi† (Science); Taehoon Kim† (Engineering); Yi-Huan Chen† (Engineering); Ching-Hsiang Huang‡ (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Machine Learning; Depth Estimation; Autonomous Driving

Mentor(s):

Shreya Ghosh (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1693**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Effect of large precursor grains on the synthesis and quality of 2D double-transition metal MXenes

Innovative Technology / Entrepreneurship / Design

Author(s):

Christian Paul Hardy Scott† (Engineering|JMHC)

Abstract:

[Abstract Redacted]

Keywords: Nanomaterial; MXenes; Two-Dimensional; MAX phase; Sintering

Mentor(s):

Babak Anasori (Engineering); Anupma Thakur (Engineering); Nithin Chandran Balachandran Sajitha (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1694**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Higgs Signal Classification

Physical Sciences

Author(s):

Amirali Sharifi Olounabadi† (Science); Alaqmar Adnan Bohori† (Engineering); Sagnik Ballabh† (Science); Tiancheng Zhang† (Science)

Abstract:

In 2012, the discovery of the Higgs boson by the CMS and ATLAS experiments confirmed a critical component of the Standard Model of particle physics. Despite this breakthrough, distinguishing Higgs signal events from background processes remains challenging due to the low production cross-section of such events. Machine learning has become an increasingly popular tool for tackling complex classification tasks like this, offering the potential to identify subtle patterns in large datasets. In this project, a Deep Neural Network (DNN) is employed to explore the separation of Higgs signals from background noise using data from the CMS experiment. The network is trained on root files containing various particle decays, with a focus on the Higgs decaying into four leptons. Using three key features, the model is built with binary cross-entropy as the loss function, the Adam optimizer, and ReLU and Sigmoid activation functions. The dataset is split with 80% used for training, and 10% each for validation and testing. Performance is assessed through DNN scores on signal and background test sets, alongside validation plots for loss and accuracy. Additional evaluations include a ROC curve and confusion matrix, offering insights into the model's capability in distinguishing signal from background.

Keywords: Higgs Boson; Machine Learning; Data Processing

Mentor(s):

Santosh Bhandari (Science); Andy Jung (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1695**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# 3D Food Images Reconstruction From 2D Images.

Mathematical/Computation Sciences

Author(s):

Ahmed Wael Shebl† (Engineering); Zeyad Ayman El Afify† (Engineering); Abdelrahman Hamdy Ghania† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: 3D Reconstruction; Computer Vision; Photogrammetry; Structure From Motion; Deep Learning

Mentor(s):

Fengqing Zhu (Engineering); Carla Zoltowski (Engineering); Edward J Delp (Engineering); Soudabeh Taghian Dinani (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1696**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Autopilot Integration for Lightweight Unmanned Fixed Wing Aircraft in PURT Testing Facility

Innovative Technology / Entrepreneurship / Design

Author(s):

John Henry Slater† (Science|JMHC); Braden Thomas Callaway* (Engineering); Natalia Zagata* (Engineering); Blake Edward Neely* (Engineering); Alexander Paul Kaufmann* (Engineering)

Abstract:

This research focuses on the development and testing of autopilot systems for lightweight fixed-wing Unmanned Aerial Vehicles (UAVs) within a controlled environment, utilizing the Purdue UAS Research and Test (PURT) facility. We propose a simple fixed-wing UAV using predominantly off-the-shelf components, replicating the characteristics of the Windracers fixed-wing aircraft, for comprehensive testing under various conditions. The aircraft utilizes an active LED marker board that is powered by the central battery and distinguishes and identifies individual aircraft, efficiently facilitating simultaneous operation of multiple units within the facility. The autonomous routine capabilities of the system are integrated with a nelly-constructed PID controller, which is simulated inside the Gazebo robotics simulation environment with a new high-quality 3D model of the aircraft.

The integration of autopilot technology in lightweight unmanned fixed-wing aircraft holds significant potential for various applications, including surveillance, monitoring, and data collection in challenging environments. The results of this research contribute to the advancement of autonomous aerial systems, offering a platform for further developments in the field of unmanned aerial vehicles.

Keywords: UAS; Computer Vision; Fixed-Wing; Motion Capture; Windracers

Mentor(s):

James Michael Goppert (Engineering); Worawis Sribunma (Engineering); Chase Ja-ok Loeb (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1697**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Cardiovascular Digital Twins: Real-Time Cardiovascular Monitoring and Prediction through Skin-Integrated Triboelectric Sensors

Innovative Technology / Entrepreneurship / Design

Author(s):

Brody Everett Snyder† (Science|JMHC); Elizabeth Reeves Cagle† (Engineering|JMHC); Yi Li† (Engineering|JMHC); Padmaja Sachin Khairnar† (Engineering|JMHC); Pranav Perumal† (Science); Kevin Nathan Qu† (Science|JMHC)

Abstract:

Cardiovascular disease remains the leading cause of death worldwide, with mortality rates increasing from 12.1 million in 1990 to 20.5 million in 2021, according to the World Heart Federation. Despite significant advances in cardiovascular diagnosis and treatment, real-time continuous monitoring for early detection remains underdeveloped. Digital twins, virtual models continuously updated with real-time physiological data, have transformative potential in healthcare by enabling early intervention and personalized treatment. We present a wireless skin-integrated triboelectric sensor for continuous cardiovascular monitoring. This sensor captures high-precision cardiovascular waveforms, generating real-time data on key parameters such as heart rate variability, differential volumetric pulse, and augmented index—critical metrics for predicting cardiovascular conditions. We wirelessly collected 100 cardiac waveforms following the mental workload NASA-TLX standards. These signals are then fed into a deep learning model to predict mental workload based on physiological cardiovascular parameters. We also provide a dashboard to show health trajectories and allow interactivity, enabling the detection of early signs of cardiovascular disease, ongoing condition monitoring, and mental workload prediction. This digital twin prototype represents a significant step toward scalable, accessible solutions for improving global cardiovascular health, providing predictive insights and enabling timely interventions.

Keywords: Digital Twin; Cardiovascular Disease; Triboelectric Sensor; Continuous Monitoring; Deep Learning

Mentor(s):

Robert Jose Ccorahua santo (Engineering); Wenzhuo Wu (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1698**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Tactile discrimination behavior paradigm to dissect circuit motif in somatosensory cortex

Innovative Technology / Entrepreneurship / Design

Author(s):

Lautaro Franco Soler† (Engineering)

Abstract:

The barrel cortex in mice is a perfect model system for studying sensory perception and neural coding as it relates to tactile whisker discrimination task. Sparsity is a hallmark of L2/3 under sensory input, yet the structure of this sparse coding remains poorly mapped. To investigate the neural basis of heterogenous circuit motif and mixed representation of whisker stimuli in superficial layer of barrel cortex, we trained mice of either sex to perform whisker-based tactile discrimination tasks. Mice were injected with AAV-GCaMP6s for dense neuronal labelling to image population calcium activity in volume. Mice underwent training consisted of three phases: “Locomotion naive”, “classical” and “operant” behavior paradigm tasks. Progression to subsequent training phases was contingent on them achieving d-prime scores, a metric for whisker discrimination in goal directed learning, with benchmark d-prime scores of 2. In addition to calcium imaging of L2/3 sparse coding, we used multi-channel electrode grids to record horizontal spread of surface electrophysiological activity. Whisker stimulation causes horizontal propagation of activity in the form of a traveling wave, measurable at the brain surface. These traveling waves arise from various layers, including L2/3, and contribute to sensory processing. Traveling waves are an important factor of neural processing and understanding how these dynamics contribute to tactile processing during active whisker touch discrimination could help us better understand neural coding. Ongoing and future work could potentially involve using optogenetic inhibition to investigate the role of higher-order feedback and its effects on traveling waves during active touch.

Keywords: Traveling Waves; Sensory Perception; Discrimination Task

Mentor(s):

Krishna Jayant (Engineering); Saumitra Yadav (Engineering); Austin Dennis Cronin (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1699**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Higgs Boson Reconstruction with CMS Data

Physical Sciences

Author(s):

Vincent Cody Stavig† (Science); Benjamin David Duttlinger† (Science); Julius Coleton Thomas Jodway† (Science); Hermes Heng-yu Fu† (Science)

Abstract:

In this project we completed a blind identification and reconstruction of the Higgs boson, with the goal of reproducing the original discovery of the Higgs, which took place in 2012. Through various statistical methods and analytical techniques, "cuts" or filters were applied to collision data from the Compact Muon Solenoid (CMS) Detector, a component of the Large Hadron Collider operated by CERN in Geneva, Switzerland. This sorting required hundreds of thousands of data points to be filtered and organized to correctly identify Higgs events from their product particles. As intended, the methods used have led to the rediscovery of the Higgs around its expected mass of roughly 126GeV/c^2. The statistical and analytical methods used to find the Higgs serve as a good exercise for handling large amounts of data. Understanding the data analysis and computer science that underpins research in particle physics can give meaningful insight into the field, as well as into handling large amounts of data in general.

Keywords: Particle Physics; Data Science; Statistics; Higgs Boson; Standard Model

Mentor(s):

David Alan Ruiter (Science); Andy Jung (Science)

Other Acknowledgement(s):

Santosh Bhandari (Science)

**Poster Presentation Abstract Number: 1700**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Using Eye-Tracking Methods to Understand Emotional Dysregulation in ADHD

Social Sciences / Humanities / Education

Author(s):

Trina Faith Tagamolila† (HHS)

Abstract:

Emotional dysregulation in children, characterized by heightened emotional reactivity and weak emotion regulation, is strongly associated with Attention Deficit Hyperactivity Disorder (ADHD) and predicts onset of additional problems later in life. Emotional dysregulation in ADHD may be related to difficulty shifting or regulating attention towards or away from emotional aspects of the environment, a process considered necessary for self-regulation. This study examines the relationship between visual attention control and emotional dysregulation in children with and without ADHD. We collected eye-tracking data from 291 children (ADHD=120) aged 7 to 10 years old as they viewed emotional images from the International Affective Picture System. Parents also rated their children's emotional reactivity and regulation using the Temperament in Middle Childhood Questionnaire (TMCQ). Eye-tracking data was collected for attentional capture (time to first fixation) and attentional control (time focusing on specific areas). We hypothesize that children with ADHD will show faster fixation and longer focus on emotionally charged images compared to controls. This effect will be amplified for children with ADHD who also show dysregulated emotion on the parent ratings. These findings may highlight future avenues for targeting attentional control to improve emotional regulation skills in children with ADHD.

Keywords: ADHD; Eye-Tracking; Emotional Dysregulation; Temperament

Mentor(s):

Sarah Lyn Karalunas (HHS); Mckenzie T. Figuracion (HHS)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1701**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Accelerated Matrix Processor - Scheduler Core

Innovative Technology / Entrepreneurship / Design

Author(s):

Nick Taha† (Engineering); Rishikesh Reddy Bathina† (Engineering); Pierce Yungjoon Johnson† (Engineering); Argha Badhon Saha† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Systolic Array; Accelerator; GEMM; Out-of-Order Architecture; Matrix

Mentor(s):

Anand Raghunathan (Engineering); Mark Johnson (Engineering)

Other Acknowledgement(s):

Nicholas William James (Engineering)

**Poster Presentation Abstract Number: 1702**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Building Conflict Resolution Skills among First Year STEM Undergraduates

Social Sciences / Humanities / Education

Author(s):

Evans Tang† (Science|JMHC); Olivia Anne Guptill† (Agriculture|JMHC); Allyson Faith Miller† (HHS|JMHC)

Abstract:

[Abstract Redacted]

Keywords: Conflict Resolution Skills; Undergraduate Students; STEM Education; Mixed Methods Research

Mentor(s):

Aparajita Jaiswal (Purdue University); Clara Elisa Hortua alvarado (Liberal Arts)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1703**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Developing LewisStructures.net: An Educational Resource for Chemistry Students at Purdue University

Physical Sciences

Author(s):

Sidney Erin Tindell† (Science|JMHC); Megan Elizabeth Bechtlofft‡ (Science); Hailey Choi Hiatt‡ (Science); Caroline Sorrells‡ (Science)

Abstract:

[Abstract Redacted]

Keywords: Problem-Solving; Chemistry; Learning; Website; Lewis Dot Structures

Mentor(s):

Hannah Elise Starr (Science); Jeffrey A Turkstra (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1704**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Proximity Labeling to Identify Transient Protein Interactions with ATP-dependent Chromatin Remodeler PICKLE

Life Sciences

Author(s):

Elysia Marlena Uggen† (Agriculture|JMHC); Joshua Paul Kaluf‡ (Agriculture); Shelby Sliger‡ (Agriculture|JMHC)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Joseph P Ogas (Agriculture); Jacob Ryan Fawley (Agriculture); Jiaxin Long (Agriculture)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1705**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Morphological characterization of anatomically defined Layer 5B pyramidal neuron subtypes

Life Sciences

Author(s):

Andres Uzcategui† (Engineering)

Abstract:

Cortical layer 5B pyramidal neurons (L5B PN) project to various cortical and subcortical regions, forming the major excitatory output of the neocortex . Morphologically, these neurons are characteristic with bushy basal dendrites and long apical dendrites originating from L5B and extending to the cortical surfaces. The apical dendrites of L5B PNs integrate information across multiple layers of the cortex, generating global dendritic activities, which is critical for sensory perception. Previous research shows correlation between the apical dendrite morphology with diverse patterns of global events, suggesting that morphological difference could allow parsing of distinct integrated information to different downstream pathways. Yet, given the heterogeneity of morphology and electrophysiology across the L5B PN population, the correlation between neuronal morphology and their down-stream projection target remained poorly mapped. This research aims to quantify the morphological differences between PNs based on their projection targets. L5B PNs in the primary somatosensory cortex (S1) projecting to PoM, SC and pons are labeled through retrograde tracing. We used ImageJ and integrated plugins to analyze two- photon imaging datasets from retrograde labeled L5B PNs for morphological analysis and comparison. In a separate cohort of retrograde labeled mice, we imaged cryotome brain slices to quantify the density and co-localization of these anatomically defined L5B PNs groups. In future studies, the reconstructed morphology of the anatomically defined subgroups may be corroborated with their electrophysiological properties to reveal the biophysical basis of subtype-specific computations.

Keywords: Neuroscience; Neuron Morphology; Two-Photon Microscopy; ImageJ; Pyramidal Neurons

Mentor(s):

Krishna Jayant (Engineering)

Other Acknowledgement(s):

Shulan Xiao (Engineering)

**Poster Presentation Abstract Number: 1706**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Accelerated Matrix Processor - Software/ISA

Mathematical/Computation Sciences

Author(s):

Pranav Wadhwa† (Engineering); Kevin Luke Phlips† (Engineering)

Abstract:

Overview: The AFTx07, a RISC-V processor developed by SoCET, excels in general-purpose tasks but struggles with matrix-matrix multiplication, which is used extensively in machine learning and artificial intelligence (AI) algorithms. This can be alleviated by making use of the systolic array, specialized hardware efficient in parallelizing matrix multiplications. Incorporating this into AI hardware requires multiple elements: a core execution unit, the array itself, the memory subsystem, and the instruction set architecture (ISA) and software which is used as an interface between the programmer and the hardware. The hardware has matrix registers to facilitate the general-purpose use of the hardware and programmability.

Implementation: We will formalize the ISA to be used by the execution core and memory subsystem to coordinate hardware scheduling with software. This ISA involves the extension to support m-type instructions, used for matrix manipulation. Test programs will be written to test the functionality of the hardware using the ISA as well as to demonstrate the use cases for the systolic array, such as the implementation of a fully connected multi-layer perceptron for digit classification based on the MNIST dataset. A compiler for AI and other matrix multiplication programs will be written by the end of the academic year, with an assembler to convert assembly instruction into machine binaries.

Verification: We will verify the functionality of test programs and the assembler with a RISC-V simulator, to act as a verification of software independent of the hardware implementation progress.

Keywords: AI; Semiconductors; Computer Architecture; Instruction Set Architecture; Accelerators

Mentor(s):

Mark Johnson (Engineering); Timothy Francis Hein (Engineering); Anand Raghunathan (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1707**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Accelerated Matrix Processor - Systolic Array

Mathematical/Computation Sciences

Author(s):

Charles James Wagner† (Engineering); Vinay Pundith† (Engineering)

Abstract:

The AFTx07, a RISC-V processor developed by SoCET (system-on-chip extension technologies), excels in general-purpose tasks but struggles with matrix multiplication, which is used extensively in machine learning algorithms. To overcome this, we are developing a TPU (tensor processing unit) specifically focused on offloading matrix multiplication tasks from the CPU. This paper outlines the design of the TPU's core execution unit, the systolic array, which operates as an NxN grid of Multiply-Accumulate (MAC) units that efficiently performs matrix operations in parallel (whereas a traditional CPU performs operations element-by-element sequentially). This design enables the TPU to handle general matrix multiplication (GEMM) much faster than a traditional CPU. The array receives input data and weights from the memory subsystem, executes the matrix multiplication, and sends the result back for storage. The systolic array needs to be fast and efficient, as it will be the critical path of the whole design. Two ways we will attack this is by employing pipelined floating-point arithmetic, which is common in parallel processing, and a pipelined MAC array to maximize throughput. The systolic array will be tested as a 4x4 array, verifying the accuracy of the results. Once this is verified, the TPU as a whole will be benchmarked for performance using image classification on the MNIST dataset. The project concludes with testing and integration of all TPU components and finalizing the AI hardware accelerator to be ready for implementation with the AFTx07.

Keywords: Computer Architecture; Digital Design; AI Hardware; Matrix Multiplication; Parallel Processing

Mentor(s):

Mark Johnson (Engineering); Anand Raghunathan (Engineering); Malcolm Lloyd Seib McClymont (Engineering)

Other Acknowledgement(s):

Travis Jakl (Engineering)

**Poster Presentation Abstract Number: 1708**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# The Effect of Different Frequency Binaural Beats on Working Memory

Social Sciences / Humanities / Education

Author(s):

Andrew Hunter Walatka† (HHS|JMHC); Carly Grace Booth* (HHS); Mary Aileen Jann* (Science|JMHC); Vineeth Surya Narra* (HHS); Grace Maria Moorman* (HHS); Lucy Pauline Murphy* (HHS); Jackson Tyler Wrubel* (HHS|JMHC)

Abstract:

[Abstract Redacted]

Keywords: Binaural Beats; Working Memory; Cognitive Enhancement; Cognitive Performance; Cognitive Psychology

Mentor(s):

Thomas S Redick (HHS)

Other Acknowledgement(s):

Alexa Kristina Bushinski (HHS); Amanda Lynn Fordyce (HHS)

**Poster Presentation Abstract Number: 1709**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Unlocking the Universe: Rediscovering the Higgs Boson

Physical Sciences

Author(s):

Sam Brody Waymire† (Science); Dean Patrick Shock† (Science); Shawanwit Poomsa-ad† (Science); Elijah Scott Forbes† (Science)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Santosh Bhandari (Science); Andreas Jung (Science)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1710**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Research on Behavior of Zeotropic Refrigerant Mixtures

Innovative Technology / Entrepreneurship / Design

Author(s):

Robert Thomas Welp† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Refrigerant; Zeotropic Mixture; Measurement; Phase Change; Global Warming Potential

Mentor(s):

Joshua Michael Cox (Engineering); Riley Bradley Barta (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1711**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Sex Differences in Social Isolation Effects on Compulsive Related Behavior in crossed High Alcohol Preferring Mice

Social Sciences / Humanities / Education

Author(s):

Caitlin Alexandra Williams† (HHS)

Abstract:

Title: Sex Differences in Social Isolation Effects on Compulsive Related Behavior in Crossed High Alcohol Preferring Mice

Authors: Caitlin Williams, Soyol Enkh-Amgalan, Julia A. Chester

Obsessive-Compulsive Disorder (OCD) and Alcohol Use Disorder (AUD) are highly comorbid, with compulsive-related behaviors potentially reflecting a shared underlying phenotype. Stress exposure increases compulsive-related behaviors and alcohol drinking. We used crossed high-alcohol preferring (cHAP) mice, which voluntarily drink binge-like levels of alcohol, to examine how adolescent social isolation stress affects compulsive-like alcohol drinking [quinine aversion-resistant drinking (QARD)] and sensorimotor gating [pre-pulse inhibition (PPI)], which controls processing of irrelevant stimuli. cHAPs were socially-isolated (F = 4, M = 7) or group-housed (F = 4, M = 6) for 28 days from mid-adolescence (PND 42-44) to adulthood (PND 77-79). Then, PPI was tested three days before and one day after QARD. For QARD, cHAPs had 5-hour acc

Keywords: Alcohol Use Disorder; Obsessive-Compulsive Disorder; Aversion Resistant Drinking; Pre-Pulse Inhibition; Social Isolation

Mentor(s):

Julia Chester (HHS)

Other Acknowledgement(s):

Soyol Enkh-Amgalan (HHS)

**Poster Presentation Abstract Number: 1712**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Accelerated Matrix Processor - Memory Subsystem

Mathematical/Computation Sciences

Author(s):

William Wong† (Engineering); varun Vaidyanathan† (Engineering|JMHC); Yue Yin† (Engineering)

Abstract:

As AI advances, systolic arrays are central to efficient training and inference. Our AI Hardware Team in SoCET proposes a fully open-source, reconfigurable RTL library for systolic arrays, enabling modular, plug-and-play integration for rapid prototyping and exploration of AI accelerator designs. We propose the design of a memory subsystem for a systolic array, which will be the center of interconnectivity of the instruction set architecture (ISA), systolic array, and scheduling subsystems. Our approach involves developing an architecture that includes components such as ramulator-2, a DRAM simulator that will have different types of RAMs like DDR, GDDR-6, or HBM, an i-cache for instruction fetching, a d-cache for scalar values, a memory arbiter to manage data flow, and a scratchpad to house memory banks and handle outputs to the systolic array.

The i-cache will be optimized to handle instruction retrieval, while the d-cache will be configured to store scalar values for the operations performed by the systolic array. The memory arbiter will direct the flow of data by assessing the requirements indicated by the scoreboard and managing access to the scratchpad. This scratchpad will serve as an intermediary, providing two FIFO buses to transmit matrix inputs and weights into a multiplexer feeding into the systolic array.

We aim to provide a parametric framework to have this project scale with an arbitrary sized systolic array. Our overall goal is to increase the speed of the existing SoCET AFTx07 microprocessor and other processors when this project is made open-sourced.

Keywords: [no keywords provided]

Mentor(s):

Mark Johnson (Engineering); Anand Raghunathan (Engineering); Sooraj Chetput Venkataraghavan (Engineering)

Other Acknowledgement(s):

Dheeraj Krishna Chaitanya Karanam (Engineering)

**Poster Presentation Abstract Number: 1713**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Progress on 3D General-Purpose Computational Quantum Electromagnetics Modeling

Physical Sciences

Author(s):

Jinhoo Yoon† (Science); Brandt David Pierce† (Engineering); Arnav Jadhav† (Engineering); Christian Scheckel† (Engineering); Aditya Gandhi† (Science); Tylen Sean Fleming† (DSB); Nicholas James Detwiler‡ (Science|Graduate|JMHC); Omkar Ghodke‡ (Engineering); Warat Nathan Vijitbenjaronk‡ (Science); Keshav Shylesh‡ (Science); Tanvi Chukka‡ (Engineering); Truman Stephen Mohr‡ (Science|JMHC)

Abstract:

The rapid advancement of quantum computers presents exciting opportunities for scientific and technological innovation. However, the engineering design of these revolutionary systems is in its early stages. Versatile numerical modeling tools have been instrumental in successfully designing most modern technologies; however, for quantum computers, the computational limitations of numerical design methods have prevented them from analyzing systems of useful scale. To address this limitation, this project is developing efficient and general-purpose tools for modeling the building blocks of quantum computers. In prior semesters, we developed a robust finite element method (FEM) implementation based on electromagnetic potentials to evaluate the electromagnetic eigenmodes of realistic 3D geometries to this end. This semester, we are improving this solver by incorporating Python packages for just-in-time (JIT) compilation and optimized linear algebra, which significantly enhance computational efficiency. Additionally, refinements to the numerical integration procedure and the implementation of adaptive frequency sweeping further boost the solvers performance. In parallel, we are creating CAD models of geometries pertinent to quantum computing to demonstrate applications of our solver. Further, the open quantum system simulator we created last semester is being updated to accelerate convergence, allowing more complex systems to be simulated. We are also developing open-source tools with graphical user interfaces for modeling quantum hardware on nanoHUB.org, making these resources available to a broader research community. By developing efficient and accessible modeling tools, our project aims to aid researchers in overcoming key challenges in quantum hardware design.

Keywords: [no keywords provided]

Mentor(s):

Thomas Edgar Roth (Engineering); Samuel Theodore Elkin (Engineering); Ghazi Khan (Engineering)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1714**
*Presentation Time: Session 4: 1:30pm-2:30pm*

# Understanding Perceived Gender Equity in Latin American Engineering Programs

Social Sciences / Humanities / Education

Author(s):

Bayan Yunis† (Liberal Arts|JMHC)

Abstract:

Gender equity in STEM faces ongoing challenges, with women remaining underrepresented in fields like engineering, physics, and computer science. This disparity often starts early, as fewer girls choose STEM subjects, and continues throughout their education and careers. Gender stereotypes and unconscious biases further discourage women from pursuing STEM and influences hiring, promotion decisions, and the creation of work environments where women may feel undervalued. To address these issues, strategies such as policy change, educational reform, mentorship programs, and cultural shifts are essential to foster a more inclusive STEM landscape.

In response, to this disparity, in 2001 the United State's National Science Foundation introduced the term "STEM" (science, technology, engineering math), which has resulted in major strides toward diversity and inclusion. However, limited gains have been seen in countries throughout the world. This study, conducted in two Colombian universities, used Photovoice—a research method combining photography and storytelling—to examine engineering students' perceptions of gender equity in STEM. Findings focus on three key themes: equity perceptions, limiting factors, and factors supporting equity. Cultural comparisons between Colombia and the U.S. highlight implications for exchange programs, study-abroad opportunities, and mentorship improvements for international students.

Keywords: Gender Equity; STEM; Latin America; Engineering

Mentor(s):

Lisa B Bosman (Polytechnic); Angel Gabriel Ruiz Castro (Polytechnic)

Other Acknowledgement(s):

**Poster Presentation Abstract Number: 1715**
*Presentation Time: Session 4: 1:30pm-2:30pm*

## TAPS team 7

Innovative Technology / Entrepreneurship / Design

Author(s):

Xinyi Zhang† (DSB); Maryam Shakil† (DSB); Jared Travis Richardson† (DSB)

Abstract:

[Abstract Redacted]

Keywords: Data Mining; AI; LLM; Grief Journey; Date for Good

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

# RESEARCH TALKS

*Research talks are delivered in Stewart Hall, Room 214 on November 20, 2024.*

## RESEARCH TALK SESSION 1 | 9:00-10:00

### ROOM: STEW 214A

9:00 **7000** Applicability of Additively Manufactured Fiber-Reinforced Thermoplastic Composite Mold for Thermoplastic Composite Thermoforming Process
*Hanhyun Kwak†*
Mentor(s): Garam Kim; Sung Jun Choi; Eduardo Barocio Vaca

9:20 **7001** OSS Fuzzing
*Amar AlAzizy†; Omar Faramawy Elsayed†*
Mentor(s): Aravind Machiry; Arunkumar Bhattar

9:40 **7002** Real-Time Agent Motion Prediction in Multi-Agent Autonomous Racing Using Deep Neural Networks
*Myron Milad Tadros†; Ahmed Sayed Omar Omar†; Omar Ahmed Roshdi Badawi Abousheishaa†; Bola Yosry Zaky Warsy†; Abdelrahman Ahmed Safwat Eissa†*
Mentor(s): Andres Felipe Hoyos Moreno; Samuel Labi

### ROOM: STEW 214B

9:00 **7003** Shear Modified Bin Discharge
*Trisha Boodhoo†*
Mentor(s): Carl R Wassgren

9:20 **7004** Examining tropical cyclone-induced compound hazards to inform effective adaptation and mitigation policies.
*Tanya Sophia Masnyk†*
Mentor(s): Qingchun Li; Daniel R Chavas

9:40 **7005** Wearable Electrochemical Sensors for Personalized Digital Health
*Surya Pratheek Turaga†*
Mentor(s): Wenzhuo Wu; Jing Jiang

### ROOM: STEW 214C

9:00 **7006** The Disconnect Between Policy and Patient Care: Exploring the Impact of Indiana's Fetal Disposition Law on Pregnancy Loss Patients
*Lily Grace Renke†; Emma Michelle Gordon‡*
Mentor(s): Kathryn Jean LaRoche

9:20 **7007** Adipose Tissue Morphology in Albumin Knockout Mice
*Yen-Hsi Lai†*
Mentor(s): Gregory C Henderson

9:40 **7008** Children’s Attribution of Blame Towards Low-Status Peer Groups
*Kendal Nicole Clay†*
Mentor(s): Megan Nicole Norris; Laura Elenbaas

### ROOM: STEW 214D

9:00 **7009** Characterizing Genetic Knockdown of CIP2A in Non-Small Cell Lung Cancer Cells
*Talia Lee Kidder†*
Mentor(s): Brittany Lee Allen-Petersen; Brittany Nicole Heil

9:20 **7010** Using Single-cell RNA Sequencing to Identify Leukocyte Subsets Present in Benign Prostatic Hyperplasia
*Andree Kolliegbo†*
Mentor(s): Nadia Atallah Lanman

9:40 Pramipexole as a potential enhancer of regeneration after zebrafish spinal cord injury

**7011** *Nikhil Samit Sadavarte†; Jonathan Minh-Tri Ngo‡; Kaitlyn Ying‡; Beatriz Cren Colalillo‡; Manasa Gudugundla‡; Anshul Sanjeev‡; Katie Manfra‡*
Mentor(s): Daniel Suter

# RESEARCH TALK SESSION 2 | 10:00-11:00

## ROOM: STEW 214A

10:00 A Survey of Autonomous Driving Algorithms for Scaled Racing
**7012** *Manav Nikhil Gagvani†; Sangeet Mohan†; Jaron David Hunt†*
Mentor(s): Shreya Ghosh

10:20 Generative Models for Images and Videos
**7013** *Ian Owen Ou†; Julianne Quin Iaccarino†; Ibrahim Issa Abdullah†; Basil Khwaja†; Ron K Natarajan†*
Mentor(s): Monika Tomar; Yung-Hsiang Lu

10:40 Design and Implementation of an Inductively Coupled Plasma Neutralizer for SPT-100 Hall Effect
**7014** Thruster
*Mathis Malaussena†*
Mentor(s): Alexey Shashurin; Lee E Organski

## ROOM: STEW 214B

10:00 Medical Minds, Literary Voices: The Intersection of Healing and Storytelling in Russian Literature
**7015** *Emily Doris Gervais†*
Mentor(s): Olga Lyanda-Geller

10:20 The Burden of Legislation: How State Partisanship Influences Policy Design
**7016** *Paige Morgan Gonzales†*
Mentor(s): David Lewis

10:40 The Risk of Harassment among Gig Workers by Race, Age, and Gender.
**7017** *Julieta Claudia Aguilar†*
Mentor(s): Jeremy E Reynolds

## ROOM: STEW 214C

10:00 Effects of DHEA on the estrous cycle: a rodent model of Polycystic Ovary Syndrome
**7018** *Morgan Marie DesEnfants†; Roshni Manikandan‡; Linnaea Eileen Krupke**
Mentor(s): Kimberly Kinzig

10:20 Environmental Contamination and Birth Anomalies in Iraq
**7019** *Bethany Faber†*
Mentor(s): Ellen M Wells; Aaron James Specht

10:40 Child Automated Speech-To-Text (CAST) - Enhancing Child Speech Comprehensibility with
**7020** Machine Learning
*Aakanksha Amol Shripal†; Son Ha†; Akhil Sagaran Kasturi‡; Akshitha Kartigueyan‡; Aarohi Panzade‡*
Mentor(s): David J Purpura

## ROOM: STEW 214D

10:00 The Chemical Makeup of Cloud Condensation Nuclei found in Stratocumulus Clouds along Costal
**7021** Peru
*Jasmine Alayna Luckett†*
Mentor(s): Greg M Michalski

10:20 Seismic Monitoring of Rainfall-induced Subsurface Changes Using Kullback–Leibler and Jensen–
**7022** Shannon Divergence
*Theo Adrian Garcia Carranco†*
Mentor(s): Yunyue Li

10:40 Forecasting the 2024 Elections using Mathematical Modeling
**7023** *Joseph Michael Crompt; Thanmaya Pattanashettyt; Alexia Rodriguest*
Mentor(s): Alexandria Volkening

# RESEARCH TALK SESSION 3 | 11:00-12:00

## ROOM: STEW 214A

11:00 The Modeling of the Umbilical Cord In End of Term Women Using a PDMS Microfluidics Design
**7024** *Divya Raghvendra Manvikart; Mira Nimesh Patelt; Dipali Rebecca Abrahamt*
Mentor(s): Ryan B Wagner; Arezoo Ardekani

11:20 A Novel Approach to Sex-Specific Responses of Enhancing Osteogenesis with a 3D-Printed Hybrid
**7025** Hydrogel
*Maria Maciast*
Mentor(s): Claudia Benito Alston; Luis Solorio

11:40 Image-based Mobile Phone Applications (APPS)
**7026** *Minchae Yunt; Huy Duc Vut; Vishwadeep Singht; William Emre Ozkant*
Mentor(s): Edward J Delp; Fengqing Zhu; Soudabeh Taghian Dinani; Carla Zoltowski

## ROOM: STEW 214B

11:00 Further validation of the neuromelanin-forming rats to model Parkinson's Disease and their
**7027** implication in HAA-induced dopaminergic neurotoxicity
*Matthew Thomas Corsont*
Mentor(s): Fatema Mustafa Currim; Josephine Maria Brown; Jason R Cannon

11:20 Polyphenol and polysaccharide interactions in whole food matrices - Role in starch digestion
**7028** *Johanna Marie Hickst*
Mentor(s): Lavanya Reddivari; Edward David Moncada

11:40 Investigating Mycoparasitic Behavior of Alternaria on Various Species of Rust Fungi
**7029** *Lane Bellt*
Mentor(s): Daniel B Raudabaugh; Mary Aime

## ROOM: STEW 214C

11:00 Analysis of the heavy metals in electrodes used in manual metal arc welding and the generated
**7030** fumes
*Shane Kevin Limast*
Mentor(s): Jae Hong Park

11:20 The pulmonary baroreflex as a neurovascular modulator: A possible therapeutic target for chronic
**7031** sympathetic overactivity in aging
*Julian Andres Guzman Torrest*
Mentor(s): Igor Alexandre Fernandes

11:40 Stress-enhanced fear learning can be reduced with unconditional stimulus deflation with
**7032** constraints.
*Jaden Brooks†; Priya Halder**
Mentor(s): Sydney Trask

## ROOM: STEW 214D

11:00 Mapping Chemical Abundances of the Supernova Remnant Cassiopia A with the James Webb
**7033** Space Telescope
*Grace Katzt*
Mentor(s): Danny Milisavljevic; Danielle Dickinson

11:20 Seasonal Variation in Radar Signatures in Amundsen and Cabeus Craters on the Moon
**7034** *Donnie Hutchisont*
Mentor(s): Ali Bramson

11:40 Investigating the effects of ciclopirox and its derivatives on urothelial and renal cell carcinomas
**7035** *Abigail Hyejin Lee†; Kaaya Dharm Sharma**
Mentor(s): Yuxin Zhuang; Majid Kazemian

# RESEARCH TALK SESSION 4 | 12:00-1:00

## ROOM: STEW 214A

12:00 Biomedical Drone for Narcan Delivery
**7036** *Victor Ionut Ene†; Danica Brynn Joyner†; Nathan James Arnold†; Harshavi P Birla†; Natasha Rajendrarao Gundapaneni†; Ty Dean Frederick†; Shelby Grace Britton†; Parth Kailash Dubal†; Bhaskar S Patke†*
Mentor(s): James Michael Goppert; Kong; Nicole Adams

12:20 Understanding Tactile Sensation: Neural Mechanisms of Texture Exploration in Freely Moving Mice
**7037** *Lucy Anne Jurow†; Hannah Jordan Margulis†*
Mentor(s): Megan Hope Lipton; Maria Cristina Makin

12:40 Optimized Text Recognition: A Transfer Learning Approach for Detecting and Transcribing Text in
**7038** Natural Scenes
*William Henry Stevens†; Gabriel A Torres†; Karthik Selvaraj†; Leo Ross Benaharon†; Surya Teja Sripathi†; Arnav Dushyant Choudhry†*
Mentor(s): Edward J Delp; Carla Zoltowski; Fengqing Zhu

## ROOM: STEW 214B

12:00 Reflections of the Economic Culture in Russian literature
**7039** *Davyd Revenko†*
Mentor(s): Olga Lyanda-Geller

12:20 Ensuring Consumer Safety by Analyzing the Impact of Fluctuating Temperatures on STEC
**7040** *Hayley Kristen Wong Liong†; Athanasios Gregory Flessas†*
Mentor(s): Bruce M Applegate; Kal Holder; Keyshla M Narvaez Davila

12:40 Making a Splash: Using Mass Spectrometry to Measure Dopamine and Serotonin Turnover in
**7041** Water-Enriched Pekin Duck Brains
*Nina Kay Wilson†*
Mentor(s): Greg Fraley

## ROOM: STEW 214C

12:00 Rethinking Civil Litigation: Why A Data Driven Approach is Necessary
**7042** *William Brian Nilges†*
Mentor(s): Beth Elly Baumgartner

12:20 Investigation of Optimal Machining Parameters for Fiber-Reinforced Thermoplastic Composite
**7043** Tooling
*Sucheol Woo†; Min Yong Chun**
Mentor(s): Garam Kim; Sung Jun Choi; Eduardo Barocio Vaca

12:40 REBEL: Rule-based and Experience-enhanced Learning with LLMs for Initial Task Allocation in
**7044** Multi-Human Multi-Robot Teams
*Arjun Sandeep Gupte†*
Mentor(s): Byung-Cheol Min; Ruiqi Wang; Lakshmi Narayan Vishnunand Venkatesh; Taehyeon Kim

## ROOM: STEW 214D

12:00 Differential responses to PP2A activation are influenced by AREG signaling
**7045** *Ella Rose Deanne Chianis†*
Mentor(s): Brittany Lee Allen-Petersen; Claire M Pfeffer

12:20 Screening Photoactivatable Proteins at Cryogenic Temperatures
**7046** *Sarah A Alvarez†*
Mentor(s): Peter Dahlberg

12:40 A PHD Filter Approach to Target-Invariant Persistent Monitoring
**7047** *Revanth Krishna Senthilkumaran†*
Mentor(s): Aniket Bera; Apoorva Vashisth

# RESEARCH TALK SESSION 5 | 1:00-2:00

## ROOM: STEW 214A

1:00 Title: Measuring Progress in Eye Tracking Behavior During Surgical Training
**7048** *Hassan Berbich†*
Mentor(s): Denny Yu

1:20 SWARMS: Multi-Agent UAV Control Simulation
**7049** *Amikosh Dube†; Noah Anthony Wisniewski†; Jay Bhavesh Gandhi†; William John Greenwood†; Jammy Wang†; Dhanush Adhitya Gopalakrishnan†; Srikar Sastry Lanka‡; Berra Ulku Kalci‡; Richard Hastings Hambleton‡*
Mentor(s): Younggil Chang; Shreyas Sundaram

1:40 Understanding Environmental Impacts of Large Language Model Serving
**7050** *Gavin Michael Fortwendel†*
Mentor(s): Yi Ding; Inez Hua

## ROOM: STEW 214B

1:00 The Consequence of Temperature Variance During Transportation on Salmonella: Impact on Food
**7051** Safety
*Carson William Rockwell†; Bailey Jean Williams†*
Mentor(s): Bruce M Applegate; Kal Holder; Keyshla M Narvaez Davila

1:20 Evaluation of Ketamine's Prosocial Effects in Scn2a-deficient Mice
**7052** *Rineet Ranga†; Akila Abeyaratna‡*
Mentor(s): Brody Alan Deming

1:40 Design of a curriculum proposal for the teaching of English/Spanish for pharmacy students focused
**7053** on the correct use of medications and interculturality.
*Gabriela Espinel Charry†*
Mentor(s): Ellen M Schellhase; Juan Camilo Alvarez Nunez; Andrea Salazar-Ospina

## ROOM: STEW 214C

1:00 Gender Differences in Global Identity Development: Implications for Intercultural Competence in
**7054** Higher Education
*Vidya Reddy Madana†*
Mentor(s): Aparajita Jaiswal

1:20 Integration of Mixed Reality and Digital Twins for the safe and efficient operation of fluid power
**7055** equipment
*Yovani Garcia Munera†; Samuel Ricardo Duncan Vides†; Felipe Ramirez Franco*; Alen Santiago Lizarazo Osorio**
Mentor(s): Jose M Garcia Bravo

1:40 Design of a training protocol to assess human error, reaction time and hand-eye coordination in
**7056** assembly lines.
*Janny Katerin Torres Canas†*
Mentor(s): Steven R Dunlop; Dutt Jagdish Thakkar

## ROOM: STEW 214D

1:00 Enhancing Cello Performance through Real-Time Posture Evaluation
**7057** *William P Jiang†; Gurtej Singh Bagga†; Trevor Mission Ju†; Paige Lorenz†; Shivam Hemal Trivedi‡; Shrinand Perumal‡; Aadiv Reki‡*
Mentor(s): Yeon Ji Yun; Yung-Hsiang Lu

1:20 Understanding the Bit-Depth of SPAD Arrays for FLIM

**7058** *Ishaan Kartik Singh†*
Mentor(s): Jing Liu

1:40 Investigating the role of PP2A-B56a in the Autophagy pathway in Pancreatic Cancer
**7059** *Indiraa Doraivel†*
Mentor(s): Garima Baral; Claire M Pfeffer; Sara Nicole Filippelli; Brittany Lee Allen-Petersen

## RESEARCH TALK SESSION 6 | 2:00-3:00

### ROOM: STEW 214A

2:00 Improving Branch Prediction Accuracy and Benchmarking for a RISC-V Based Microcontroller
**7060** *Aishwarya Saikrupa Anand†; Andy Hanjun Hu†; Mary Francis†; Dhruv Roopchand Khatri**
Mentor(s): Cole Aaron Nelson; Mark Johnson

2:20 Modeling The Racehorse Airway
**7061** *Christine Elizabeth Mayo†; Adalene Noel Stangeland†; Meggie Faye Khantsis†; Megan Leanne Painter‡; Payton Elizabeth Gault‡*
Mentor(s): Curtis Earl Marshall

2:40 Forecasting and Optimizing EV Charging Station Demand using Traffic Patterns
**7062** *Jihyo Park†; Shounak Mukherjee†; Alexa Joan Noto†; Ankitha Mallekav†; Akanksh Rao†; Hsin-Wei Hsieh‡; Hyunsang Cho‡; Jaewon Cho‡*
Mentor(s): Sivaranjani Seetharaman

### ROOM: STEW 214B

2:00 Protective Effects of Polyphenols Against Alpha-Synuclein Aggregation in a Cellular PFF Model of
**7063** Parkinson's Disease
*Jacob Gold†*
Mentor(s): Jean-christophe Rochet

2:20 Innovating Against Geographical and Climate Adversity: Israel's Groundbreaking Agricultural
**7064** Techniques and Technologies
*Madison Chloe Lee†*
Mentor(s): Olga Lyanda-Geller

2:40 Disparities in Per- and Poly Fluoroalkyl Substances (PFAS) Tolerance and Life History Traits in
**7065** Simocephalus serrulatus Populations.
*Jack Douglas Morehouse†*
Mentor(s): Jason T Hoverman

### ROOM: STEW 214C

2:00 Commodity Flow Analysis of Indiana: Insights into Supply Chain Dynamics and Economic
**7066** Development
*Kely Johanna Monroy Malagon†; Luisa Fernanda Victoria Florez†*
Mentor(s): Dutt Jagdish Thakkar

2:20 The Impact of Finance Case Competitions on Undergraduate Learning and Professional Skill
**7067** Building
*Christopher Alexandre Ghita†*
Mentor(s): Zoeanna Mayhook

2:40 Designing, Implementing, and Evaluating a Sex Trafficking & Intimate Partner Violence Training
**7068** Program for Licensed Salon Professionals in Indiana
*Ashton Zachary Allen†; Abhinaya Nagalla†; Jordan Elizabeth Cooley†; Juliana Reese St Denis†; Evan Graham Coblentz‡*
Mentor(s): Kathryn Seigfried-Spellar; Andrea DeMaria

### ROOM: STEW 214D

2:00 Glycoprotein Analysis of Aged Mice Brain Proteome
**7069** *Rishabh Kottakota†; Aryaman Dewan*; Malyka Ram*; Priyanshu Datta Roy**
Mentor(s): Uma K Aryal

2:20 A Triangular Ladder of Superconducting Qubits for Quantum Simulation
**7070** *Santiago Lopez†*
Mentor(s): Alex Ruichao Ma

2:40 Toric methods in bordism theory
**7071** *Mathilda Campillo Abuchaibe†*
Mentor(s): Manuel Luis Rivera

## RESEARCH TALK SESSION 7 | 3:00-4:00

### ROOM: STEW 214A

3:00 Increasing Membrane-Based Dehumidification Performance with Reduced Graphene Oxide
**7072** Nanofillers
*Lily Avery Waterman†*
Mentor(s): Md Ashiqur Rahman; David Warsinger

3:20 Automation of LAMP Biomolecular Assays Using the Eppendorf epMotion 5075 Robotic Pipettor
**7073** *Shamalaa Sathiasealan†*
Mentor(s): Mohit Verma; Josiah L Davidson

3:40 EEG Brain Signal Analysis for Active Authentication in Immersive Virtual Worlds
**7074** *Shruthika Sundar†*
Mentor(s): Diksha Shukla

### ROOM: STEW 214B

3:00 Placental Phenotype in Leukoencephalopathy with Calcifications and Cysts
**7075** *Natalie Christine Smith†*
Mentor(s): Jamie Fraser; Brianna Pierce

3:20 Comparison of Speech Token Variations and Their Ability to Assess Features of Hearing Loss
**7076** *Jax Patrick Marrone†; Andres Navarro‡; Emily Le Bell‡; Audrey V Harrison‡*
Mentor(s): Edward L Bartlett; Meredith Christine Ziliak

3:40 The INCOSE Symposium Paper Collection: What Does It Tell Us About the Discipline?
**7077** *Caroline Grace Thomas†*
Mentor(s): Charles Robert Kenley

### ROOM: STEW 214C

3:00 Project oCEANIC: Computing Environmental Adaptation and Navigation in Island Communities
**7078** *Marlo Ann Weber†; Connor Taychin Underwood†; Christopher Gerald Farber†; Allyson Lynn Dinwiddie†; Jacob David Dorson†; Hannah Morgan Stegall†; Danielle C Ejiogu†; Giovanni Ignatius Stabile†*
Mentor(s): Katherine Jarriel

3:20 A Study on the SoTL Accelerator Effectiveness in Enhancing Faculty Best Practices for New
**7079** Curriculum Development, Assessment, and Dissemination
*Ava Thant Samuel†*
Mentor(s): Lisa B Bosman

3:40 Assessment of Echocardiographic Biomarkers for the Prognosis of Cardiac Dysfunction in Sepsis
**7080** *Brianna Nicole Lewis†*
Mentor(s): Pavlos Vlachos

### ROOM: STEW 214D

3:00 Investigating the functions of Epstein-Barr Virus Gene BNLF2b in Gastric Cancer Progression
**7081** *An My Nguyen†*
Mentor(s): Majid Kazemian; Yuxin Zhuang

3:20 Design of a Bromide Ion-Exchange Column for Application in Low-Bromide Waters
**7082** *Diana Lucia Pinto Montes†; Destin Javai Gentillon‡*
Mentor(s): Marty D Frisbee

3:40 Neuro-Symbolic Action Anticipation through Spatio-temporal Affordance Reasoning
**7083** *Muyang Yan†*
Mentor(s): Yexiang Xue; Maxwell Joseph Jacobson; Simon Stepputtis

## RESEARCH TALK SESSION 8 | 4:00-5:00

### ROOM: STEW 214A

4:00 Purdue Aerial Robotics Team (PART) - R&D Division - Avionics - AUGUST
**7084** *Doha Bahaa Eldin Hafez†; Parker Steven Hitchcock†; Hasan Sultan†*
Mentor(s): Niall Patrick Moloney; Shreyas Sundaram

4:20 2.4 , 5 GHz Dual Band Wi-Fi RF Receiver
**7085** *Abdelrahman Osama Khalid†; Kerollos Ehab Matta Yanny†; Youssef Nagah Haider†; Manuel Ashraf Melad Gad†*
Mentor(s): Seyedehmarzieh Rouhani; Archana Dharanipragada; Mark Johnson

4:40 NucleusPrime: An efficient computational tool for the design of oligonucleotide primers for nucleic
**7086** acid amplification methods
*Arman Kumar†*
Mentor(s): Mohit Verma; Josiah L Davidson

### ROOM: STEW 214B

4:00 A Comparative Study of Coherent Ising Machine Variations through Numerical Simulation
**7087** *Vidisha Singhal†; Charles Spencer Bowles†*
Mentor(s): Peter Bermel

4:20 Enhancing Workforce Development through Virtual Reality and Digital Twin Integration
**7088** *Alberto Minaya Lopez†*
Mentor(s): Ramses Martinez

### ROOM: STEW 214C

4:00 Pets in the office: A systematic review and pilot study examining pets in the workplace
**7089** *Sophie Kaitlyn Stahl†; Braxton J Schieler**
Mentor(s): Leanne Nieforth; Jane F Yatcilla

**Research Talk Presentation Abstract Number: 7000**
*Presentation Time: STEW 214A at 9:00-9:20*

# Applicability of Additively Manufactured Fiber-Reinforced Thermoplastic Composite Mold for Thermoplastic Composite Thermoforming Process

Innovative Technology / Entrepreneurship / Design

Author(s):

Hanhyun Kwak† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Additive Manufacturing; Composite; Thermoforming; Cost-Effective

Mentor(s):

Garam Kim (Polytechnic); Sung Jun Choi (Polytechnic); Eduardo Barocio Vaca (Engineering)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7001**
*Presentation Time: STEW 214A at 9:20-9:40*

# OSS Fuzzing

Mathematical/Computation Sciences

Author(s):

Amar AlAzizy† (Engineering); Omar Faramawy Elsayed† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Fuzz; OSS; LLM; Big Data; Machine Learning

Mentor(s):

Aravind Machiry (Engineering); Arunkumar Bhattar (Engineering)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7002**
*Presentation Time: STEW 214A at 9:40-10:00*

# Real-Time Agent Motion Prediction in Multi-Agent Autonomous Racing Using Deep Neural Networks

Mathematical/Computation Sciences

Author(s):

Myron Milad Tadros† (Engineering); Ahmed Sayed Omar Omar† (Engineering); Omar Ahmed Roshdi Badawi Abousheishaa† (Engineering); Bola Yosry Zaky Warsy† (Engineering); Abdelrahman Ahmed Safwat Eissa† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Autonomous Racing; Self-Driving Cars; Multi-Agent Systems; Motion Prediction; Deep Neural Networks

Mentor(s):

Andres Felipe Hoyos Moreno (Engineering); Samuel Labi (Engineering)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7003**
*Presentation Time: STEW 214B at 9:00-9:20*

# Shear Modified Bin Discharge

Physical Sciences

Author(s):

Trisha Boodhoo† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Altair EDEM; Shear Bin Discharge; Simulations; Discrete Element Modelling; CAD

Mentor(s):

Carl R Wassgren (Engineering)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7004**
*Presentation Time: STEW 214B at 9:20-9:40*

# Examining tropical cyclone-induced compound hazards to inform effective adaptation and mitigation policies.

Physical Sciences

Author(s):

Tanya Sophia Masnyk† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Qingchun Li (Polytechnic); Daniel R Chavas (Science)

Other Acknowledgement(s):

Tianle Duan (Polytechnic)

**Research Talk Presentation Abstract Number: 7005**
*Presentation Time: STEW 214B at 9:40-10:00*

# Wearable Electrochemical Sensors for Personalized Digital Health

Innovative Technology / Entrepreneurship / Design

Author(s):

Surya Pratheek Turaga† (Engineering|JMHC)

Abstract:

Wearable skin interfacing sweat sensors attract significant interests in recent years that can be used to track and monitor biomolecule levels in sweat as a cost effective and non-invasive method of remote patient monitoring. Electrochemical sensors are ideal for wearable sweat sensors because of their excellent performance, affordability, compact size, and broad range of detection ability. In this work, we design and fabricate skin interfaced electrochemical electrodes in a highly scalable way using nanomanufacturing techniques. These highly consistent electrodes were then integrated with miniatured wearable platform, which would then interface with microprocessors and Bluetooth transmitters to make a fully functioning wearable monitoring device that can be easily, conformally attached to human skin. The developed system aims at providing real-time, longitudinal analysis of human sweat. The obtained data could provide valuable insight into human physiology at the molecular level, which would benefit modern human digital health.

Keywords: Wearable Technology; Electrochemical Sensors; Remote Healthcare; Skin Interfaced; Nanomanufacturing

Mentor(s):

Wenzhuo Wu (Engineering); Jing Jiang (Engineering)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7006**
*Presentation Time: STEW 214C at 9:00-9:20*

# The Disconnect Between Policy and Patient Care: Exploring the Impact of Indiana's Fetal Disposition Law on Pregnancy Loss Patients

Social Sciences / Humanities / Education

Author(s):

Lily Grace Renke† (Polytechnic); Emma Michelle Gordon‡ (HHS)

Abstract:

Background: Approximately 20% of pregnancies in the United States end in miscarriage each year. Seeing and managing blood, tissue, and clots (clinically referred to as products of conception, or POC) is a common part of pregnancy loss, but very little research examines how people experiencing pregnancy loss react to, and decide to manage, their POC. Since December 2022, Indiana is one of eleven states with mandatory fetal burial laws that mandates a specific process for disposing of fetal remains. This study aims to shed light on people's experiences with, and attitudes toward, managing POC in the context of Indiana's fetal disposition laws.

Methods: We used community-based recruitment to identify participants and conducted in-depth interviews with 26 Indiana residents who had experienced a miscarriage since 2018. We audio-recorded all interviews and carried out content and thematic analysis.

Results: Many participants expressed a desire to commemorate their pregnancy/baby but felt unsatisfied and confused by the options explained by healthcare providers under the fetal disposition law. Providers were unable to answer questions asked by participants about what would happen with their fetal remains. Participants wanted clearer guidance about managing the physical process of miscarriage and generally expressed dissatisfaction with bedside manner.

Discussion: Indiana's fetal disposition laws were enacted with a stated intent of benefitting the mental health of pregnant people. However, our findings do not support this and instead suggest that the inconsistent care and information may be distressing for patients. More consistent training and standardized guidance appears warranted.

Keywords: Miscarriage

Mentor(s):

Kathryn Jean LaRoche (HHS)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7007**
*Presentation Time: STEW 214C at 9:20-9:40*

# Adipose Tissue Morphology in Albumin Knockout Mice

Life Sciences

Author(s):

Yen-Hsi Lai† (HHS)

Abstract:

Excess body fat contributes to the development of diseases like type 2 diabetes, liver diseases, and cardiovascular diseases due to its effects on metabolism and inflammation. Albumin, a protein produced by the liver, helps transport free fatty acids (FFAs) from adipose tissue into the bloodstream and to other organs. When albumin is absent, this transport is disrupted, and FFAs are trapped in adipose tissue, thus preventing ectopic fat accumulation in other tissues. The research aims to investigate whether albumin knockout (Alb KO) mice would have changes in their adipose tissue morphology compared to wildtype (WT) mice. Specifically, the density of mitochondria and caveolae will be analyzed as they are key components involved in fatty acids catabolism and transport in the cells. To examine these changes, adipose tissue samples from Alb KO and WT mice will be analyzed using light microscopy and transmission electron microscopy (TEM). The study will focus on measuring mitochondria and caveolae morphology in both adipocytes and capillary endothelial cells to identify structural differences between the genotypes. We expect to find higher densities of mitochondria and caveolae in the adipose tissue of Alb KO mice, as the tissue adapts metabolically to the lack of albumin and reduced FFA release. This study will help us better understand how fat tissue adapts to stress when fatty acid transport is impaired, it will improve our understanding of fatty acid metabolism and its role in conditions such as obesity and metabolic disease.

Keywords: Adipose Tissue; Gene Knockout Model; Free Fatty Acids; Organelle Morphology; Transmission Electron Microscopy

Mentor(s):

Gregory C Henderson (HHS)

Other Acknowledgement(s):

Yi Zhang (HHS); Keigo Tomoo (HHS)

**Research Talk Presentation Abstract Number: 7008**
*Presentation Time: STEW 214C at 9:40-10:00*

# Children's Attribution of Blame Towards Low-Status Peer Groups

Social Sciences / Humanities / Education

Author(s):

Kendal Nicole Clay† (HHS|JMHC)

Abstract:

[Abstract Redacted]

Keywords: Social Mobility; Blame; Merit

Mentor(s):

Megan Nicole Norris (HHS); Laura Elenbaas (HHS)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7009**
*Presentation Time: STEW 214D at 9:00-9:20*

# Characterizing Genetic Knockdown of CIP2A in Non-Small Cell Lung Cancer Cells

Life Sciences

Author(s):

Talia Lee Kidder† (Science)

Abstract:

Metastasis is the leading cause of death in many types of cancer so we must understand the cellular processes causing it. Non-small cell lung cancer (NSCLC) is the most common type of lung cancer, accounting for around 85% of cases (Sher, Taimur et al., 2008, p. 355-67). It often exhibits treatment resistance, partly due to cellular changes like an epithelial-mesenchymal transition (EMT), a phenotypic process that causes tumors to become more invasive and often leads to metastasis. Protein phosphatase 2A (PP2A) is a heterotrimeric holoenzyme that regulates many signaling pathways, including those involved in cell state management. It has three subunits, A, B, and C, which are the scaffolding, regulatory, and catalytic subunits respectively. Previous data generated in my lab suggests that suppression of PP2A-B56? leads to an EMT and increased therapeutic resistance. In patients, overexpression of a cancerous inhibitor of PP2A-B56, CIP2A, is associated with therapeutic resistance and EMT-like phenotypes in NSCLC. I am researching how a genetic knockdown (KD) of CIP2A affects signaling in the HCC827 NSCLC cell line. Studying the growth and signaling of CIP2A KD cells in vitro will give us a better understanding of how to counteract metastasis and therapeutic resistance in NSCLC patients. Through Western blots, qPCR, and immunofluorescence, we expect to see an increase in epithelial markers like E-cadherin and a decrease in oncogenic signaling (AKT, ERK, Myc) via activation of PP2A-B56?.

Keywords: PP2A; Epithelial Mesenchymal Transition; Non-Small Cell Lung Cancer; Metastasis; CIP2A

Mentor(s):

Brittany Lee Allen-Petersen (Science); Brittany Nicole Heil (Science)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7010**
*Presentation Time: STEW 214D at 9:20-9:40*

# Using Single-cell RNA Sequencing to Identify Leukocyte Subsets Present in Benign Prostatic Hyperplasia

Life Sciences

Author(s):

Andree Kolliegbo† (Science)

Abstract:

Benign Prostate Hyperplasia (BPH) is characterized by the non-cancerous enlargement of the prostate. BPH and the associated lower urinary tract symptoms result in significant morbidity and around $3.9 billion (about $12 per person in the US) in annual medical expenses in the US. The current medications for BPH are often ineffective, with undesirable side effects and high rates of patient non-compliance. Using single cell RNA sequencing (scRNA-seq) data, our goal is to identify and characterize subsets of leukocytes in normal and enlarged human prostate to better understand the association between BPH and inflammation. ScRNA-seq was generated from 20 patient samples. We sequenced 5,000 cells from 10 small (<40g) and 10 large (>90g) BPH prostate tissue samples to determine the composition of individual leukocyte populations in the patient samples using size to determine the progression of the disease. The resulting data were aligned to the human reference genome using Cell Ranger followed by downstream analysis using the package Seurat to identify distinct clusters of cells from both large and small samples. Notably, we have determined that BPH tissues exhibit elevated levels of T cells, B cells, and macrophages, similar to autoimmune and inflammatory disease environments. Moving forward, subsets of T cells and macrophages will be compared with publicly available scRNA-seq datasets generated from patients diagnosed with autoimmune and inflammatory conditions to identify and characterize the subsets of macrophages and T cells using similar alignment methods. Understanding the subsets of immune cells present in BPH compared with the population will provide potential therapeutic targets for personalized treatment approaches.

Keywords: Single Cell RNA Seq; BPH; Prostate Cancer; Unsupervised Clustering; Machine Learning

Mentor(s):

Nadia Atallah Lanman (Vet Med)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7011**
*Presentation Time: STEW 214D at 9:40-10:00*

# Pramipexole as a potential enhancer of regeneration after zebrafish spinal cord injury

Life Sciences

Author(s):

Nikhil Samit Sadavarte† (Science|JMHC); Jonathan Minh-Tri Ngo‡ (Science); Kaitlyn Ying‡ (Science); Beatriz Cren Colalillo‡ (Science|JMHC); Manasa Gudugundla‡ (Science); Anshul Sanjeev‡ (Science); Katie Manfra‡

Abstract:

[Abstract Redacted]

Keywords: Spinal Cord; Regeneration; Pramipexole

Mentor(s):

Daniel Suter (Science)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7012**
*Presentation Time: STEW 214A at 10:00-10:20*

# A Survey of Autonomous Driving Algorithms for Scaled Racing

Mathematical/Computation Sciences

Author(s):

Manav Nikhil Gagvani† (Engineering); Sangeet Mohan† (Engineering); Jaron David Hunt† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Robotics; Machine Learning; Control Theory; Autonomous Systems; Systems Engineering

Mentor(s):

Shreya Ghosh (Engineering)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7013**
*Presentation Time: STEW 214A at 10:20-10:40*

# Generative Models for Images and Videos

Innovative Technology / Entrepreneurship / Design

Author(s):

Ian Owen Ou† (Engineering); Julianne Quin Iaccarino† (Engineering); Ibrahim Issa Abdullah† (Engineering); Basil Khwaja† (Engineering); Ron K Natarajan† (Science)

Abstract:

[Abstract Redacted]

Keywords: Text-to-Image Generative Models; Object Detection; Visual Transformers; Low Power Computer Vision

Mentor(s):

Monika Tomar (Engineering); Yung-Hsiang Lu (Engineering)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7014**
*Presentation Time: STEW 214A at 10:40-11:00*

# Design and Implementation of an Inductively Coupled Plasma Neutralizer for SPT-100 Hall Effect Thruster

Physical Sciences

Author(s):

Mathis Malaussena† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Inductively Coupled Plasma; Electric Propulsion; Hall Effect Thruster; RF Current; Gas Discharge Physics

Mentor(s):

Alexey Shashurin (Purdue University); Lee E Organski (Engineering)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7015**
*Presentation Time: STEW 214B at 10:00-10:20*

# Medical Minds, Literary Voices: The Intersection of Healing and Storytelling in Russian Literature

Fine Arts

Author(s):

Emily Doris Gervais† (Liberal Arts)

Abstract:

This project examines the intersection of medicine and literature through the works of Russian physicians who became influential authors. Focusing on Anton Chekhov's Sakhalin Island, Vikenty Veresaev's Memoirs of a Physician, and Mikhail Bulgakov's A Young Doctor's Notebook, this research highlights how their medical experiences shaped both their personal narratives and broader societal criticism. By analyzing the variation of both implicit, individual-centered stories and systemic, socio-political commentaries, the project reveals how these authors brought a unique clinical perspective to Russian literature. Their attention to detail, moral and ethical concerns, and use of medical language enriched their writings, imbuing their prose with practiced precision and distinctive portrayals of the human condition. This combination allowed them to balance observation with empathy, while also using their medical knowledge to develop their rhetoric. Ultimately, this work explores the significant role that medical insight plays in shaping stylistic language and conceptual depth in Russian literature, which is unique to the background of the authors.

Keywords: Literature; Russian; Medical; Physicians; Memoirs

Mentor(s):

Olga Lyanda-Geller (Liberal Arts)

Other Acknowledgement(s):

Amina Gabrielov (Liberal Arts)

**Research Talk Presentation Abstract Number: 7016**
*Presentation Time: STEW 214B at 10:20-10:40*

# The Burden of Legislation: How State Partisanship Influences Policy Design

Social Sciences / Humanities / Education

Author(s):

Paige Morgan Gonzales† (Liberal Arts|JMHC)

Abstract:

To achieve policy goals, legislators design policies that can be more or less punitive. For policymakers, getting the public to do what aligns with their policy goals requires strategic policy design– imposing burdens to punish non-compliance or extending benefits that incentivize and make compliance easier. For example, legislators may aim to address illegal drug use by increasing criminalization for users or increasing treatment access. But, which of these types of policies do state policymakers use more to achieve their legislative goals? Does the party in control of the state legislature influence the likelihood of implementing burden-focused policy designs? This paper evaluates whether strong conservative control of a state legislature increases likelihood to implement burden-focused policies. Using data from the Correlates of State Policy Project on a set of 10 policies between 1969-2011, I find that partisanship influences legislators' design preferences, often by reference to how partisans feel about target populations (e.g., marijuana users, the poor, etc.). I conclude with implications of these findings providing more insight into the partisan tendencies of policy design theory and their impact on future policy implementation rates.

Keywords: Policy Design; Public Policy; Partisanship; Political Science

Mentor(s):

David Lewis (Vanderbilt University)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7017**
*Presentation Time: STEW 214B at 10:40-11:00*

# The Risk of Harassment among Gig Workers by Race, Age, and Gender.

Social Sciences / Humanities / Education

Author(s):

Julieta Claudia Aguilar† (Liberal Arts)

Abstract:

Social scientists have found that the harassment that occurs in conventional workplaces is also prevalent in the gig economy. This is especially concerning because there are fewer legal protections for gig workers than conventional workers. Previous studies of gig workers indicate that women and minorities experience higher levels of harassment than others. Few studies however have examined the prevalence of inequality in the gig economy using an intersectional perspective. Using 2021 data from the American Trends Panel (ATP), we examine experiences of harassment among gig workers and how they may reflect the intersection of race, age, and gender. We find that Hispanics are more likely than whites to report harassment, with no significant variation by gender or age. The effects of gender and age, however, are interdependent. Although women do not report more harassment than men on average, young women report substantially more harassment than young men. Young women also experience more harassment than older men and women. For young women, gig work is thus not only precarious in an economic sense, it also involves a comparatively high risk of harassment.

Keywords: Gig Work; Harassment; Intersectionality

Mentor(s):

Jeremy E Reynolds (Liberal Arts)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7018**
*Presentation Time: STEW 214C at 10:00-10:20*

# Effects of DHEA on the estrous cycle: a rodent model of Polycystic Ovary Syndrome

Life Sciences

Author(s):

Morgan Marie DesEnfants† (Science); Roshni Manikandan‡ (Science); Linnaea Eileen Krupke* (HHS)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Kimberly Kinzig (HHS)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7019**
*Presentation Time: STEW 214C at 10:20-10:40*

# Environmental Contamination and Birth Anomalies in Iraq

Social Sciences / Humanities / Education

Author(s):

Bethany Faber† (HHS)

Abstract:

[Abstract Redacted]

Keywords: Iraq; Gulf War; Birth Anomalies; Toxicants

Mentor(s):

Ellen M Wells (HHS); Aaron James Specht (HHS)

Other Acknowledgement(s):

Ian Lindsay (Liberal Arts); Kali Rubaii (Liberal Arts)

**Research Talk Presentation Abstract Number: 7020**
*Presentation Time: STEW 214C at 10:40-11:00*

# Child Automated Speech-To-Text (CAST) - Enhancing Child Speech Comprehensibility with Machine Learning

Innovative Technology / Entrepreneurship / Design

Author(s):

Aakanksha Amol Shripal† (Engineering); Son Ha† (Science); Akhil Sagaran Kasturi‡ (Science); Akshitha Kartigueyan‡ (Science); Aarohi Panzade‡ (Science|JMHC)

Abstract:

[Abstract Redacted]

Keywords: Machine Learning; Artificial Intelligence; Automatic Speech Recognition (ASR); Natural Language Processing; Speech Development

Mentor(s):

David J Purpura (HHS)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7021**
*Presentation Time: STEW 214D at 10:00-10:20*

# The Chemical Makeup of Cloud Condensation Nuclei found in Stratocumulus Clouds along Costal Peru

Physical Sciences

Author(s):

Jasmine Alayna Luckett† (Science)

Abstract:

[Abstract Redacted]

Keywords: Cloud Condensation Nuclei; Nitrate; Sulfate; Chloride; Sea Salt

Mentor(s):

Greg M Michalski (Science)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7022**
*Presentation Time: STEW 214D at 10:20-10:40*

# Seismic Monitoring of Rainfall-induced Subsurface Changes Using Kullback–Leibler and Jensen–Shannon Divergence

Physical Sciences

Author(s):

Theo Adrian Garcia Carranco†

Abstract:

Monitoring changes in the earth's response to rainfall using seismic data provides valuable insights into soil moisture dynamics in densely forested areas, offering an indirect method for measuring it. This study uses seismic data from three different nodal seismometers: 2 closely spaced, 1 meter apart, and the third one located 30 meters away. Kullback–Leibler (KL) and Jensen–Shannon (JS) divergence are used to assess the similarity between their responses. The analysis revealed that, under normal conditions, the low-frequency seismic signals (5-50 Hz) from the closely spaced stations are more similar. However, the similarity consistently decreases with rainfall, indicating a measurable change in the subsurface response to precipitation. Doing the same analysis with higher frequency (50 - 500 Hz) signals shows more stable results. Generally, the responses of nearby stations are more similar than the faraway stations, with occasional deviations. Additionally, KL and JS divergence measures exhibit higher standard deviations in the lower frequencies, with greater variability in the 30-meter apart stations than the closer ones. A noticeable trend during rainfall events is the destabilization of the lower frequency band, followed by a recovery period before stabilizing. These findings show the impact of rainfall on earth responses and show a promising methodology to numerically find the recovery period, which could give information on the soil moisture content. Further comparison with ground truth data will establish reliability in our method.

Keywords: Earth Response; Kullback-Leibler Divergence; Jensen-Shannon Divergence

Mentor(s):

Yunyue Li (Science)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7023**
*Presentation Time: STEW 214D at 10:40-11:00*

# Forecasting the 2024 Elections using Mathematical Modeling

Mathematical/Computation Sciences

Author(s):

Joseph Michael Cromp† (Science); Thanmaya Pattanashetty† (Science); Alexia Rodrigues† (Science)

Abstract:

Election forecasting is an exciting, yet complex and uncertain process that is often under scrutiny from the public eye. Our research has been focused on forecasting the 2024 president, Senate, and governor elections in the United States. We apply mathematical modeling to describe the interactions between voters in different states. Combined with this, we use polling data and data-science approaches to forecast and visualize results for upcoming elections. In addition to running weekly 2024 forecasts and updating our website, we are also working on grading pollsters based on their performance relative to other polling organizations, and on improving our methods to account for poll sample size. Our forecasts are publicly shared on our website (https://c-r-u-d.gitlab.io/2024/ and in a weekly column in the Purdue Exponent) with interactive features to display the uncertainty in election forecasting. We will discuss the accuracy of our 2024 forecasts as well as our experience sharing forecasts in real time.

Keywords: Math; Computational Modeling; Data Science

Mentor(s):

Alexandria Volkening (Science)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7024**
*Presentation Time: STEW 214A at 11:00-11:20*

# The Modeling of the Umbilical Cord In End of Term Women Using a PDMS Microfluidics Design

Innovative Technology / Entrepreneurship / Design

Author(s):

Divya Raghvendra Manvikar† (Engineering); Mira Nimesh Patel† (Engineering); Dipali Rebecca Abraham† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Microfluidics; Pregnancy; Umbilical Cord

Mentor(s):

Ryan B Wagner (Engineering); Arezoo Ardekani (Engineering)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7025**
*Presentation Time: STEW 214A at 11:20-11:40*

# A Novel Approach to Sex-Specific Responses of Enhancing Osteogenesis with a 3D-Printed Hybrid Hydrogel

Life Sciences

Author(s):

Maria Macias† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Osteogenesis; BMSCs; Cell Metabolic Activity; Bone Graft; Hybrid Hydrogel

Mentor(s):

Claudia Benito Alston (Engineering); Luis Solorio (Engineering)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7026**
*Presentation Time: STEW 214A at 11:40-12:00*

# Image-based Mobile Phone Applications (APPS)

Innovative Technology / Entrepreneurship / Design

Author(s):

Minchae Yun† (Science); Huy Duc Vu† (Science); Vishwadeep Singh† (DSB); William Emre Ozkan† (DSB|JMHC)

Abstract:

[Abstract Redacted]

Keywords: Image-Based Mobile Phone Applications; Grayscale Conversion; Gaussian Filtering; Sobel Edge Detection; Otsu Thresholding

Mentor(s):

Edward J Delp (Engineering); Fengqing Zhu (Engineering); Soudabeh Taghian Dinani (Engineering); Carla Zoltowski (Engineering)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7027**
*Presentation Time: STEW 214B at 11:00-11:20*

# Further validation of the neuromelanin-forming rats to model Parkinson's Disease and their implication in HAA-induced dopaminergic neurotoxicity

Life Sciences

Author(s):

Matthew Thomas Corson† (HHS|JMHC)

Abstract:

[Abstract Redacted]

Keywords: Parkinson; Neuromelanin; Rat Model; HAA; Neurotoxicity

Mentor(s):

Fatema Mustafa Currim (HHS); Josephine Maria Brown (HHS); Jason R Cannon (HHS)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7028**
*Presentation Time: STEW 214B at 11:20-11:40*

# Polyphenol and polysaccharide interactions in whole food matrices - Role in starch digestion

Life Sciences

Author(s):

Johanna Marie Hicks† (Agriculture|JMHC)

Abstract:

[Abstract Redacted]

Keywords: Foods for Health; ?-Amylase; Polyphenols; Grain Processing; Particle Size

Mentor(s):

Lavanya Reddivari (Agriculture); Edward David Moncada (Agriculture)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7029**
*Presentation Time: STEW 214B at 11:40-12:00*

# Investigating Mycoparasitic Behavior of Alternaria on Various Species of Rust Fungi

Life Sciences

Author(s):

Lane Bell† (Agriculture)

Abstract:

[Abstract Redacted]

Keywords: Mycoparasites; Rust Fungi; Biocontrol; Appressoria; Alternaria

Mentor(s):

Daniel B Raudabaugh (Agriculture); Mary Aime (Agriculture)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7030**
*Presentation Time: STEW 214C at 11:00-11:20*

# Analysis of the heavy metals in electrodes used in manual metal arc welding and the generated fumes

Life Sciences

Author(s):

Shane Kevin Limas† (HHS|JMHC)

Abstract:

Stick welding, also known as manual metal arc welding (MMAW) involves using a consumable electrode to create an electric arc that joins metals. This process generates welding fumes containing toxic metallic aerosols. Inhalation of these metallic aerosols can cause adverse health effects; for example, cancer and neurological damage. Specifically, chronic exposures to manganese (Mn) found within the welding fumes can result in Manganism, characterized by tremors, stiffness, slowed motor movement, and muscle spasms. Furthermore, the onset of these symptoms is typically preceded by aggressiveness, depression, and hallucinations. To protect welders who use their skills to earn their living, understanding Mn exposure is essential. In this study, the iron (Fe) and Mn present in the welding electrode and the fumes generated during the welding process were analyzed to investigate the behavior and fate of Mn throughout the process. Specifically, an experimental setup consisted of a welding station to generate welding fumes, an exposure chamber to place sample/monitoring systems or animal subjects, and a centrifugal fan to pull the welding fumes to the exposure chamber. Four different welding sticks were tested and their metal contents were analyzed using X-ray fluorescence (XRF). To characterize the metallic aerosols in the welding fumes generated from each welding stick, respirable samplers utilizing mixed ester cellulose (MCE) filters were installed in the exposure chamber. After collecting welding fumes until the electrode was fully consumed, the metal contents in the samples collected on the MCE filters were also analyzed using XRF. The results of the XRF analysis show that the average Fe:Mn ratio in the coating material of the welding stick was about 5 while the average Fe:Mn ratio in the core material was about 172. This indicates that the coating materials contain more Mn. Respirable Fe and Mn concentrations in the fumes were 10.5 mg/m3 and 3.0 mg/m3, respectively. Fe:Mn ratio in the collected welding fumes was about 4.4. The major source of Mn could be the coating materials of welding sticks. The practical implications of this research are significant for occupational health and safety in welding environments. By identifying the concentration and behavior of Mn in welding fumes, the study provides valuable insights that can inform guidelines and regulations aimed at minimizing worker exposure.

Keywords: Stick Welding; Welding Fumes; Manganese (Mn); Health Effects; X-Ray Fluorescence

Mentor(s):

Jae Hong Park (HHS)

Other Acknowledgement(s):

Chang Geun Lee (HHS)

**Research Talk Presentation Abstract Number: 7031**
*Presentation Time: STEW 214C at 11:20-11:40*

# The pulmonary baroreflex as a neurovascular modulator: A possible therapeutic target for chronic sympathetic overactivity in aging

Life Sciences

Author(s):

Julian Andres Guzman Torres† (Universidad Nacional de Colombia)

Abstract:

[Abstract Redacted]

Keywords: Aging; Muscle Sympathetic Nerve Activity; Pulmonary Baroreflex

Mentor(s):

Igor Alexandre Fernandes (HHS)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7032**
*Presentation Time: STEW 214C at 11:40-12:00*

# Stress-enhanced fear learning can be reduced with unconditional stimulus deflation with constraints.

Life Sciences

Author(s):

Jaden Brooks† (Science); Priya Halder* (HHS)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Sydney Trask (HHS)

Other Acknowledgement(s):

Payton K Robinson (HHS); Sean Warner (HHS)

**Research Talk Presentation Abstract Number: 7033**
*Presentation Time: STEW 214D at 11:00-11:20*

# Mapping Chemical Abundances of the Supernova Remnant Cassiopia A with the James Webb Space Telescope

Physical Sciences

Author(s):

Grace Katz† (Science)

Abstract:

[Abstract Redacted]

Keywords: Supernovae; Supernova Remnant; Astronomy

Mentor(s):

Danny Milisavljevic (Science); Danielle Dickinson (Science)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7034**
*Presentation Time: STEW 214D at 11:20-11:40*

# Seasonal Variation in Radar Signatures in Amundsen and Cabeus Craters on the Moon

Physical Sciences

Author(s):

Donnie Hutchison† (Science)

Abstract:

[Abstract Redacted]

Keywords: Geology; Moon; Ice; Radar; GIS

Mentor(s):

Ali Bramson (Science)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7035**
*Presentation Time: STEW 214D at 11:40-12:00*

# Investigating the effects of ciclopirox and its derivatives on urothelial and renal cell carcinomas

Life Sciences

Author(s):

Abigail Hyejin Lee† (Science|JMHC); Kaaya Dharm Sharma* (Agriculture)

Abstract:

As drug discovery is known to be a labor, time, and cost-intensive process, computational drug repurposing provides a promising approach for identifying new applications of existing therapeutics. From a large-scale in silico drug screening, our lab has identified ciclopirox (CPX), an FDA-approved antifungal agent, as a top candidate for treating urothelial and renal carcinomas. CPX has previously demonstrated anti-tumor activity against other cancers through an iron chelation mechanism, however, its clinical application has been hampered by limited half-life in vivo and low aqueous solubility. To mitigate these shortcomings, we developed the novel modified prodrug (AL1), aiming to improve CPX's solubility and resistance to iron-mediated inactivation. Thus, this study investigates how AL1 impacts cancer cell proliferation and provides resistance to iron-mediated inactivation in vitro as compared to conventional CPX and existing CPX prodrugs. Canine urothelial and human renal cancer cell cultures were first treated with CPX and selected prodrugs in the presence or absence of iron. Relative cell proliferation was then quantified with a Cell Counting Kit 8 assay. Additionally, the impact of CPX on the activation of cancer-related pathways, such as the Wnt/B-catenin and NFkB pathway, was determined using western blot. Results suggest that AL1 exhibits potent anti-tumor activity and the greatest resistance among CPX and derivatives to iron-mediated inactivation in both urothelial and renal cancer cells. These findings provide insights on the activity, stability, and mechanism of CPX, and may support future exploration of AL1 for in vivo animal models and ultimately human clinical trials.

Keywords: Drug Repurposing; Ciclopirox; Urothelial Carcinoma; Renal Carcinoma; Cell Proliferation

Mentor(s):

Yuxin Zhuang (Agriculture); Majid Kazemian (Science)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7036**
*Presentation Time: STEW 214A at 12:00-12:20*

# Biomedical Drone for Narcan Delivery

Innovative Technology / Entrepreneurship / Design

Author(s):

Victor Ionut Ene† (Engineering); Danica Brynn Joyner† (Engineering); Nathan James Arnold† (Engineering); Harshavi P Birla† (Engineering); Natasha Rajendrarao Gundapaneni† (Engineering); Ty Dean Frederick† (Engineering); Shelby Grace Britton† (Engineering); Parth Kailash Dubal† (Engineering); Bhaskar S Patke† (Engineering)

Abstract:

Opioid Overdose is a growing public health crisis with more than 81,000 deaths in the United States in 2023 alone. Fortunately, Narcan is an easily administered drug that can reverse the effects of an overdose. However, oxygen deprivation from an overdose causes permanent brain damage within just 6 minutes, quickly becoming fatal. The national average response time of an EMS is 7 minutes in urban areas, and 14 minutes in rural areas. This project seeks to design an Unmanned Aerial Vehicle (UAV) that autonomously delivers Narcan to the scene and gives audio and visual instructions on how to administer treatment, ahead of an ambulance arriving.

We derived vehicle flight performance requirements modeling current EMS infrastructure and the impact of cooperatively deployed UAVs. Using physics simulations, we built a UAV to meet these requirements. The design process included an evaluation of various path-planning methods given various speeds. This UAV doubles the EMS coverage area of Indiana in a six minute window. The vehicle navigates to a victim using a planned flight path with forward and downward collision sensors to prevent accidents, as well as a 4G-enabled companion computer for added reliability. A bystander retrieves Narcan from the payload dispenser, and follows video and audio instructions played by the vehicle. With the ability to rapidly reach far distances, autonomously land, and provide medication and instructions to bystanders, a fleet of these UAVs would provide EMS responses to areas where ambulances cannot reach quickly, improving the medical outcomes of overdose victims.

Keywords: [no keywords provided]

Mentor(s):

James Michael Goppert (Engineering);  Kong (Engineering); Nicole Adams (Centers & Institutes)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7037**
*Presentation Time: STEW 214A at 12:20-12:40*

# Understanding Tactile Sensation: Neural Mechanisms of Texture Exploration in Freely Moving Mice

Life Sciences

Author(s):

Lucy Anne Jurow† (Engineering); Hannah Jordan Margulis† (Engineering|JMHC)

Abstract:

We rely on our sense of touch to identify textures and make decisions relevant to our everyday functioning, from choosing comfortable clothing to determining if a surface is slippery. Despite the cognitive involvement in processing texture, the neural mechanisms of texture encoding are not well understood. Here, we aim to determine the behavioral and neural correlates of texture sensation. First, mice will be trained to explore pairs of textures (16 sandpapers of varying grit) through their paws in an open arena and indicate which texture is rougher by selecting one of two reward ports. The results from this behavioral task will determine the threshold with which mice can perceive varying types of textures. Using this behavior as a baseline, we will then investigate how texture is encoded by neurons in the mouse primary somatosensory cortex (S1) by recording neural activity in freely-moving mice during texture exploration. The mice will be implanted with a 16-channel microelectrode array in S1 and will be allowed to roam freely in an arena containing 17 different textures (16 sandpapers of varying grit and smooth plastic acrylic). The breadth of data gathered from the multi-channel electrode array will provide both high spatial resolution and high temporal resolution neural recordings. Together, the neural and behavioral data collected from this study will assemble a more complete picture of multi-feature texture encoding in the brain. Knowledge of this representation of texture information will contribute to the development of next generation prosthetics which aim to replicate naturalistic sensation.

Keywords: Neuroscience; Somatosensory; Texture; Neural Networks

Mentor(s):

Megan Hope Lipton (Science); Maria Cristina Makin (Engineering)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7038**
*Presentation Time: STEW 214A at 12:40-1:00*

# Optimized Text Recognition: A Transfer Learning Approach for Detecting and Transcribing Text in Natural Scenes

Mathematical/Computation Sciences

Author(s):

William Henry Stevens† (Science); Gabriel A Torres† (Engineering); Karthik Selvaraj† (Engineering); Leo Ross Benaharon† (Engineering); Surya Teja Sripathi† (Science); Arnav Dushyant Choudhry† (Engineering)

Abstract:

Text and writing is abundant in the human world. Every day, humans read and understand writing of various sizes, styles, and fonts. For machines like autonomous cars, smart glasses, and technological aids for the blind to be successful, the development of robust computer vision algorithms to accurately scan and understand text in our world is highly important. Building on our image processing foundations, we propose an advanced text detection and transcription algorithm leveraging transfer learning techniques. Our approach utilizes a large synthetic dataset, SynthText, containing 850,000 images and 7.5 million synthetically generated text instances for pre-training. This dataset serves as a backbone for a model that can generalize to real-world scenarios. Our model architecture is based on TextBoxes, a specialized text detection network, and includes machine learning components like CNNs, RNNs, and transformers. Our goal is to maximize the model's performance in complicated natural scenes for text localization, segmentation, and recognition. Using datasets from the Robust Reading Competition, we intend to refine the pre-trained model and gradually tackle more difficult tasks, such as end-to-end text detection and recognition, from basic text localization. By bridging the gap between synthetic data training and real-world applications, this transfer learning strategy aims to improve text recognition accuracy across a variety of examples, including menus from restaurants, store names, and street signs. By combining advanced neural network architectures with strategic dataset utilization, we aspire to develop an accurate and efficient text recognition model that can generalize to various real-world scenarios.

Keywords: Machine Learning; Computer Vision; Text Recognition; Transfer Learning

Mentor(s):

Edward J Delp (Engineering); Carla Zoltowski (Engineering); Fengqing Zhu (Engineering)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7039**
*Presentation Time: STEW 214B at 12:00-12:20*

# Reflections of the Economic Culture in Russian literature

Social Sciences / Humanities / Education

Author(s):

Davyd Revenko† (DSB|JMHC)

Abstract:

This project delves into the intricate reflections of economic culture in Nikolai Gogol's classical poem "Dead Souls", and Ilya Ilf and Yevgeny Petrov's novel "The Golden Calf", focusing on the distinct personality traits of the main characters from both books and why readers root for them within the context of Russian economic realities. This research focuses on how the personalities of the central characters, Chichikov and Ostap Bender, with their ambition and adaptability, mirror the shifting economic ideologies and conditions of their time. These characters are often perceived as charming anti-heroes, they embody the opportunism, resilience, and moral ambiguity that arise in environments of economic instability and transformation. Through this lens, the research not only traces changes in economic thought but also uncovers deeper insights into the values, conflicts, and aspirations that have defined and transformed the Russian society across time.

Keywords: Economics; Russian Society; Key Texts; Personality

Mentor(s):

Olga Lyanda-Geller (Liberal Arts)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7040**
*Presentation Time: STEW 214B at 12:20-12:40*

# Ensuring Consumer Safety by Analyzing the Impact of Fluctuating Temperatures on STEC

Life Sciences

Author(s):

Hayley Kristen Wong Liong† (Agriculture|JMHC); Athanasios Gregory Flessas† (Agriculture|JMHC)

Abstract:

[Abstract Redacted]

Keywords: Food Science; Food Microbiology; E. coli; Pathogens; USDA

Mentor(s):

Bruce M Applegate (Agriculture); Kal Holder (Science); Keyshla M Narvaez Davila (Agriculture)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7041**
*Presentation Time: STEW 214B at 12:40-1:00*

# Making a Splash: Using Mass Spectrometry to Measure Dopamine and Serotonin Turnover in Water-Enriched Pekin Duck Brains

Life Sciences

Author(s):

Nina Kay Wilson† (Agriculture)

Abstract:

We sought to understand if environmental enrichment alters brain neurotransmitters in ducks. Brain serotonin and dopamine activity have been associated with affective states for decades, but not following environmental enrichment in ducks. Thus, we set out to determine if water-based enrichment can impact the affective state of Pekin ducks through the lens of brain neurotransmitter levels. To accomplish this goal, we evaluated the effect of preening cups on 5-HT and DA turnover via mass spectrometry. Grow-out Pekin ducks (n = 525) were housed at Purdue and raised per industry standards. On day 16, brains were collected from ducks in pens before the non-water and water enrichment were placed (PRE, n = 8) and, again on day 44, in pens with wiffle balls (EED, n = 8), a preening cup (PC = 8), Pekino (PEK = 8) and ducks without any enrichment (CON = 8). Brains were micro dissected into 4 brain areas: caudal mesencephalon (CM), rostral mesencephalon (RM), diencephalon (DI), and forebrain (FB). Our data shows no significant differences in static levels nor neurotransmitter turnover. Since DA and 5HT are linked to affective states these data would suggest that there were no changes in affective state related to the presence of water- or non-water-based enrichment. This project however, is part of a larger study that incorporates behavioral analyses to quantify duck behavior. The brain chemistry in my study will be used with the behavioral data to develop a holistic view of the ducks' affective state.

Keywords: Neurotransmitter; Biogenic amines; Aggression; Emotion; Environmental Enrichment

Mentor(s):

Greg Fraley (Agriculture)

Other Acknowledgement(s):

Jenna M Schober (Agriculture)

**Research Talk Presentation Abstract Number: 7042**
*Presentation Time: STEW 214C at 12:00-12:20*

# Rethinking Civil Litigation: Why A Data Driven Approach is Necessary

Social Sciences / Humanities / Education

Author(s):

William Brian Nilges† (HHS)

Abstract:

Heuristics and biases such as ‘loss aversion’ and the ‘anchoring effect' impact lawyers judgment during civil litigation. To explain how such biases occur, this paper provides an overview of the two systems of thinking—System I and System II—to discuss how these cognitive frameworks lead to systematic errors in judgment. To address the challenges brought upon by System I thinking, this paper proposes the incorporation of statistical models guided by prospect theory. In theory, the proposed models provide a more accurate assessment of an expected settlement value for a given case. The paper includes evidence that the incorporation of the proposed models can be applicable to the civil litigation process. Further, the findings suggest that the incorporation of statistics to mitigate the effects of unconscious biases can significantly improve an individuals decision-making under uncertainty.

Keywords: Heuristics; Biases; Statistics; Judgment; Uncertainty

Mentor(s):

Beth Elly Baumgartner (Liberal Arts)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7043**
*Presentation Time: STEW 214C at 12:20-12:40*

# Investigation of Optimal Machining Parameters for Fiber-Reinforced Thermoplastic Composite Tooling

Innovative Technology / Entrepreneurship / Design

Author(s):

Sucheol Woo† (Polytechnic); Min Yong Chun* (Polytechnic)

Abstract:

[Abstract Redacted]

Keywords: Fiber-Reinforced Composite; Additive Manufacturing; Surface Characteristics; Tooling Operation

Mentor(s):

Garam Kim (Polytechnic); Sung Jun Choi (Polytechnic); Eduardo Barocio Vaca (Engineering)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7044**
*Presentation Time: STEW 214C at 12:40-1:00*

# REBEL: Rule-based and Experience-enhanced Learning with LLMs for Initial Task Allocation in Multi-Human Multi-Robot Teams

Mathematical/Computation Sciences

Author(s):

Arjun Sandeep Gupte† (Engineering)

Abstract:

Multi-human multi-robot teams combine the complementary strengths of humans and robots to tackle complex tasks across diverse applications. However, the inherent heterogeneity of these teams presents significant challenges in initial task allocation (ITA), which involves assigning the most suitable tasks to each team member based on their individual capabilities before task execution. While current learning-based methods have shown promising results, they are often computationally expensive to train, and lack the flexibility to incorporate user preferences in multi-objective optimization and adapt to last-minute changes in real-world dynamic environments. To address these issues, we propose REBEL, an LLM-based ITA framework that integrates rule-based and experience-enhanced learning. By leveraging RetrievalAugmented Generation, REBEL dynamically retrieves relevant rules and past experiences, enhancing reasoning efficiency. Additionally, REBEL can complement pre-trained RL-based ITA policies, improving situational awareness and overall team performance. Extensive experiments validate the effectiveness of our approach across various settings. More details are available at https://sites.google.com/view/ita-rebel.

Keywords: Multi-Human Multi-Robot Teams; Initial Task Allocation; Large Language Models; Human Robot Interaction

Mentor(s):

Byung-Cheol Min (Polytechnic); Ruiqi Wang (Polytechnic); Lakshmi Narayan Vishnunand Venkatesh (Polytechnic); Taehyeon Kim (Polytechnic)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7045**
*Presentation Time: STEW 214D at 12:00-12:20*

# Differential responses to PP2A activation are influenced by AREG signaling

Life Sciences

Author(s):

Ella Rose Deanne Chianis† (Science)

Abstract:

Pancreatic ductal adenocarcinoma (PDAC) has the lowest five-year survival rate of all major cancers at only 13%. Mutations in the small GTPase KRAS cause activation of the epidermal growth factor receptor (EGFR) pathway which drives PDAC development. Current treatments target EGFR and KRAS, but many patients develop resistance. Our lab investigates alternative therapeutic strategies through the activation of protein phosphatase 2A (PP2A). PP2A turns off many of the signals in the EGFR-KRAS pathway but is often suppressed in PDAC. We use a small molecule called DT-061 to study PP2A activation, but little is known about resistance mechanisms to this therapeutic route. Preliminary data in our lab demonstrate that PDAC cells treated with DT-061 increase production of the EGFR ligand, amphiregulin (AREG). AREG is associated with many cellular survival programs including the integrated stress response, activation of the EGFR pathway, and epithelial to mesenchymal transition (EMT) which is a common resistance mechanism to therapeutics including KRAS inhibitors. I hypothesize that PDAC cells increase production of AREG in response to PP2A activation to evade cell death. To investigate this potential resistance mechanism, I altered human PDAC cell lines to stably overexpress AREG. I showed an increase in viability of lines that highly express AREG compared to control lines with PP2A activation. By knocking down EGFR, I also investigated whether this viability increase can be attributed to AREG signaling through EGFR. Uncovering this relationship between AREG expression and resistance mechanisms would provide critical data for the therapeutic efficacy of PP2A activation in patients.

Keywords: PDAC; PP2A; AREG

Mentor(s):

Brittany Lee Allen-Petersen (Science); Claire M Pfeffer (Science)

Other Acknowledgement(s):

Sydney Joann Clifford (Science)

**Research Talk Presentation Abstract Number: 7046**
*Presentation Time: STEW 214D at 12:20-12:40*

# Screening Photoactivatable Proteins at Cryogenic Temperatures

Physical Sciences

Author(s):

Sarah A Alvarez† (Science)

Abstract:

[Abstract Redacted]

Keywords: Microscopy; Fluorescent Proteins; cryoCLEM; TEM/CET

Mentor(s):

Peter Dahlberg (Stanford University)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7047**
*Presentation Time: STEW 214D at 12:40-1:00*

# A PHD Filter Approach to Target-Invariant Persistent Monitoring

Mathematical/Computation Sciences

Author(s):

Revanth Krishna Senthilkumaran† (Engineering|JMHC)

Abstract:

Persistent monitoring involves the continuous observation and tracking of multiple mobile targets, combining search and tracking tasks in dynamic environments. Existing methods, such as the Spatio-Temporal Attention network for persistent monitoring of Multiple mobile Targets (STAMP), utilize Gaussian processes to model target trajectories. However, these approaches require a-priori knowledge of the number of targets in the environment and individual models the trajectory of each target, limiting the scalability of the approach when the number of targets are unknown. We propose integrating Probability Hypothesis Density (PHD) filtering into the STAMP framework to overcome this limitation. PHD filtering, based on the Random Finite Set (RFS) theory, enables estimation of target densities without explicit data association, effectively handling varying numbers of targets. By replacing Gaussian processes with a PHD filter, we aim to develop a learning-based solution that inherently manages an unknown and varying number of targets, maintaining a single representation of the trajectories of all targets within the environment. Our approach aims to enhance the monitoring performance via invariance with number of targets and reducing computational complexity associated with modeling the target trajectories. Our research offers a scalable and adaptive method for persistent monitoring, with potential applications including surveillance, environmental monitoring, and search-and-rescue operations. Future extensions of our research focuses validating the approach in more complex 3D environments and real-world scenarios.

Keywords: Robotics; Object Tracking; Persistent Monitoring; Probability; Computational Simulation

Mentor(s):

Aniket Bera (Science); Apoorva Vashisth (Science)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7048**
*Presentation Time: STEW 214A at 1:00-1:20*

**Title: Measuring Progress in Eye Tracking Behavior During Surgical Training**

Life Sciences

Author(s):

Hassan Berbich† (Engineering)

Abstract:

Title: Measuring Progress in Eye Tracking Behavior During Surgical Training

Background: Eye-tracking technology provides objective data on visual attention patterns, which can offer valuable insights into how surgeons focus when watching complex procedures. Eye-tracking techniques have been employed in various ways within clinical environments. In surgical training, understanding these patterns could serve as a key indicator of skill acquisition and proficiency.

Purpose: To examine whether there is measurable progress in eye-tracking behavior during surgical training and whether it correlates with a trainee's experience level or the types of surgical procedures.

Methods: A total of 18 participants from the Urology department at IU Medicine were enrolled, including six faculty members and twelve residents (PGY1-5). Each participant watched two surgical videos—one robotic and one endoscopic—showing a bladder neck dissection during a prostatectomy, a procedure that none had previously encountered. Eye-tracking data was collected using Tobii-pro glasses (Tobii AB, Danderyd Municipality, Sweden), and serveral gaze metrics (e.g., average fixation duration, fixation to saccade ratio) were extracted using Tobii Pro Lab. Statistical anlysis would be performed to assess two key areas: (1) the correlation between eye-tracking behaviors and experience level and (2) differences in eye-tracking behavior between the robotic and endoscopic videos.

Expected Results and Impact: We anticipate finding a measurable gradient in eye-tracking behavior, showing increased focus and refined attention with higher experience levels. Differences between robotic and endoscopic approaches are also expected. These findings could support the use of eye-tracking as an objective tool in evaluating and assessing the skill development of surgical trainees.

Keywords: Eye-Tracking; Statistical Analysis

Mentor(s):

Denny Yu (Engineering)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7049**
*Presentation Time: STEW 214A at 1:20-1:40*

# SWARMS: Multi-Agent UAV Control Simulation

Innovative Technology / Entrepreneurship / Design

Author(s):

Amikosh Dube† (Engineering); Noah Anthony Wisniewski† (Engineering); Jay Bhavesh Gandhi† (Engineering); William John Greenwood† (Science); Jammy Wang† (Science); Dhanush Adhitya Gopalakrishnan† (Engineering); Srikar Sastry Lanka‡ (Science); Berra Ulku Kalci‡ (Engineering); Richard Hastings Hambleton‡ (DSB)

Abstract:

[Abstract Redacted]

Keywords: Simulation; Drone Racing; Autonomous Control Systems; UAV; Multi-Agent

Mentor(s):

Younggil Chang (Engineering); Shreyas Sundaram (Engineering)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7050**
*Presentation Time: STEW 214A at 1:40-2:00*

# Understanding Environmental Impacts of Large Language Model Serving

Mathematical/Computation Sciences

Author(s):

Gavin Michael Fortwendel† (Science)

Abstract:

This project aims to examine the environmental impacts—specifically the carbon and water footprints—of large language model (LLM) serving. The widespread deployment of LLMs requires substantial energy, resulting in significant operational carbon footprints. In addition, LLM serving systems depend on advanced GPUs, contributing considerable embodied carbon footprints from hardware manufacturing. Recent studies also indicate that LLM operation involves considerable water consumption. To assess these impacts, we run open-source Llama 1B and 7B models at varying batch sizes on L40 GPUs, measuring energy consumption and modeling their carbon and water footprints. Data is collected both end-to-end and at the per-token level, separately for prefill and decoding phases. The findings from this project provide preliminary insights for developing sustainable LLM serving systems and establish a foundation for reducing the environmental impacts of LLM deployment while meeting performance goals.

Keywords: Large Language Models; Carbon Footprints; Water Footprints

Mentor(s):

Yi Ding (Engineering); Inez Hua (Engineering)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7051**
*Presentation Time: STEW 214B at 1:00-1:20*

# The Consequence of Temperature Variance During Transportation on Salmonella: Impact on Food Safety

Life Sciences

Author(s):

Carson William Rockwell† (Science); Bailey Jean Williams† (Agriculture)

Abstract:

Salmonella enterica is one of the most prevalent foodborne pathogens in North America, costing billions per year. It is most commonly found in poultry products, necessitating testing and screening from the USDA Food Safety Inspection Service. These samples are delivered to central testing facilities via ground and air transport in insulated, chilled boxes. Due to the nature of this process, the packages may experience temperature fluctuations, the effects of which are currently unknown. These conditions can affect the validity of the sample testing, so it is necessary to study the effects of these shipping conditions. In previous experiments, we investigated the threshold temperature where Salmonella growth occurred in neutralizing buffered peptone water (nBPW) using three temperatures: 5°C, 7°C, and 10°C. Hence, we investigated if Salmonella experiences similar trends on inoculated ground turkey samples at 5°C, 7°C, and 10°C to observe any effect the food matrix may have on results. Salmonella growth in the inoculated samples experienced vast changes in growth between the 7°C and 10°C, however, only at the 72 hour mark. Compared to the nBPW results, there was a similar trend in growth. Temperature fluctuations in shipping can impact enumeration in lab testing – and with growing sentiments to make Salmonella enterica a zero-tolerance pathogen, there is a need to validate current sampling and shipping protocols. Further research includes performing a demarcation experiment to determine the exact cutoff temperature at which growth ceases and to test inoculated ground meat samples in the shipping boxes to more accurately simulate transportation conditions.

Keywords: Salmonella Enterica; Pathogens; Temperature; Growth; Shipping Conditions

Mentor(s):

Bruce M Applegate (Agriculture); Kal Holder (Science); Keyshla M Narvaez Davila (Agriculture)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7052**
*Presentation Time: STEW 214B at 1:20-1:40*

# Evaluation of Ketamine's Prosocial Effects in Scn2a-deficient Mice

Life Sciences

Author(s):

Rineet Ranga† (HHS); Akila Abeyaratna‡ (Agriculture|JMHC)

Abstract:

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder affecting approximately 1 in 36 children, characterized by deficits in social communication and social interaction. Among the genetic factors contributing to ASD, mutations in SCN2A, a gene encoding a sodium ion channel (Nav1.2), has been identified as one of the leading monogenic causes of ASD. Our lab has characterized a novel mouse model of SCN2A deficiency, which recapitulates many of the phenotypes seen in ASD patients, such as social deficits. Recently, Ketamine has been evaluated as a therapeutic in autistic children, showing significant improvements in social communication and social withdrawal. Ketamine, primarily known as a NMDA antagonist, has been found to increase serotonin release in major brain regions affected in ASD, such as the prefrontal cortex, a crucial region for social and cognitive functions. Using the Three-Chamber assay, we aim to determine if acute ketamine injections produce prosocial effects in Scn2a-deficient mice. To further explore the specific receptor mechanisms that elicit prosocial effects, 7-Cholorokynuric acid, an NMDA receptor antagonist, and serotonin receptor agonists, CP-94, 253, and Psilocybin, which target 5HT1B and 5HT2A receptors, respectively, were evaluated. An acute injection of 20 mg/kg of ketamine produces prosocial effects in SCN2A-deficient mice. In contrast, NMDA antagonism does not produce prosocial effects; however, 5HT1B and 5HT2A agonism with CP 94,253 and Psilocybin increases sociability in SC2NA-deficient mice. Our findings highlight the potential use of compounds that modulate the serotonergic system as therapeutic in SCN2A-related autism.

Keywords: Ketamine; Social Deficits; Autism Spectrum Disorder; Psilocybin; SCN2A

Mentor(s):

Brody Alan Deming (Pharmacy)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7053**
*Presentation Time: STEW 214B at 1:40-2:00*

# Design of a curriculum proposal for the teaching of English/Spanish for pharmacy students focused on the correct use of medications and interculturality.

Social Sciences / Humanities / Education

Author(s):

Gabriela Espinel Charry† (Universidad de Antioquia)

Abstract:

This project aims to create a curriculum for second language education (English and Spanish) for pharmacists, focusing on cultural dynamics to enhance patient care, especially for Hispanic/Latino and American populations. Collaboration between Purdue University and the University of Antioquia makes efforts to equip the students with essential language skills and cultural competence, enhancing their ability to engage in multicultural patient interactions in their own language. The design of this curriculum has the potential to significantly impact public health and economic outcomes by fostering patients' understanding of their therapies, bodies, and illnesses.

The development process began with a comprehensive literature review to identify relevant articles that would inform curricular content and pedagogical activities for teaching a second language in a clinical context. Building on these findings, dialogue sessions were conducted between colleagues within the Department of Pharmacy Practice at Purdue University and the University of Antioquia. Employing the Content and Language Integrated Learning (CLIL) methodology, the program integrates linguistic and technical content with cultural relevance in pharmacy practice.

The outcome was a micro curriculum created for a 48-hour semester course comprising four units. The course is designed in a virtual format with both synchronous and asynchronous meetings, utilizing integrative scaffolding principles from the CLIL methodology. This adaptable curriculum can be implemented in different pharmacy schools, incorporating traditional practices unique to each region. By fostering a deeper understanding of diverse cultural perspectives, this curriculum aims to advance the effectiveness and relevance of pharmacy practice worldwide in a language integrated way.

Keywords: Language Integrated; English; Spanish; Multicultural Patients Interactions; Cultural Relevance

Mentor(s):

Ellen M Schellhase (Pharmacy); Juan Camilo Alvarez Nunez (Pharmacy); Andrea Salazar-Ospina (Pharmacy)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7054**
*Presentation Time: STEW 214C at 1:00-1:20*

# Gender Differences in Global Identity Development: Implications for Intercultural Competence in Higher Education

Social Sciences / Humanities / Education

Author(s):

Vidya Reddy Madana† (Science)

Abstract:

[Abstract Redacted]

Keywords: Intercultural Competence; Global Identity; Self-Certitude; Basic Determinism; Emotional Intelligence

Mentor(s):

Aparajita Jaiswal (Purdue University)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7055**
*Presentation Time: STEW 214C at 1:20-1:40*

# Integration of Mixed Reality and Digital Twins for the safe and efficient operation of fluid power equipment

Innovative Technology / Entrepreneurship / Design

Author(s):

Yovani Garcia Munera† (Universidad Nacional de Colombia); Samuel Ricardo Duncan Vides† (Institución Universitaria de Barranquilla); Felipe Ramirez Franco* (Universidad Nacional de Colombia); Alen Santiago Lizarazo Osorio* (Universidad de La Sabana, Columbia)

Abstract:

[Abstract Redacted]

Keywords: Digital Twin; Teleoperation; Fluid Power

Mentor(s):

Jose M Garcia Bravo (Polytechnic)

Other Acknowledgement(s):

Marvin Raymundo Durango Cogollo (Polytechnic)

**Research Talk Presentation Abstract Number: 7056**
*Presentation Time: STEW 214C at 1:40-2:00*

# Design of a training protocol to assess human error, reaction time and hand-eye coordination in assembly lines.

Innovative Technology / Entrepreneurship / Design

Author(s):

Janny Katerin Torres Canas† (Pontificia Universidad Javeriana)

Abstract:

The influence of cognitive abilities on minimizing errors in manufacturing processes is fundamental to enhancing operational efficiency and job performance. This study evaluates the effectiveness of cognitive abilities training using advanced light-response technology (Fitlight) to reduce human error during assembly tasks. A total of 60 participants, selected through proportion estimation sampling (90% confidence level), were divided into a control group and an experimental group. Both groups participated in three sessions. The control group was provided with an image of the final assembled piece and a precedence diagram during the first two sessions. In contrast, the experimental group underwent training designed to optimize hand-eye coordination in the first session and focused on the interaction between Lego® pieces and the Fitlight system in the second session. The final session measured assembly time and errors, with both groups completing the Lego® assembly under identical conditions without any external tools or guidance. Eight types of errors were identified during the assembly process using the Sherpa approach, a method for categorizing human error in complex systems. The most frequent errors, classified as action errors (A7, A8, and A10), involved difficulties in following the sequence, resulting in omitted components and incorrect placements. The experimental group demonstrated statistically significant improvements in hand-eye coordination ($p = 0.011$) and reaction times ($p = 0.086$), leading to reduced errors in the most frequent categories. These findings highlight the potential of cognitive training using innovative technologies to improve precision, coordination, and task efficiency in industrial assembly processes.

Keywords: Cognitive Abilities; Light-Response Technology; Sherpa; Human Error

Mentor(s):

Steven R Dunlop (DSB); Dutt Jagdish Thakkar (DSB)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7057**
*Presentation Time: STEW 214D at 1:00-1:20*

# Enhancing Cello Performance through Real-Time Posture Evaluation

Social Sciences / Humanities / Education

Author(s):

William P Jiang† (Science|JMHC); Gurtej Singh Bagga† (Science); Trevor Mission Ju† (Engineering); Paige Lorenz† (Science); Shivam Hemal Trivedi‡ (Science); Shrinand Perumal‡ (Science); Aadiv Reki‡ (Science)

Abstract:

[Abstract Redacted]

Keywords: Neural Network; Posture Evaluation; Mediapipe; Roboflow; YOLOv8

Mentor(s):

Yeon Ji Yun (Liberal Arts); Yung-Hsiang Lu (Engineering)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7058**
*Presentation Time: STEW 214D at 1:20-1:40*

# Understanding the Bit-Depth of SPAD Arrays for FLIM

Physical Sciences

Author(s):

Ishaan Kartik Singh† (Science|JMHC)

Abstract:

Fluorescence lifetime imaging microscopy (FLIM) is well established as a useful technique for visualizing spatial fluorescence in a cell, while also extracting information about the chemical environment of the fluorescing molecules. However, one major limitation to FLIM is imaging speed; ultra-precise setups can take minutes for a single image, and even the fastest setups to date reach at best 100 frames per second (FPS). This prevents the application of FLIM to novel processes that occur at millisecond timescales. Recent developments in imaging technology have given rise to the single photon avalanche diode (SPAD) array, which has shown great potential for rapid FLIM. Unlike traditional cameras, the data output by SPAD arrays is significantly impacted by the choice of bit-rate. To date, research has failed to properly consider the effects of this bit-rate; in this research, we perform a deep-dive into bit-depth, and present a novel correction formula. We show the effects to time-gated FLIM schemes, and semi-empirically discuss the bias for saturated counts. Finally, we show that the bit-depth of SPAD arrays can be leveraged to bin many short acquisitions together for ultra-fast FLIM. Understanding the bit-depth of SPAD arrays is of central importance in order to leverage the full capabilities they have for FLIM; future research into ultra-fast FLIM using SPAD arrays will significantly benefit from these considerations.

Keywords: Fluorescence; Microscopy; Biophysics

Mentor(s):

Jing Liu (Science)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7059**
*Presentation Time: STEW 214D at 1:40-2:00*

# Investigating the role of PP2A-B56a in the Autophagy pathway in Pancreatic Cancer

Life Sciences

Author(s):

Indiraa Doraivel† (Science)

Abstract:

[Abstract Redacted]

Keywords: Pancreatic Cancer; Autophagy; PIKfyve; PP2A; Microenvironment

Mentor(s):

Garima Baral (Science); Claire M Pfeffer (Science); Sara Nicole Filippelli (Science); Brittany Lee Allen-Petersen (Science)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7060**
*Presentation Time: STEW 214A at 2:00-2:20*

# Improving Branch Prediction Accuracy and Benchmarking for a RISC-V Based Microcontroller

Innovative Technology / Entrepreneurship / Design

Author(s):

Aishwarya Saikrupa Anand† (Engineering); Andy Hanjun Hu† (Engineering); Mary Francis† (Engineering|JMHC); Dhruv Roopchand Khatri* (Engineering)

Abstract:

Branch prediction is crucial in modern processors to increase the performance of conditional branch instructions in high-level code, such as if statements and loops. In pipelined CPUs, a branch's outcome may not be known until later stages, leading to stalls and wasted resources. To avoid this, branch predictors speculate the branch outcome, allowing the CPU to continue execution. Accurate predictions minimize disruptions, while incorrect ones require flushing the pipeline, wasting cycles.

The AFTx07 currently employs a simple static “Not Taken” predictor, with only 42.06% accuracy. To address this, we have implementations of better control flow strategies including a Backward Taken Forward Not Taken (BTFNT) predictor, 1- and 2-bit dynamic predictors with a Branch Target Buffer (BTB), a Return Address Stack (RAS) for function calls, and a 2-Level Global Branch Predictor, which considers prior branch outcomes. The project aims to debug, integrate, and evaluate these prediction techniques to improve RISC-V CPU performance.

So far the team has generated custom instruction sets to better observe and debug branch predictors. Next steps include comprehensive benchmarking, such as evaluating the performance of all branch predictor designs using the Embench IoT for comparison with existing predictors and to inform design modifications. We plan to sweep parameters for each branch predictor type, optimizing accuracy, power, and hardware area. This will help identify the best performance-to-area configuration to implement on x08. Other tasks include verifying the compatibility with RISC-V 32C compressed instruction set architecture (ISA) and implementing the RAS in parallel with other branch predictors.

Keywords: Branch Prediction; RISC-V; Optimization; Accuracy; Embench

Mentor(s):

Cole Aaron Nelson (Engineering); Mark Johnson (Engineering)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7061**
*Presentation Time: STEW 214A at 2:20-2:40*

# Modeling The Racehorse Airway

Life Sciences

Author(s):

Christine Elizabeth Mayo† (Engineering); Adalene Noel Stangeland† (Agriculture|Engineering); Meggie Faye Khantsis† (Agriculture|JMHC); Megan Leanne Painter‡ (Agriculture|Engineering); Payton Elizabeth Gault‡ (Agriculture)

Abstract:

Recurrent airway obstruction (RAO), or severe equine asthma, and inflammatory airway disease (IAD) are chronic, non-infectious respiratory conditions that impair the health and performance of horses, often triggered by airborne irritants such as dust from grain and bedding or mold in hay. This project introduces a novel approach within the emerging field of veterinary engineering, which combines engineering principles with veterinary science to address complex animal health challenges. The primary goal is to develop a life-sized, anatomically accurate model of the equine airway from the nostrils to the lung using data from computed tomography (CT) imaging and other methods.

This model will facilitate the study of how different environmental particulates affect respiratory function and airflow, utilizing advanced techniques such as particle image velocimetry (PIV) to visualize and analyze airflow patterns. Key engineering challenges include selecting materials that replicate both the structural properties of the airway and are compatible with PIV analysis. The lack of standardized anatomical data for the entire respiratory system, as most research focuses on the trachea due to recurrent laryngeal neuropathy (RLN), further complicates the model's design.

By merging engineering design, veterinary imaging, and airflow analysis, this project demonstrates how veterinary engineering can provide new insights into chronic equine respiratory diseases such as RAO and IAD. The outcomes will not only enhance understanding of these conditions but also inform the development of more effective preventive and therapeutic strategies to improve equine health and performance.

Keywords: Equine Asthma; Respiratory Modeling; Particle Image Velocimetry (PIV); Computed Tomography (CT); Veterinary Engineering

Mentor(s):

Curtis Earl Marshall (Engineering)

Other Acknowledgement(s):

Laurent L Couetil (Vet Med); Michelle L Tucker (Vet Med)

**Research Talk Presentation Abstract Number: 7062**
*Presentation Time: STEW 214A at 2:40-3:00*

# Forecasting and Optimizing EV Charging Station Demand using Traffic Patterns

Innovative Technology / Entrepreneurship / Design

Author(s):

Jihyo Park† (Engineering); Shounak Mukherjee† (Engineering|JMHC); Alexa Joan Noto† (Engineering); Ankitha Mallekav† (Engineering); Akanksh Rao† (Engineering); Hsin-Wei Hsieh‡ (Engineering); Hyunsang Cho‡ (Engineering); Jaewon Cho‡ (Engineering)

Abstract:

The widespread adoption of electric vehicles (EVs) has created an urgent need for an extensive and efficient charging infrastructure. However, a lack of granular, publicly accessible data on EV charging demand poses a significant challenge to accurate demand forecasting and infrastructure planning. Traditional forecasting models, which rely on historical charging data, are often insufficient due to limited access to such data. This project addresses these limitations by integrating advanced techniques across three distinct phases: synthetic data generation, demand forecasting, and optimization modeling. To overcome data scarcity, we employ Variational Autoencoders (VAEs) and TimeGAN models to generate high-quality synthetic time-series data that faithfully replicates real-world EV charging patterns. This synthetic data serves as the foundation for our demand prediction models. Next, we leverage machine learning techniques, including convolutional neural networks (CNNs) and recurrent neural networks (RNNs) with LSTM and GRU layers, to capture both short- and long-term temporal dependencies in EV charging behavior. Hyperparameter tuning and robust preprocessing steps ensure the accuracy and generalization of these models. In the final phase, a Real-Time Pricing (RTP) optimization model is implemented in SAS Viya to dynamically adjust charging prices in response to demand fluctuations, enhancing both grid efficiency and user convenience. This approach ensures a balanced distribution of charging demand, promoting off-peak charging while mitigating grid strain. Future efforts will focus on refining the optimization model and expanding the scope of synthetic data to explore diverse demand scenarios, advancing sustainable EV infrastructure development.

Keywords: Electric Vehicle Charging; Synthetic Data Generation; Demand Forecasting; Machine Learning; Real Time Pricing Optimization

Mentor(s):

Sivaranjani Seetharaman (Engineering)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7063**
*Presentation Time: STEW 214B at 2:00-2:20*

# Protective Effects of Polyphenols Against Alpha-Synuclein Aggregation in a Cellular PFF Model of Parkinson's Disease

Life Sciences

Author(s):

Jacob Gold† (Pharmacy)

Abstract:

[Abstract Redacted]

Keywords: Parkinson; Neurodegeneration; Polyphenols

Mentor(s):

Jean-christophe Rochet (Centers & Institutes)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7064**
*Presentation Time: STEW 214B at 2:20-2:40*

# Innovating Against Geographical and Climate Adversity: Israel's Groundbreaking Agricultural Techniques and Technologies

Social Sciences / Humanities / Education

Author(s):

Madison Chloe Lee† (Agriculture|Engineering)

Abstract:

This research explores the innovation and evolution of Israeli agriculture, a remarkable and innovative industry despite facing many environmental and political challenges. The local agricultural landscape greatly shifted with the establishment of Israel as a country in 1948, traditional crop production decreased as exportation and commercial crop growing became the primary focus of Israel's agricultural sector. Despite limited water resources and arable land in Israel, various agritech products and techniques such as drip irrigation, precision farming, and genetic engineering have allowed Israel to become a global hub for agricultural innovation, producing a diverse range of crops and agricultural products, including fruits, vegetables, livestock, poultry, fish, hobby fish, aquatic plants/corals, and flowers. In this research, I will highlight Israel's advanced agritech innovations, specifically regarding water management, precision farming, and genetic engineering. These innovations impact the agricultural industry worldwide through Israel's many exports and innovative agricultural technology and techniques.

Keywords: [no keywords provided]

Mentor(s):

Olga Lyanda-Geller (Liberal Arts)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7065**
*Presentation Time: STEW 214B at 2:40-3:00*

# Disparities in Per- and Poly Fluoroalkyl Substances (PFAS) Tolerance and Life History Traits in Simocephalus serrulatus Populations.

Life Sciences

Author(s):

Jack Douglas Morehouse† (Science)

Abstract:

Per- and poly fluoroalkyl substances (PFAS) represent a broad class of ubiquitous and pervasive anthropogenic chemicals. While data examining the toxic effects of PFAS are accumulating in the literature, this work has largely focused on laboratory model species with little consideration given to population level differences in toxicity. In this study, we assessed the effects of three PFAS (perfluorooctane sulfonic acid, PFOS; perfluorooctanoic acid, PFOA; and perfluorohexanesulfonic, PFHxS) on two populations of Simocephalus serrulatus, an abundant but little studied species of zooplankton. We found population-level differences in acute toxicity of PFOS and PFHxS. Moreover, toxicity estimates substantially differed from commonly used toxicity reference values derived from similar species that are used to represent S. serrulatus in risk assessment. While PFAS had limited chronic effects on the populations, we observed population-level differences in survival, growth, and reproduction. In particular, the population from the site with a legacy of PFAS exposure showed greater mortality, smaller body size, and greater reproduction. These findings suggest that prior PFAS exposure may have selected for fecundity compensation in the population. This work highlights the need to consider both species- and population-level differences in assessing PFAS toxicity, as these insights will enhance risk assessment and give more accurate insight into effective conservation of affected habitats.

Keywords: Natural Selection; Evolutionary Tradeoff; Food Web; Forever Chemical; Trophic Cascade

Mentor(s):

Jason T Hoverman (Agriculture)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7066**
*Presentation Time: STEW 214C at 2:00-2:20*

# Commodity Flow Analysis of Indiana: Insights into Supply Chain Dynamics and Economic Development

Social Sciences / Humanities / Education

Author(s):

Kely Johanna Monroy Malagon† (Universidad Nacional De Colombia); Luisa Fernanda Victoria Florez† (Universidad de Antioquia)

Abstract:

Indiana is a strategically located state, popularly known as the "Crossroads of America," making it a key player in the supply chain across the United States. Understanding the movement of commodities over the past several years is crucial to fostering growth and economic development in the region. This research leverages Freight Movement Analysis to evaluate the flow of goods and materials through various transportation modes, focusing on Indiana’s role in these dynamics.

The objective of this study is to analyze the behavior of commodities traded between Indiana and other regions in the United States from 2017 to 2023, measured in both tonnage and value. Using open-source data from the Freight Analysis Framework (FAF5) and the Bureau of Transportation Statistics (BTS), the analysis encompasses all transportation modes and 42 different commodities. The data was classified, organized, cleaned, and analyzed, providing insights into Indiana's supply chain and its broader impact on the Midwest region.

The findings reveal that Indiana's top outbound commodities by tonnage are coal and petroleum products, agriculture and animal husbandry products, and stone products. In terms of value, the top outbound commodities are transportation products, industrial products, and additional transportation equipment. These insights not only shed light on Indiana's current supply chain dynamics but also help identify opportunities for growth by forecasting future commodity trade trends. This forward-looking analysis is crucial for enhancing Indiana’s role in regional and national economic development.

Keywords: Indiana Supply Chain; Freight Movement Analysis; Commodity Flow; Economic Development; Midwest Economy

Mentor(s):

Dutt Jagdish Thakkar (DSB)

Other Acknowledgement(s):

Steven R Dunlop (DSB)

**Research Talk Presentation Abstract Number: 7067**
*Presentation Time: STEW 214C at 2:20-2:40*

# The Impact of Finance Case Competitions on Undergraduate Learning and Professional Skill Building

Social Sciences / Humanities / Education

Author(s):

Christopher Alexandre Ghita† (DSB|JMHC)

Abstract:

Business case competitions are an experiential learning approach that allows students to apply academic knowledge to real-world business problems and develop consulting and presentation skills that address industry-specific challenges (Meyer et al., 2019). Through a team-based approach, students collaborate to analyze these complex problems and propose practical solutions to a panel of judges (Lebrón et al., 2020). These experiences can solidify course material and may contribute to more effective learning outcomes and better preparation for professional settings.

This study examines the perceived academic and professional benefits of undergraduate students who participate in case competitions with a finance component. Using a survey research design, it explores learning outcomes related to financial knowledge, professionalism, and ethics and evaluates whether participants consider these skills transferable to industry settings. Additionally, the study investigates potential challenges and drawbacks that may hinder participation or affect engagement levels. The findings aim to help instructors communicate the value of case competitions and identify barriers to student involvement.

Keywords: Case Competition; Case Study; Problem Solving; Finance; Strategy

Mentor(s):

Zoeanna Mayhook (Libraries)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7068**
*Presentation Time: STEW 214C at 2:40-3:00*

# Designing, Implementing, and Evaluating a Sex Trafficking & Intimate Partner Violence Training Program for Licensed Salon Professionals in Indiana

Social Sciences / Humanities / Education

Author(s):

Ashton Zachary Allen† (Polytechnic|JMHC); Abhinaya Nagalla† (Polytechnic); Jordan Elizabeth Cooley† (Polytechnic|JMHC); Juliana Reese St Denis† (Polytechnic|JMHC); Evan Graham Coblentz‡ (Agriculture|JMHC)

Abstract:

[Abstract Redacted]

Keywords: Sex Trafficking; Intimate Partner Violence; Salon Professionals; Intervention; Policy

Mentor(s):

Kathryn Seigfried-Spellar (Polytechnic); Andrea DeMaria (Polytechnic)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7069**
*Presentation Time: STEW 214D at 2:00-2:20*

# Glycoprotein Analysis of Aged Mice Brain Proteome

Life Sciences

Author(s):

Rishabh Kottakota† (Science); Aryaman Dewan* (Science); Malyka Ram* (Agriculture|Engineering); Priyanshu Datta Roy* (Agriculture|Engineering|JMHC)

Abstract:

Neurodegenerative diseases such as Alzheimer's disease are a major health concern, with approximately 1 in 9 people above the age of 65 suffering from Alzheimer's disease. Since aging is the primary risk factor for neurodegenerative diseases, understanding the biology of aging is critical for developing new therapies. To contribute to this goal, we recently performed a quantitative mass spectrometry to analyze the changes in protein abundances between adult and old mice brains. Our findings revealed that four proteins (Alg2, Mpi, Napa, and Rpn1), all involved in protein glycosylation, were significantly affected by aging. Alg2 and Napa were more abundant in aged mice compared to adult mice. Alg2 is an alpha-1,3-mannosyltransferase that acts in the synthesis of dolichol-linked oligosaccharides which are glycan precursors for N-linked glycosylation. In contrast, Mpi and Rpn1 were lower abundant in aged mice compared to adult mice. Rpn1 is a subunit of the oligosaccharyl transferase complex which catalyzes the first step in N-linked glycosylation, and changes in its protein levels may indicate a potential dysregulation of protein glycosylation pathways. Building on these results, we will perform glycoproteomic analysis to further investigate alterations in protein glycosylation, aiming to understand their role in age-related changes in the brain.

Keywords: Neurodegeneration; Aging; Mass Spectrometry; Glycoproteomics; Glycosylation

Mentor(s):

Uma K Aryal (Vet Med)

Other Acknowledgement(s):

Rodrigo Mohallem Ferreira (Vet Med); Punyatoya Panda (Vet Med); Anup Bhusal (Vet Med)

**Research Talk Presentation Abstract Number: 7070**
*Presentation Time: STEW 214D at 2:20-2:40*

# A Triangular Ladder of Superconducting Qubits for Quantum Simulation

Physical Sciences

Author(s):

Santiago Lopez† (Science|JMHC)

Abstract:

[Abstract Redacted]

Keywords: Superconducting Qubits; Quantum Simulation

Mentor(s):

Alex Ruichao Ma (Science)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7071**
*Presentation Time: STEW 214D at 2:40-3:00*

# Toric methods in bordism theory

Mathematical/Computation Sciences

Author(s):

Mathilda Campillo Abuchaibe† (Universidad del Norte)

Abstract:

[Abstract Redacted]

Keywords: Unitary Bordism; Toric Varieties; Projectivisation; Equivariant Bordism; Torus Action

Mentor(s):

Manuel Luis Rivera (Science)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7072**
*Presentation Time: STEW 214A at 3:00-3:20*

# Increasing Membrane-Based Dehumidification Performance with Reduced Graphene Oxide Nanofillers

Physical Sciences

Author(s):

Lily Avery Waterman† (Engineering)

Abstract:

Membrane-based dehumidification is emerging as an energy-efficient alternative to conventional air-conditioning systems due to its ability to remove moisture from the air above dew point temperature. Specifically, passive membrane-based dehumidification (PMD) utilizes a thermally insulative membrane for water vapor partial pressure-driven dehumidification. However, current membranes have inadequate thermal insulation thus systems depend on work devices such as vacuums. Therefore, a composite membrane was fabricated to achieve high water vapor permeability and low thermal conductivity. A polyvinyl difluoride (PVDF) and reduced graphene oxide (rGO) thermally insulative support layer was fabricated through casting and phase immersion for rGO concentrations ranging from 0% to 1.5%. A hydrophilic active layer of Pebax and graphene oxide was then cast on the feed side of the membrane to increase the water vapor permeability. The in-plane thermal conductivity of the membrane was lowered with the addition of rGO to 0.044 W/m-K for PVDF with a 0.5% concentration of rGO. The water vapor permeance of the membrane decreased by 26% with the addition of hydrophobic rGO. The membranes were tested in a novel PMD system to determine the effectiveness of increasing membrane thermal insulation at the expense of lower water vapor permeance. Both dehumidification performance and latent effectiveness increased with the addition of rGO as the increased thermal insulation allowed a higher percentage of water vapor to be removed from the air. Future studies will explore other thermally insulative materials to further increase the efficiency of PMD through lower membrane thermal conductivity or enhanced water vapor selectivity.

Keywords: Membrane; Dehumidification; Mass Transfer; Heat Transfer

Mentor(s):

Md Ashiqur Rahman (Engineering); David Warsinger (Engineering)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7073**
*Presentation Time: STEW 214A at 3:20-3:40*

# Automation of LAMP Biomolecular Assays Using the Eppendorf epMotion 5075 Robotic Pipettor

Life Sciences

Author(s):

Shamalaa Sathiasealan† (Science)

Abstract:

Loop-mediated Isothermal Amplification (LAMP) is a nucleic acid amplification technique known for its specificity and efficiency in less controlled environments than laboratories. Designing novel LAMP reagents requires strict contamination control, and unlike the more commonly automated Polymerase Chain Reaction, LAMP's heightened sensitivity pose unique challenges to automation. To address this, we optimized automation procedures for LAMP using the robotic pipettor without altering the core assay itself.

This project focuses on minimizing contamination using sealed plates, reducing operator intervention by automating pipetting, and preventing enzyme degradation using cooling plates. Our approach employs pre-slit pierceable seals and cooling blocks to prevent cross-contamination between wells and maintain primer integrity, enhancing the system's scalability for large sample sizes.

The implementation of this automated workflow resulted in a 75% reduction in processing time, cutting LAMP assay duration from 1 hour for 16 reactions in a 96-well plate to just 15 minutes. Comparative analysis between manual and automated runs show no significant difference in reaction profiles, and initial evaluations indicate negligible cross-contamination.

By extending this automation workflow, we aim to create a fully autonomous 24-hour LAMP screening system by integrating a nucleic acid synthesizer for on-demand primer production. Furthermore, this system will interface with AI-based experimental design models, enabling autonomous optimization of LAMP reagent design and assay development. By eliminating manual intervention, the diagnostic process is streamlined, accelerating assay development and enhancing response capabilities for emerging pathogens. This marks a significant advancement in biomolecular diagnostics, with potential for continuous innovation to address evolving public health needs.

Keywords: LAMP Automation; Contamination Control; Nucleic Acid Synthesizer; AI-Based Optimization; Biomolecular Diagnostics

Mentor(s):

Mohit Verma (Engineering); Josiah L Davidson (Agriculture)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7074**
*Presentation Time: STEW 214A at 3:40-4:00*

# EEG Brain Signal Analysis for Active Authentication in Immersive Virtual Worlds

Mathematical/Computation Sciences

Author(s):

Shruthika Sundar† (Engineering)

Abstract:

With the growing adoption of augmented and virtual reality (AR/VR) technologies, ensuring the security of these devices has become increasingly critical. Users typically control their AR/VR devices through gestures, making it challenging to input traditional PINs or passwords for authentication. This often leads to users creating shorter, weaker passwords, heightening security risks. This research aims to enhance AR/VR authentication systems by leveraging user's unique brain behavior captured using EEG electrodes. EEG signals present an inherent advantage over other biometrics as they are not physically visible to adversaries, making them more difficult to replicate than other observable behaviors.

In this work, we recruited 34 volunteer participants, each of whom created a personalized symmetrical grid and familiar face-based "password stimulus". Participants were presented with the chosen password stimulus among other random password stimulus, while we recorded their EEG signals. The data was collected in two separate sessions on two different days, with a minimum interval of five days between sessions. We conducted zero-effort and non-zero-effort testing to evaluate the system's authentication efficacy against potential attacks. Experimental analysis on our dataset shows that electrodes F3, F4, Fz, C3, and P3 have potential to be used for EEG-based authentication in our scenario. Currently, we are developing a one-dimensional convolutional neural network (CNN)-based authentication system that utilizes users' brain behavior.

Keywords: EEG; Brain Signals; Biometric Authentication; Virtual Reality; Machine Learning

Mentor(s):

Diksha Shukla (University of Wyoming)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7075**
*Presentation Time: STEW 214B at 3:00-3:20*

# Placental Phenotype in Leukoencephalopathy with Calcifications and Cysts

Life Sciences

Author(s):

Natalie Christine Smith† (Agriculture)

Abstract:

Background:

Leukoencephalopathy with Calcifications and Cysts (LCC) is a rare, autosomal recessive neurodegenerative disorder characterized by progressive white matter injury, calcium deposits, and cyst formation in the brain. In our patient population, 61.9% of affected individuals were born preterm or had fetal growth restriction. We sought to study the relationship between LCC and placental dysfunction.

Methods:

Timed matings were performed using two LCC mouse lines, one harboring a knock-in recurrent Snord118 n.8G>C variant (LCC-KI) and the other a Snord118 knock-out (LCC-KO). LCC-KI embryos and placentas were collected at E18.5, genotyped, and weighed. To assess differences in placental size, placentas were cryosectioned at 30um, histologically stained, and placental regions were measured. LCC-KO litters were genotyped at postnatal day 10-14 (P10-14), neonatally (P0.5), and at embryonic day 10.5 and 13.5 (E10.5 and E13.5) to assess for Mendelian ratios.

Results:

The LCC-KO mice did not follow typical mendelian ratios, and no LCC-KO homozygotes were identified from E10.5. No significant difference was observed in the area or thickness of the different placental regions between the LCC-KIs, HETs, and WTs in the LCC-KI E18.5 litters. The embryo weights were consistent across genotypes, yet we observed a trend toward reduced placental weight.

Conclusions:

LCC-KO homozygotes demonstrate early embryonic lethality. LCC-KI pups show no significant fetal growth restriction. Placentas did not demonstrate significant size or structural differences, but cryodamage artifact was observed. With increased sample size and improved methods, placental findings may reach significance.

Keywords: LCC; Labrune Syndrome; snoRNA; Embryology; Embryonic Lethality

Mentor(s):

Jamie Fraser (Childrens National Medical Center); Brianna Pierce (Childrens National Medical Center)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7076**
*Presentation Time: STEW 214B at 3:20-3:40*

# Comparison of Speech Token Variations and Their Ability to Assess Features of Hearing Loss

Life Sciences

Author(s):

Jax Patrick Marrone† (Engineering); Andres Navarro‡ (Science); Emily Le Bell‡ (Science); Audrey V Harrison‡ (Science)

Abstract:

Envelope following responses (EFRs) are potentials elicited by populations of neurons in response to the contour, or envelope, of a sound. Prior studies show decreases in the EFR are markers of age-related and noise-induced hearing loss. However, there is a dearth of research on both acute and longitudinal EFR changes in response to small arms fire (SAF) - a leading cause of noise induced hearing loss in military and recreational settings. This research aims to design and validate a stimulus capable of identifying changes in EFR in response to various auditory stressors, including SAF. It is hypothesized that the use of complex speech stimuli may reveal SAF-induced changes to EFR responsible for speech processing and communication. To test this, a speech token was created using an audio recording of a male voiced “Purdue”. The envelope of the audio stimulus was given either an 8 kHz tone or a gaussian noise carrier. The resulting stimulus then either rectified or not. Rodent subjects were exposed to either 120 dBpSPL SAF, or 60 dBsPL sham noise. EFRs to each speech token were recorded for eight-weeks post-exposure. Analyses will include comparisons of neural responses to each speech token, the response magnitude for specific frequency bands, and phonetic boundaries of response signals. It is predicted that the SAF group will show weaker frequency responses and less distinct phonetic boundaries. This research will provide evidence for the use of speech tokens as a diagnostic tool to pinpoint underlying markers of various hearing loss pathologies.

Keywords: Hearing Loss; Envelope Following Response; Central Auditory System; Diagnostics

Mentor(s):

Edward L Bartlett (Engineering); Meredith Christine Ziliak (HHS)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7077**
*Presentation Time: STEW 214B at 3:40-4:00*

# The INCOSE Symposium Paper Collection: What Does It Tell Us About the Discipline?

Mathematical/Computation Sciences

Author(s):

Caroline Grace Thomas† (Engineering|JMHC)

Abstract:

To gain insights into the discipline of systems engineering, bibliometric analysis was performed on the text corpus of the abstracts from symposium papers of two different eras of the INCOSE symposium and of the sources cited in symposium papers of seven different eras. The eras were decided based on periods of change throughout the 33 years of the symposium.

Co-occurrence analysis was performed using VOSviewer, a software application that identifies pairs of terms from the abstracts of papers and connects them. This analysis found terms that occur together across multiple abstracts by applying a natural language processing algorithm that identified the terms and formed clusters of terms that are strongly related to each other. This process identified systems engineering trends in each era.

Finally, bibliographic coupling analysis and co-citation analysis were performed using VOSviewer. A bibliographic coupling link is a link between two papers that both cite the same source. A co-citation link is a link between two sources that are both cited by the same paper. The coupling analysis reflected prominent events and trends that appeared in systems engineering throughout the eras. The co-citation revealed information about the classification of authors contributing to symposium papers.

Keywords: Natural Language Processing; Bibliometrics; Systems Engineering; Evolution of Systems Engineering; Visualization

Mentor(s):

Charles Robert Kenley (Engineering)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7078**
*Presentation Time: STEW 214C at 3:00-3:20*

# Project oCEANIC: Computing Environmental Adaptation and Navigation in Island Communities

Social Sciences / Humanities / Education

Author(s):

Marlo Ann Weber† (Science|JMHC); Connor Taychin Underwood† (Science|JMHC); Christopher Gerald Farber† (Science|JMHC); Allyson Lynn Dinwiddie† (Liberal Arts|JMHC); Jacob David Dorson† (Science|JMHC); Hannah Morgan Stegall† (Engineeing|JMHC); Danielle C Ejiogu† (Science|JMHC); Giovanni Ignatius Stabile† (Engineering|JMHC)

Abstract:

Residents of small Pacific islands face devastating effects from climate change, such as sea level rise, loss of biodiversity, and intensifying storms. Funded by a JMHC Breakthrough Research Award, Project oCEANIC (Computing Environmental Adaptation and Navigation in Island Communities) combines Indigenous and local peoples' environmental knowledge (ILEK) from communities in the Marshall Islands, Yap, and Hawai'i with quantitative computer models of archaeological and paleoclimate data. The project investigates how traditional navigation practices can build community resilience amid climate change and post-pandemic disruption.

Our project takes an interdisciplinary approach, combining historical, cultural, environmental, and geospatial data to enhance community resilience and inform the development of socially just environmental policies. We incorporate data from the past to inform the present-day revitalization of traditional seafaring practices which provide a sustainable mode of transportation.

Our team utilizes Mesa-Geo, a geographic information system (GIS) extension in Python, to visualize geographic data within an agent-based model to map sawei routes. Sawei is a system of relationship, tribute, and disaster relief among Yapese communities. The agent-based model best represents this network by simulating natural and human-based systems and processes in a digital landscape.? We plan to showcase the preliminary model's innovative methodological design.

Currently, we are testing the validity of the model through collaboration with Oceanian navigators. We are also developing a website using Next.js to enhance our capacity for visualization and conduct statistical analysis of voyaging patterns. We aim to further investigate traditional seafaring patterns to answer questions about the interconnectivity of Pacific Island communities.

Keywords: Sustainability; Indigenous and Local Ecological Knowledge; Agent Based Modeling

Mentor(s):

Katherine Jarriel (JMHC)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7079**
*Presentation Time: STEW 214C at 3:20-3:40*

# A Study on the SoTL Accelerator Effectiveness in Enhancing Faculty Best Practices for New Curriculum Development, Assessment, and Dissemination

Social Sciences / Humanities / Education

Author(s):

Ava Thant Samuel† (Engineering|JMHC)

Abstract:

Despite the importance of creating effective educational curriculums, the tools for doing so are not always streamlined or straight-forward for higher education engineering faculty. The Scholarship of Teaching and Learning (SoTL) Accelerator has an aim to overcome this challenge by advancing structure, accountability, productivity, and peer mentoring for faculty wanting to progress into education research and scholarly teaching. It improves student learning and enhances professional development and teaching practices with evidence-based decisions. In this study, we explore the applicability of the SoTL Accelerator program using over 30 engineering faculty participants in the United States. This study uses retrospective post-then-pre approach surveys to gather data, focusing on curriculum development, assessment and dissemination. The surveys are also designed to gauge the participants average satisfaction with the program and include open-ended questions regarding participants' experience with SoTL. The results showed that there was a statistically significant ($p < 0.05$) difference between pre- and post- survey questions with the average overall satisfaction ranging between 4 and 5. These findings suggest that the SoTL Accelerator is an effective method for restructuring educational curriculums. The SoTL Accelerator can become a mainstream tool applicable to all disciplines to aid faculty in organizing their courses in an educational manner.

Keywords: Scholarship of Teaching and Learning; Faculty Professional Development; Engineering; Entrepreneurial Mindset; Dissemination

Mentor(s):

Lisa B Bosman (Polytechnic)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7080**
*Presentation Time: STEW 214C at 3:40-4:00*

# Assessment of Echocardiographic Biomarkers for the Prognosis of Cardiac Dysfunction in Sepsis

Life Sciences

Author(s):

Brianna Nicole Lewis† (Engineering|JMHC)

Abstract:

Sepsis, a life-threatening condition caused by an overreaction of the immune system to infection, is a leading cause of death in intensive care units, affecting approximately 1.7 million people each year in the United States. One of the major complications of sepsis is cardiac dysfunction, which occurs when the heart is under increased pressure and strain due to fluid overload. Without timely treatment, sepsis can cause severe symptoms like low blood pressure, organ failure, and death.

In this study, we used novel, in-house-developed algorithms to analyze cardiac biomarkers in sepsis patients. We used echocardiographic data (B-mode and color Doppler ultrasound) from the MIMIC-IV database, which contains anonymized records from the Beth Israel Deaconess Medical Center (2008–2022). We studied 141 patients, including 63 with data from multiple ICU admissions.

Through statistical analysis of cardiac volume, strain, and hemodynamic measurements, we identify links between sepsis and cardiac dysfunction. These findings can help clinicians use imaging-based cardiac biomarkers to better predict sepsis progression, leading to more effective treatment strategies and improved patient recovery.

Keywords: Sepsis; Echocardiography; Cardiac Biomarkers; Cardiac Dysfunction

Mentor(s):

Pavlos Vlachos (Engineering)

Other Acknowledgement(s):

Shailee Mitra (Engineering); Brett A Meyers (Centers & Institutes)

**Research Talk Presentation Abstract Number: 7081**
*Presentation Time: STEW 214D at 3:00-3:20*

# Investigating the functions of Epstein-Barr Virus Gene BNLF2b in Gastric Cancer Progression

Life Sciences

Author(s):

An My Nguyen† (Engineering)

Abstract:

Epstein-Barr Virus (EBV) is a highly contagious, oncogenic virus, infecting over 95% of the adult population worldwide and causes about 160,000 deaths annually. Upon infection, the virus typically establishes a latent state within the host cell. Lytic induction therapy specifically targets and kills tumor cells that harbor EBV in a lytic state by inducing the infected cell to go from the latent to the lytic phase, which serves as a promising therapeutic solution for EBV+ cancers. Through analysis of publicly available single-cell sequencing data, our lab identified BNLF2b as the most up-regulated EBV gene in EBV+ gastric cancers compared to EBV- ones. Some EBV genes, like LMP1, are well studied and known to contribute to tumor metastasis and immune invasion; However, the function of BNLF2b remains unknown. In this project, we aim to characterize BNLF2b and investigate its functions in EBV+ cancers and lytic induction cycle. We first validated the elevated levels of BNLF2b mRNA in two GC cell lines (SNU719 and AGXBX1). Then, by overexpressing BNLF2b in HEK293T cells, we discovered that BNLF2b is located in the nucleus, cytoplasm, and membrane through flow cytometry immunofluorescence staining. Furthermore, we generated and validated a custom antibody against BNLF2b for its protein expression quantification. Ongoing experiments will utilize these tools to explore BNLF2b's role in EBV reactivation and tumor progression. The results of this work could enhance the understanding of the function of BNLF2b, which facilitates the development of possible therapeutic strategies to target BNLF2b for reducing EBV-driven tumor progression.

Keywords: BNLF2b; Gastric Cancer; Lytic Induction; Epstein-Barr Virus

Mentor(s):

Majid Kazemian (Science); Yuxin Zhuang (Agriculture)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7082**
*Presentation Time: STEW 214D at 3:20-3:40*

# Design of a Bromide Ion-Exchange Column for Application in Low-Bromide Waters

Physical Sciences

Author(s):

Diana Lucia Pinto Montes† (Universidad Nacional de Colombia); Destin Javai Gentillon‡ (Science|JMHC)

Abstract:

Non-traditional isotopes are often underutilized in hydrogeological studies. Bromine-81 (81Br), for example, can help track the bromide (Br-) source in natural waters and the transport of Br- through water systems. This application of 81Br is being tested in the Groundwater/Surface Water Interactions Lab in EAPS at Purdue. However, removing Br- from natural water sources with low Br- concentrations poses a significant challenge. This research experiment describes designing and testing a simple anion-exchange column to extract three mg/L of Br- from water samples containing an average of 0.05 mg/L of Br- using Amberlite HPR4811, an ion exchange resin. Ion exchange operates through sorption, which transfers solutes from the liquid to the solid Amberlite particles. Bromide anions in the water are exchanged for Cl- ions that have been sorbed to the particles during pre-treatment. This research aimed to design a simple, field-ready ion-exchange column and then assess Br- removal efficiency at different pumping rates.

Key parameters of the design include a porosity of 47.8% and pore volume of 2.09 for the chosen column geometry. Using these parameters and a pumping rate of 10.9 mL/s for 95 liters, we expect to achieve a minimum contact time of 2.4 hours. These values indicate a high-sorption capacity of the resin, but the time constraints are not logistically feasible. Additionally, the study evaluates the impact of competing ions, such as chloride, sulfate, and DOCs, on bromide removal efficiency, as these could hinder the resin's selectivity under varying water chemistry conditions. This study aims to optimize these parameters to enhance the application of AmberliteHPR4811 for efficient bromide extraction in field settings.

Keywords: Bromide Removal; Ion Exchange; Amberlite HPR4811; Water Treatment; Sorption Capacity

Mentor(s):

Marty D Frisbee (Science)

Other Acknowledgement(s):

Srilani Wickramasinghe Wickramasi Mudiyanselage (Interdisciplinary & Special Programs)

**Research Talk Presentation Abstract Number: 7083**
*Presentation Time: STEW 214D at 3:40-4:00*

# Neuro-Symbolic Action Anticipation through Spatio-temporal Affordance Reasoning

Mathematical/Computation Sciences

Author(s):

Muyang Yan† (Science)

Abstract:

Action anticipation is a crucial agent understanding task and is useful in fields like human-robot interaction and autonomous driving. Past action anticipation models have achieved promising results by conditioning on domain knowledge about object affordances. However, these models learn to use affordances implicitly, as opposed to treating them as constraints. As a result, they cannot provide guarantees that physically infeasible actions will not be predicted. We propose to address this gap by learning explicit spatio-temporal rules to prune affordances, constraining the prediction space to only the actions afforded to the agent. We do this by reasoning over an interpretable spatio-temporal graph representation of scene observations. By augmenting a neural action anticipation model with our symbolic affordance reasoning, we aim to show that our approach predicts more reasonable actions while never violating affordance constraints.

Keywords: Action Anticipation; Neuro-Symbolic AI; Human-Robot Interaction; Graph Learning; Affordance Reasoning

Mentor(s):

Yexiang Xue (Science); Maxwell Joseph Jacobson (Science); Simon Stepputtis (Carnegie Mellon University)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7084**
*Presentation Time: STEW 214A at 4:00-4:20*

# Purdue Aerial Robotics Team (PART) - R&D Division - Avionics - AUGUST

Innovative Technology / Entrepreneurship / Design

Author(s):

Doha Bahaa Eldin Hafez† (Engineering); Parker Steven Hitchcock† (Engineering); Hasan Sultan† (Engineering)

Abstract:

Traditional unmanned aerial vehicles (UAVs) have been optimized for point-to-point missions, but with advancements in technology, new applications such as payload drops in search and rescue, delivery services, and military operations require greater precision and adaptability. Payload drops present several challenges, including the need to account for horizontal velocity and reduced accuracy in trajectory calculations, which can compromise mission success. These limitations, along with the risks involved in UAV take-off and landing, call for innovative solutions to enhance safety and precision.

To address these issues, we developed AUGUST (Autonomous Unmanned Guided Uplift and Safe Transport), a wireless precision payload winch system designed for UAVs. The system consists of two Arduino-based modules that communicate via LoRa technology, providing long-range, low-power data transmission. Security in communication is a priority, with encryption protocols implemented to ensure that commands between the modules remain protected from external interference or tampering.

The winch mechanism, driven by a DC-motor, ensures precise control over payload descent, release, and retrieval. The design is reinforced with sensors that monitor line tension and position, enhancing operational safety and reliability. AUGUST enables bidirectional communication for key commands and integrates real-time feedback loops to maintain communication integrity, mitigating issues such as Doppler effects caused by UAV movement.

Keywords: Microcontrollers; UAV; Payload; Aircraft; Winch

Mentor(s):

Niall Patrick Moloney (Engineering); Shreyas Sundaram (Engineering)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7085**
*Presentation Time: STEW 214A at 4:20-4:40*

# 2.4 , 5 GHz Dual Band Wi-Fi RF Receiver

Innovative Technology / Entrepreneurship / Design

Author(s):

Abdelrahman Osama Khalid† (Engineering); Kerollos Ehab Matta Yanny† (Engineering); Youssef Nagah Haider† (Engineering); Manuel Ashraf Melad Gad† (Engineering)

Abstract:

This project focuses on developing an energy-efficient Wi-Fi RF receiver for low-power applications, such as mobile phones and IoT devices. The receiver operates in the 2.4 GHz and 5 GHz frequency bands, adhering to Wi-Fi 6 (802.11ax) standards. The direct conversion architecture was chosen for its simplicity, low power consumption, and suitability for compact, portable devices. The receiver targets a gain of 25 dB, a noise figure (NF) between 2.1 and 4.4 dB, and power consumption of 23-49 mW. Key challenges include optimizing sensitivity, selectivity, and minimizing image frequency interference. The design process includes advanced simulations, prototyping, and performance analysis. This project aims to advance RF communication technology by delivering a balanced solution that enhances battery life while ensuring reliable wireless communication. Our approach involves systematic design, component optimization, and iterative testing to meet all specified requirements for mobile and IoT applications.

Keywords: [no keywords provided]

Mentor(s):

Seyedehmarzieh Rouhani (Engineering); Archana Dharanipragada (Engineering); Mark Johnson (Engineering)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7086**
*Presentation Time: STEW 214A at 4:40-5:00*

# NucleusPrime: An efficient computational tool for the design of oligonucleotide primers for nucleic acid amplification methods

Mathematical/Computation Sciences

Author(s):

Arman Kumar† (Science|JMHC)

Abstract:

The design of oligonucleotide primers for complex isothermal amplification methods has been a challenge for scientists. The selection of a primer requires the calculation and comparison of steady-state thermodynamics. Computational complexity increases when considering permutations of multiple oligonucleotides to form primer sets. Various programs have been developed to address specific techniques, but they rely upon assumptions that detract from experimental relevance and dated algorithms that operate based on old computational limitations. In this work, we present NucleusPrime, a software to efficiently solve the primer design problem using a generalized algorithm with applications for any arbitrary biomolecular reaction. This is accomplished through advanced algorithms and techniques that leverage modern computer architecture principles such as memory locality. We demonstrate the utility of these algorithms by applying them to the primer design problem of two complex nucleic acid amplification reaction schemes: quantitative PCR (qPCR) and loop-mediated isothermal amplification (LAMP). In the case of LAMP, we show that it is possible to design complete primer sets at least 400 times faster than leading software packages currently available. We expect comparable performance increases for qPCR primer design. NucleusPrime facilitates the efficient design of nucleic acid reagents for a wide variety of potential reaction schemas encountered in molecular biology and synthetic biology. This algorithm overcomes current limitations in the experimental design process and enables researchers to design oligonucleotide reagents for a wide range of adaptable reaction schemes, both known and potentially unimagined.

Keywords: Primer Design; Isothermal Amplification; Bioinformatics Algorithms; LAMP

Mentor(s):

Mohit Verma (Engineering); Josiah L Davidson (Agriculture)

Other Acknowledgement(s):

Connor Klaassen (Science)

**Research Talk Presentation Abstract Number: 7087**
*Presentation Time: STEW 214B at 4:00-4:20*

# A Comparative Study of Coherent Ising Machine Variations through Numerical Simulation

Mathematical/Computation Sciences

Author(s):

Vidisha Singhal† (Engineering); Charles Spencer Bowles† (Engineering|JMHC)

Abstract:

The end Moore's Law necessitates the search for alternative computing methods to solve combinatorial optimization problems that are important in fields such as science, engineering, and the social sciences. Many of these problems are classified as Non-Deterministic Polynomial (NP)-Hard or NP-Complete, meaning that the time and resources required to solve them using classical computing scale exponentially with the problem size. Many NP problems can map to the Ising Hamiltonian, and finding its ground state is equivalent to solving the NP problem. Coherent Ising Machines (CIMs) simulate the Ising Hamiltonian using the optical phase of time-multiplexed degenerate optical parametric oscillators (DOPOs), i.e., nonlinear optical systems, to represent individual spins. A major challenge that prevents CIMs from searching for the ground state is amplitude inhomogeneity of the spins, arising from their analog nature. To address amplitude inhomogeneity and prevent the solver from becoming ensnared in local minima, several CIM modifications have been explored, including the incorporation of nonlinear transfer functions, the spiking neural network (SNN), quantum adiabaticity, and error correction feedback schemes. This work provides a direct comparative study of these CIM variations through numerical simulation on instances of the MAXCUT problem. CIMs can be superior to other quantum and classical algorithms due to the inherent speed of the optical system and its ability to operate at room temperature. Given the significant costs associated with manufacturing CIMs due to the high precision optical system, our work will provide guidelines for future manufacturing, experimentation, numerical simulation, and research efforts in the field.

Keywords: NP Problems; Combinatorial Optimization; Optical Computing; Alternative Computing; Probabilistic Computing

Mentor(s):

Peter Bermel (Engineering)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7088**
*Presentation Time: STEW 214B at 4:20-4:40*

# Enhancing Workforce Development through Virtual Reality and Digital Twin Integration

Innovative Technology / Entrepreneurship / Design

Author(s):

Alberto Minaya Lopez† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Digital Twins; Virtual Reality; Workforce Development; Simulation Based Training; Manufacturing

Mentor(s):

Ramses Martinez (Engineering)

Other Acknowledgement(s):

**Research Talk Presentation Abstract Number: 7089**
*Presentation Time: STEW 214C at 4:00-4:20*

# Pets in the office: A systematic review and pilot study examining pets in the workplace

Social Sciences / Humanities / Education

Author(s):

Sophie Kaitlyn Stahl† (Science|JMHC); Braxton J Schieler* (Science|JMHC)

Abstract:

With increasing mental health challenges in the workplace, organizations are seeking innovative ways to improve employee satisfaction while increasing productivity and retention. As a possible solution, research has begun to explore the integration of pets in the workplace. Prior research, outside the workplace, demonstrates that pets may benefit the social, mental, and physical health of their guardians. This talk will share our findings from two studies, a systematic review and a pilot study, examining the impacts of pets in the workplace. The systematic review followed PRISMA guidelines, searched seven databases and screened 5330 articles. The pilot study included a total of 73 veterinary professionals. All participants completed a survey composed of clinically-validated instruments to measure mental health and wellbeing. T-tests were used to measure the differences among employees who brought their pets into the workplace versus employees who did not bring their pets into the workplace. Results of the systematic review suggest that employees that bring their pets to the workplace showed lower stress and increased social interactions. Results from the pilot study suggest that people that bring their pets to work have significantly higher scores on the Perceived Occupational Stress Scale and the Maslach Burnout Inventory Cynicism Scale in comparison to those that do not bring their pets to work. Taken together these findings suggest mixed evidence for the integration of pets in the workplace. Future studies should consider refining the programs to promote the benefits while mitigating common challenges associated with bringing pets to work.

Keywords: Mental Health; Workplace; Wellbeing; Companion Animals; Pets

Mentor(s):

Leanne Nieforth (Vet Med); Jane F Yatcilla (Libraries)

Other Acknowledgement(s):

Niwako Ogata (Vet Med)

# VIRTUAL PRESENTATIONS

*Presentations available on Fall Expo website November 19-26, 2024.*
*Posters sorted by last name of first author.*

9000 *Satvika Anand Raj†*
Mentor(s): Philip Eugene Pare; Chi Ho Leung

9001 *Elliott T Buescher†; Abhijeet Vijay Mohod†; Grayson Dean Gibson†; Roni H Aziz†; Kyston Reeve Howard†*
Mentor(s): Steve Clayton Rausch

9002 *Enrique Camacho†; Haruna Kawai†; Muhammad Ameer Hamza†; Andrew Lee Schlabach‡; Geetika Chitturi‡; Akshath Raghav Ravikiran‡*
Mentor(s): Boyuan Chen; Sergey Zakharov; Mark Johnson

9003 *Aritro Chatterjee†; Evan Chareunsouk Sengsanith†; Lauren M Burch†; Camden Michael French†; Lucas Michael Rulo†; Yana Manishkumar Shah†; Likith Reddy Singam†*
Mentor(s): Robin Carpenter

9004 *Zhaoru Chen†; Nicholas Helushka†; Seongwon Hong†; Minghan Wang†; Arina Harlanovich†; Milen Mundackal Manoj†*
Mentor(s): Abinands Ramshanker; Mark Senn

9005 *Sanjna K Chokshi†; Joshua Paik†; Nishaant Kunal Shah†; Elina Ashish Shah†*
Mentor(s): Fiona Kolbinger; Fengqing Zhu; Soudabeh Taghian Dinani

9006 *Indrayudh Chowdhury†; Adam Jacob Keith†*
Mentor(s): Mark Johnson; Isaac P Hagedorn; Vishnu Chaithanya Lagudu

9007 *Ryan James Cook†*
Mentor(s): Ryan James Cook

9008 *Satyam Vipulbhai Dave†; Yana Sheoran†*
Mentor(s): Matthew Lanham

9009 *Joan Dominguez Lora†*
Mentor(s): Laura L Ingwell

9010 *Seth Christian Graber†*
Mentor(s): Vishnu Chaithanya Lagudu; Isaac P Hagedorn

9011 *William John Greenwood†; Noah Anthony Wisniewski‡*
Mentor(s): Younggil Chang; Amikosh Dube; Shreyas Sundaram

9012 *Christopher Barnes Haynes†; Hayden Leonhard Supple†; Edwin Alvarado†*
Mentor(s): Kevin T Lee

9013 *Cole Allen Hufford†; Madilyn Grace Shingle†; Jack Brian Cramer†; Alexander Marcus Krapels†; Nolan Douglas Brown†*
Mentor(s): Steve Clayton Rausch

9014 *Dhruv Roopchand Khatri†; Zafeer Aaryan Reza†; Yan-Jun Lin†; Wei-Yun Liu†*
Mentor(s): Timothy Francis Hein; Mark Johnson

9015 *Mingyu Kim†; Mohamed Sameh Abdeltawab Abdelmouty†; Mohamed Alaa Mohamed Ahmed†*
Mentor(s): James C Davis

9016 *Zelin Li†*
Mentor(s): Yu She; Jaeeun Kim

9017 *Zelin Li†*
Mentor(s): Curtis Earl Marshall

9018 *Jessica Frances Lyng†; Rongbo Hu‡*
Mentor(s): Abolfazl Hashemi; Zijian He

9019 *Cohen Scott Meredith†; Elliott Samuel Korentager†; Willard Gabriel Rash Cuevas†; Gavin Robert Beyers†; Owen Michael Bartel‡; Toby Dwayne George‡; Meghana Sunil Kumar‡; Pralhad Prashant Mundargi‡; Samir Niradbhai Patel‡; Gavin Wang‡; Andrew Loren Peterson‡*
Mentor(s): Ken Yoshida; Awadh Mubarak M Al Hawwash

9020 *Gavin Neal Meyers†; Zachary Gosnell†; Rudra Vimlesh Patel†; Gavin Allen Arner†; Jin Park†*
Mentor(s): Steve Clayton Rausch

9021 *Sonal Naik†*
Mentor(s): Vaneet Aggarwal; Denny Yu

9022 *Dang Kim Minh Nguyen†; Donhyung Ko†; Nam Hoang Tran†; Muhammad Usman Mushahid†*
Mentor(s): Edward J Delp

9023 *Seungkeun Oh†; Shishir Tumma†*
Mentor(s): Shreya Ghosh

9024 *Dev M Patel†; Tri Than†; Medha Mahesh Shinde†; Benjamin Aaron McDowell†*
Mentor(s): Cole Aaron Nelson; Johnathan Hong

9025 *Akshath Raghav Ravikiran†*
Mentor(s): Han Sae Kim; Jinha Jung

9026 *Robert Viktor Rozhanskyy†*
Mentor(s): Isaac P Hagedorn

9027 *Tanmay Singla†*
Mentor(s): Dharun Rajkkumar Anandayuvaraj

9028 *Rohil H Tailor†; Yongwook Lee†; Ammar Hafiy Bin Abd Ghaffar†; Jacob Metcalf†; Rikhil Tadiparthi†; Neal Jacob Grogg-Reading†*
Mentor(s): Kevin T Lee

9029 *Laasya Thiagarajan†*
Mentor(s): Shubhra Bansal; Huilong Liu

9030 *Eric Chase Williams†; Michael Brayden Hudson†; Jacob Tyler Renta†; Tsz Pui Jiang†; YuKuan Lu†*
Mentor(s): Arvind Krishna Radhakrishnan; Steve Clayton Rausch

9031 *Yutong Wu†; Sayee Sabri Anand†; Aditya Hegde†; Hao-Chen Li†*
Mentor(s): Steve Clayton Rausch

**Virtual Presentation Abstract Number: 9000**
*Presentation Time: Nov. 19-26, 2024*

# How can the Gillespie Algorithm be used to Model Disease Spread?

Mathematical/Computation Sciences

Author(s):

Satvika Anand Raj† (Engineering)

Abstract:

This research study focuses on simulating the susceptible-infected-susceptible (SIS) epidemiological model using the Gillespie Algorithm (a.k.a. EDSSA). The Gillespie algorithm is used to provide exact simulations of a reacting species in a population. The main objective was to understand how diseases spread within different population structures. We explored two main cases of the SIS model: the single population case and networked case. The bi-virus and coupled bi-virus models are types of cases that were each simulated under the Single Population and Networked cases. Python programming was used to simulate the model and generate descriptive plots depicting the proportion of susceptible and infected individuals in a given population over time. The single population case offered a theoretical view of disease dynamics in a uniform population, whereas the networked case provided a more realistic representation accounting for interconnected population structures. The simulations demonstrated distinct behaviors of how diseases propagate through these differing population models. The findings draw attention to the significance of accounting for networked structures in epidemiological models, offering insight into disease spread in real-world scenarios.

Keywords: Gillespie Algorithm; SIS Epidemiological Model; EDSSA; Single Population Case; Networked Case

Mentor(s):

Philip Eugene Pare (Engineering); Chi Ho Leung (Engineering)

Other Acknowledgement(s):

**Virtual Presentation Abstract Number: 9001**
*Presentation Time: Nov. 19-26, 2024*

# System on Chip Embedded Technology Usage in Self Flying Drones

Innovative Technology / Entrepreneurship / Design

Author(s):

Elliott T Buescher† (Engineering); Abhijeet Vijay Mohod† (Engineering); Grayson Dean Gibson† (Engineering); Roni H Aziz† (Engineering); Kyston Reeve Howard† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Steve Clayton Rausch (Engineering)

Other Acknowledgement(s):

**Virtual Presentation Abstract Number: 9002**
*Presentation Time: Nov. 19-26, 2024*

# Design and Implementation of a Standard Cell Library Using Open-Source Tools

Innovative Technology / Entrepreneurship / Design

Author(s):

Enrique Camacho† (Engineering|JMHC); Haruna Kawai† (Engineering); Muhammad Ameer Hamza† (Engineering); Andrew Lee Schlabach‡ (Engineering); Geetika Chitturi‡ (Engineering|JMHC); Akshath Raghav Ravikiran‡ (Engineering)

Abstract:

This project aims to synthesize an existing RISC-V CPU core designed by the SoCET team using only open-source software. The project is in collaboration with AcuSemi and uses their AS800 process, an 800nm technology node designed for educational and demonstration purposes. To recompile the RISC-V CPU core, the team is developing a standard cell library for the AS800 process. The first step of the project is to design schematics for basic CMOS logic gates using XSCHEM and has already been completed. Currently, SPICE simulation is being run on XSCHEM to confirm the functionality of the logic gates. Additionally, layouts for each standard cell are currently being created in KLayout with DRC (Design Rule Check) and LVS (Layout vs. Schematic) checks. Parameterized cells (PCELLs) are also being designed within the AS800 PCELL script to support the development of the standard cell layouts. The standard cell library will be built using an open-source standard cell characterizer to generate liberty format files for use with OpenLane, an automated RTL to GDSII flow. OpenLane includes tools to complete synthesis, place & route, and verification, while abstracting the underlying open-source utilities which are adjustable by the users with just a single configuration file. The developed open-source PDK and standard cell library will be formally documented and made publicly available via GitHub.

Keywords: Standard Cell Library; Open-Source Process Design Kit; IC Layout; IC Design; Open-Source EDA Tool

Mentor(s):

Boyuan Chen (Engineering); Sergey Zakharov (Purdue University); Mark Johnson (Engineering)

Other Acknowledgement(s):

Bashir Sfar (Engineering); Kerway Lee Tsai (Engineering)

**Virtual Presentation Abstract Number: 9003**
*Presentation Time: Nov. 19-26, 2024*

# Optimizing QUBO Creation for Enhanced Clustering Efficiency Using the Anti-kt Algorithm

Physical Sciences

Author(s):

Aritro Chatterjee† (Science); Evan Chareunsouk Sengsanith† (Engineering); Lauren M Burch† (Science); Camden Michael French† (Science); Lucas Michael Rulo† (Science); Yana Manishkumar Shah† (Science); Likith Reddy Singam† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Robin Carpenter (Science)

Other Acknowledgement(s):

**Virtual Presentation Abstract Number: 9004**
*Presentation Time: Nov. 19-26, 2024*

# Implementing DFT on a RISC-V SoC chip

Innovative Technology / Entrepreneurship / Design

Author(s):

Zhaoru Chen† (Engineering); Nicholas Helushka† (Engineering); Seongwon Hong† (Engineering); Minghan Wang† (Engineering); Arina Harlanovich† (Engineering); Milen Mundackal Manoj† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Design for Testability; Scan Insertion; Automatic Test Pattern Generation; On-Chip Clock Controller; System on Chip

Mentor(s):

Abinands Ramshanker (Engineering); Mark Senn (Information Technology)

Other Acknowledgement(s):

**Virtual Presentation Abstract Number: 9005**
*Presentation Time: Nov. 19-26, 2024*

# Surgical Scene Segmentation

Mathematical/Computation Sciences

Author(s):

Sanjna K Chokshi† (Engineering); Joshua Paik† (Science); Nishaant Kunal Shah† (Engineering); Elina Ashish Shah† (Science)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Fiona Kolbinger (Engineering); Fengqing Zhu (Engineering); Soudabeh Taghian Dinani (Engineering)

Other Acknowledgement(s):

**Virtual Presentation Abstract Number: 9006**
*Presentation Time: Nov. 19-26, 2024*

# UVM-Based Verification of RISC-V Multicore Design

Innovative Technology / Entrepreneurship / Design

Author(s):

Indrayudh Chowdhury† (Engineering); Adam Jacob Keith† (Engineering)

Abstract:

In this project, we verified a RISC-V multicore system using the Universal Verification Methodology (UVM). We developed a comprehensive test plan and architecture that defined the roles of monitors, drivers, and interfaces in relation to the Device Under Test (DUT). Our UVM environment, along with well-designed sequences and tests, enabled a thorough evaluation of the multicore system’s core-to-memory interactions. The verification plan included high-level base and corner test cases of directed, pseudo-random (constrained random), and randomized nature. Additionally, when determining the Verification Confidence Level (VCL), we accounted for both module-level behavior and coverage, as well as system-level behavior where applicable. This rigorous approach ensured thorough functional coverage and highlighted the system's ability to handle parallelization, strengthening the reliability of the multicore design in managing concurrent operations and complex workloads. While initial results were demonstrated, further system-level coverage and results will be presented at the next symposium. This project highlights the importance of advanced verification techniques in improving the robustness of modern hardware systems.

Keywords: RISC-V Multicore; Universal Verification Methodology; Verification Confidence Level; Parallelization; Test Architecture

Mentor(s):

Mark Johnson (Engineering); Isaac P Hagedorn (Engineering); Vishnu Chaithanya Lagudu (Engineering)

Other Acknowledgement(s):

**Virtual Presentation Abstract Number: 9007**
*Presentation Time: Nov. 19-26, 2024*

# AI making AI

Innovative Technology / Entrepreneurship / Design

Author(s):

Ryan James Cook† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Ryan James Cook (Engineering)

Other Acknowledgement(s):

**Virtual Presentation Abstract Number: 9008**
*Presentation Time: Nov. 19-26, 2024*

# Comparative Analysis of AI Pipelines for Multi-Modal Story Generation and Visualization: Balancing Complexity, Performance, and Adaptability

Innovative Technology / Entrepreneurship / Design

Author(s):

Satyam Vipulbhai Dave† (Polytechnic); Yana Sheoran† (Science)

Abstract:

This research presents a comprehensive and accessible comparison of three cutting-edge AI pipelines designed for multi-modal story generation and visualization. The study meticulously examines:

Pipeline 1 (Advanced NLP with Graph-based Image Generation): Utilizing ChatGPT for natural language processing, DALL-E for image creation, CLIP for image embedding, and a sequence-to-sequence model for image ordering. This pipeline excels in versatility and ease of deployment.

Pipeline 2 (Multi-modal Transformer with Action Decomposition): Employing GPT-3 for text processing, Midjourney for image generation, DETR for object detection, and Hugging Face Transformers for sequence modeling. This pipeline stands out for its high accuracy in complex visual tasks.

Pipeline 3 (Automated Feature Engineering with Iterative Refinement): Featuring Jasper AI for text analysis, Stable Diffusion for image generation, CLIP for image-to-text conversion, and LSTM for sequence modeling. This pipeline's strength lies in its ability to learn and improve over time.

The analysis delves into each pipeline's unique architecture, exploring their approaches to key tasks such as text processing, story segmentation, prompt generation, image creation, and story reconstruction. The research also evaluates the integration capabilities of these pipelines using platforms like LangChain and Make.com, highlighting the trade-offs between flexibility and user-friendliness.Key insights are provided in layman's terms, offering clear guidance on which pipeline best suits specific needs and scenarios. The study concludes with practical recommendations for choosing between the pipelines based on factors such as ease of use, accuracy in complex tasks, and long-term adaptability.This comparative analysis serves as an invaluable resource for both researchers and practitioners in the field of AI-driven storytelling and visual content creation. By breaking down complex technical concepts into understandable terms, it provides a solid foundation for informed decision-making in pipeline selection and implementation, bridging the gap between cutting-edge AI technology and practical application.

Keywords: Natural Language Processing (NLP); Image Generation; Multi-Modal Learning; Generative Adversarial Networks; Variational Autoencoders

Mentor(s):

Matthew Lanham (DSB)

Other Acknowledgement(s):

**Virtual Presentation Abstract Number: 9009**
*Presentation Time: Nov. 19-26, 2024*

# Aplication of a Surveillance System for Insect Behavior Analysis

Life Sciences

Author(s):

Joan Dominguez Lora†

Abstract:

[Abstract Redacted]

Keywords: Raspberry Pi; Machine Learning; Parasite; Predation; Behavior

Mentor(s):

Laura L Ingwell (Agriculture)

Other Acknowledgement(s):

**Virtual Presentation Abstract Number: 9010**
*Presentation Time: Nov. 19-26, 2024*

# Edge Detector Verification (UVM)

Innovative Technology / Entrepreneurship / Design

Author(s):

Seth Christian Graber† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Universal Verification Method (UVM); Verification; Digital Design; Hardware Description Language (HDL); Test Bench

Mentor(s):

Vishnu Chaithanya Lagudu (Engineering); Isaac P Hagedorn (Engineering)

Other Acknowledgement(s):

**Virtual Presentation Abstract Number: 9011**
*Presentation Time: Nov. 19-26, 2024*

# SWARMS: Multi-Agent Control Simulation Platform

Mathematical/Computation Sciences

Author(s):

William John Greenwood† (Science); Noah Anthony Wisniewski‡ (Engineering)

Abstract:

[Abstract Redacted]

Keywords: SWARMS; Drone; Autonomous Racing; Machine Learning; Cloud Based Sim Environment

Mentor(s):

Younggil Chang (Engineering); Amikosh Dube (Engineering); Shreyas Sundaram (Engineering)

Other Acknowledgement(s):

**Virtual Presentation Abstract Number: 9012**
*Presentation Time: Nov. 19-26, 2024*

# Use of 2D Image Processing to Obtain Unknown Distance

Innovative Technology / Entrepreneurship / Design

Author(s):

Christopher Barnes Haynes† (Engineering); Hayden Leonhard Supple† (Engineering); Edwin Alvarado† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Camera; Depth; Training; Frames; Algorithms

Mentor(s):

Kevin T Lee (Engineering)

Other Acknowledgement(s):

**Virtual Presentation Abstract Number: 9013**
*Presentation Time: Nov. 19-26, 2024*

# Computational Power of Apollo Guidance Computer

Mathematical/Computation Sciences

Author(s):

Cole Allen Hufford† (Engineering); Madilyn Grace Shingle† (Engineering); Jack Brian Cramer† (Engineering); Alexander Marcus Krapels† (Engineering); Nolan Douglas Brown† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Steve Clayton Rausch (Engineering)

Other Acknowledgement(s):

**Virtual Presentation Abstract Number: 9014**
*Presentation Time: Nov. 19-26, 2024*

# SkyWater Design Flow

Innovative Technology / Entrepreneurship / Design

Author(s):

Dhruv Roopchand Khatri† (Engineering); Zafeer Aaryan Reza† (Engineering); Yan-Jun Lin† (Engineering); Wei-Yun Liu† (Engineering)

Abstract:

The project aims to optimize the physical design process for the SkyWater 130 nm based manufacturing of the RISC-V computer chip developed by the System-on-Chip Extension Technologies group. Particularly, our goal is to improve the chip's power efficiency, speed, area usage, and timing, while ensuring it meets the manufacturing process rules. To achieve this, the clock distribution will be optimized to achieve higher speed for the chip, and power analysis will be conducted to reduce the chip's power consumption. Further, the chip's functionality under various operating modes and conditions will be verified, focusing on timing requirements and improving specific paths to reduce delays. Finally, the design verification process will be automated for thorough simulation testing of the chip design.

Keywords: Design Flow; Clock Tree Synthesis; Multi-Mode Multi-Corner; Verification Automation; PPA

Mentor(s):

Timothy Francis Hein (Engineering); Mark Johnson (Engineering)

Other Acknowledgement(s):

**Virtual Presentation Abstract Number: 9015**
*Presentation Time: Nov. 19-26, 2024*

# The Best of Both Worlds: A Hybrid Approach to Prompt-Level and Token-Level Jailbreaking in PTLMs

Mathematical/Computation Sciences

Author(s):

Mingyu Kim† (Engineering); Mohamed Sameh Abdeltawab Abdelmouty† (Engineering); Mohamed Alaa Mohamed Ahmed† (Engineering)

Abstract:

The advancement of Pre-Trained Language Models (PTLMs) and Large Language Models (LLMs) has led to their widespread adoption across diverse applications. Despite their success, these models are vulnerable to a multitude of attacks over their lifecycle stages that exploit the nature of the models to bypass their safety measures. Two primary types of inference phase attacks are token-level and prompt-level jailbreaks. While token-level attacks provide attack transferability to black-box models like GPT using adversarial sequences into prompts, noticeable patterns and the requirement of gradient information of the tokens are its limitations. In contrast, prompt-level attacks utilize semantically structured prompts to elicit harmful and unintended responses but rely on feedback from its target LLMs, which can be less effective if responses are inconsistent. We propose a novel hybrid approach that integrates both token-level and prompt-level attack techniques to enhance the effectiveness of jailbreak attacks across different PTLMs. We iteratively refine the prompt based on the feedback from target model response, with addition of inject adversarial suffix that maximize the likelihood of generating the target phase. Our model is evaluated using AdvBench, which is commonly used for measuring attack success rate in various attack models inducing adversarial response from the model.

Keywords: Pre-Trained Language Models; Large Language Models; Prompt Injection; Jailbreak; AI Security

Mentor(s):

James C Davis (Engineering)

Other Acknowledgement(s):

**Virtual Presentation Abstract Number: 9016**
*Presentation Time: Nov. 19-26, 2024*

# Exploring Robotic Manipulation: Kinematics, Control, and Reinforcement Learning in the VIP-GEAI Project

Innovative Technology / Entrepreneurship / Design

Author(s):

Zelin Li† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Robotics; AI; Machine Learning

Mentor(s):

Yu She (Engineering); Jaeeun Kim (Engineering)

Other Acknowledgement(s):

**Virtual Presentation Abstract Number: 9017**
*Presentation Time: Nov. 19-26, 2024*

# Firmware Development for Advanced Motor Control and Communication in Luna Robotic Systems

Innovative Technology / Entrepreneurship / Design

Author(s):

Zelin Li† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Robotics; Firmware

Mentor(s):

Curtis Earl Marshall (Engineering)

Other Acknowledgement(s):

**Virtual Presentation Abstract Number: 9018**
*Presentation Time: Nov. 19-26, 2024*

# Design and Development of Radar Sensors for Environment Feedback

Mathematical/Computation Sciences

Author(s):

Jessica Frances Lyng† (Engineering); Rongbo Hu‡ (Engineering)

Abstract:

The purpose of this design project was to develop a way for the Purdue RoboMaster robots to have awareness of their surroundings using radar sensors and avoid hitting walls, which can potentially damage critical parts of the robot and interfere with effective piloting. The design involves a custom STM32 board designed using Altium, and corresponding code to calculate the position of the robot. Mounted radar sensors would be connected to the STM32 on the robot, sending feedback of the robot's surroundings, which would be sent to code that utilizes the Kalman filter. This project was started in late September 2024 and is currently ongoing, with the final STM32 PCB design being finalized before being sent out for manufacturing, being made as small as possible as to not interfere with any other parts around it during installation. The task of putting together and soldering the PCB will be handed off to more junior members of the team for practice while the next step (coding) would be done. It is the goal of this project to protect the integrity of the robot and to limit the number of considerations the pilot needs during competitions.

Keywords: Robot; PCB Design; Sensors; STM32; Kalman Filter

Mentor(s):

Abolfazl Hashemi (Engineering); Zijian He (Engineering)

Other Acknowledgement(s):

**Virtual Presentation Abstract Number: 9019**
*Presentation Time: Nov. 19-26, 2024*

# The Rat Cage Conundrum: An Innovative Cage Design

Innovative Technology / Entrepreneurship / Design

Author(s):

Cohen Scott Meredith† (Engineering); Elliott Samuel Korentager† (Engineering); Willard Gabriel Rash Cuevas† (Engineering); Gavin Robert Beyers† (Engineering); Owen Michael Bartel‡ (Engineering); Toby Dwayne George‡ (Engineering); Meghana Sunil Kumar‡ (Engineering); Pralhad Prashant Mundargi‡ (Engineering); Samir Niradbhai Patel‡ (Engineering); Gavin Wang‡ (Engineering); Andrew Loren Peterson‡ (Engineering)

Abstract:

This project focuses on redesigning a specialized cage and mechanical counter-lever system for a rat implanted with cranial electrodes used to monitor electrical signals during seizures. The primary objective is to minimize strain on the wire while maintaining ease of cleaning as well as minimizing metal which could potentially interfere with signals sent during seizures. Our group began first with brainstorming and then developing multiple designs for the cage, water bottle holder, and spring system. To ensure structural integrity during the assembly process, puzzle-piece joints were chosen for the wall junctions, offering a precise and secure fit. This will also introduce standardization into the cages, allowing each to be interchanged with one another and to ensure that the cages meet the standards for ethical animal treatment. Weekly team meetings were held to review and iterate on designs, where the pros and cons of each iteration were carefully discussed. These regular reviews fostered a collaborative environment, allowing the team to refine the design continually. Moving onto the prototyping phases we worked with software tools like Fusion 360 and Inkscape, which enabled rapid visualization and modification of these concepts. Test cases were sized down and then created using laser-cut acrylic models to evaluate the prototypes in real-world conditions. The team then continued to reform and iterate through the design process to further the development of the project. By addressing these concerns, the redesigned cage aims to improve the durability of the monitoring system while ensuring animal welfare and efficiency.

Keywords: Electroencephalogram; Epilepsy; EEG-Cage; System; Seizures

Mentor(s):

Ken Yoshida (Engineering); Awadh Mubarak M Al Hawwash (Engineering)

Other Acknowledgement(s):

**Virtual Presentation Abstract Number: 9020**
*Presentation Time: Nov. 19-26, 2024*

# Manufacturing Processes used in SoCET Development

Innovative Technology / Entrepreneurship / Design

Author(s):

Gavin Neal Meyers† (Engineering); Zachary Gosnell† (Engineering); Rudra Vimlesh Patel† (Engineering); Gavin Allen Arner† (Engineering); Jin Park† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Steve Clayton Rausch (Engineering)

Other Acknowledgement(s):

**Virtual Presentation Abstract Number: 9021**
*Presentation Time: Nov. 19-26, 2024*

# Machine Learning Algorithms for Improved Decision Making in Healthcare

Mathematical/Computation Sciences

Author(s):

Sonal Naik† (Science)

Abstract:

Sepsis, a life-threatening condition triggered by the body's exaggerated response to infection, demands urgent intervention to prevent severe complications. This project will investigate developing treatment simulations using offline-online reinforcement learning to potentially save sepsis patients.

Keywords: Sepsis; Machine Learning; Healthcare; Reinforcement Learning

Mentor(s):

Vaneet Aggarwal (Engineering); Denny Yu (Engineering)

Other Acknowledgement(s):

Dipesh Hemchandra Tamboli (Engineering)

**Virtual Presentation Abstract Number: 9022**
*Presentation Time: Nov. 19-26, 2024*

# VIP/APP Fruit Detection (Fruit1 Team)

Mathematical/Computation Sciences

Author(s):

Dang Kim Minh Nguyen† (Polytechnic); Donhyung Ko† (Engineering); Nam Hoang Tran† (Science); Muhammad Usman Mushahid† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Edward J Delp (Engineering)

Other Acknowledgement(s):

**Virtual Presentation Abstract Number: 9023**
*Presentation Time: Nov. 19-26, 2024*

# Autonomous Rescue Drone

Innovative Technology / Entrepreneurship / Design

Author(s):

Seungkeun Oh† (Engineering); Shishir Tumma† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: AI; DQN; Reinforced Learning; Drone; Navigation

Mentor(s):

Shreya Ghosh (Engineering)

Other Acknowledgement(s):

**Virtual Presentation Abstract Number: 9024**
*Presentation Time: Nov. 19-26, 2024*

# Inter-Integrated Circuit bus for System on Chip AFTx07

Innovative Technology / Entrepreneurship / Design

Author(s):

Dev M Patel† (Engineering|JMHC); Tri Than† (Engineering); Medha Mahesh Shinde† (Engineering); Benjamin Aaron McDowell† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: I2C; System on Chip (SoC); SystemVerilog

Mentor(s):

Cole Aaron Nelson (Engineering); Johnathan Hong (Engineering)

Other Acknowledgement(s):

**Virtual Presentation Abstract Number: 9025**
*Presentation Time: Nov. 19-26, 2024*

# Window Detection for LoD3 Building Models: A Comparative Study

Mathematical/Computation Sciences

Author(s):

Akshath Raghav Ravikiran† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: Level of Detail (LoD3); Digital Twins; Oriented Bounding Boxes; Geomatics; Urban Planning

Mentor(s):

Han Sae Kim (Engineering); Jinha Jung (Engineering)

Other Acknowledgement(s):

**Virtual Presentation Abstract Number: 9026**
*Presentation Time: Nov. 19-26, 2024*

# UVM Verification of an AHB Mux

Mathematical/Computation Sciences

Author(s):

Robert Viktor Rozhanskyy† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: UVM; Verification; SystemVerilog; Chip Design

Mentor(s):

Isaac P Hagedorn (Engineering)

Other Acknowledgement(s):

**Virtual Presentation Abstract Number: 9027**
*Presentation Time: Nov. 19-26, 2024*

# Analyzing Software Failures from the News Using LLMs

Innovative Technology / Entrepreneurship / Design

Author(s):

Tanmay Singla† (Engineering)

Abstract:

As reported by the news, software failures provide valuable insights into engineering practices, standards, and regulatory efforts. However, traditional approaches to analyzing such failures rely heavily on manual processes, limiting the scope and scale of analysis. To address this, we propose an automated Failure Analysis Investigation with Large Language Models (FAIL) system designed to collect, group, and analyze news articles reporting on software failures. The FAIL system utilizes large-scale natural language models to identify relevant incidents and categorize them according to established software engineering taxonomies. In this project, we extend FAIL by developing a web-based platform, which includes a chatbot interface, enabling interactive exploration of failure data. Our system significantly reduces the cost and effort of large-scale failure analysis, offering a comprehensive resource for software engineers, researchers, and policymakers better to understand the causes and consequences of software failures. Through this initiative, we aim to support the development of failure-aware software systems and contribute to ongoing advancements in software engineering practices.

Keywords: Software Failure Analysis; News Analysis; Large Language Models, Empirical Software Engineering

Mentor(s):

Dharun Rajkkumar Anandayuvaraj (Engineering)

Other Acknowledgement(s):

**Virtual Presentation Abstract Number: 9028**
*Presentation Time: Nov. 19-26, 2024*

# NSCW AIMM Buoy Detection and Boat Orientation Using 2D Webcams

Innovative Technology / Entrepreneurship / Design

Author(s):

Rohil H Tailor† (Engineering); Yongwook Lee† (Engineering); Ammar Hafiy Bin Abd Ghaffar† (Engineering); Jacob Metcalf† (Engineering); Rikhil Tadiparthi† (Engineering); Neal Jacob Grogg-Reading† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: AIMM; Object Detection; Webcams; Orientation; Buoy Detection

Mentor(s):

Kevin T Lee (Engineering)

Other Acknowledgement(s):

**Virtual Presentation Abstract Number: 9029**
*Presentation Time: Nov. 19-26, 2024*

# Critical metal extraction from thin-film semiconductors at End-of-Life

Innovative Technology / Entrepreneurship / Design

Author(s):

Laasya Thiagarajan† (Engineering)

Abstract:

Critical metal extraction from thin-film semiconductors at End-of-Life

Laasya Thiagarajan1, Huilong Liu1, and Shubhra Bansal1,2,*

1School of Mechanical Engineering, 2School of Materials Engineering, Purdue University, West Lafayette IN 47906

*Contact Email: bansal91@purdue.edu

Perovskites refer to broad classes of materials that share the same crystal structure as the calcium titanium oxide mineral which is mainly composed of CaTiO3. A Pt-based halide perovskite is a 0D vacancy-ordered double perovskite. It typically has the formula A2PtX6, where A is a monovalent cation (Cs) and X is a halide (Cl, Br, I), and specific anion or cation sites are intentionally left vacant, changing the formula slightly. Its 0D structure allows for environmental stability and less toxicity than a lead-based perovskite. Since Pt exhibits chemical stability, high electrical conductivity, and catalytic properties, it can enhance the properties of perovskite phase. Pt-based halide perovskites are generally studied for their potential in solar cells, thermoelectric devices, and water splitting photocatalysis.

Pt is typically very expensive and scarce due to its complex properties, making it a critical metal. Extracting platinum from Pt-based halide perovskite thin film semiconductors has significant importance because it can be reused and recycled for other applications that require Pt-based technologies, like fuel cells or catalytic converters. This allows for sustainability, cost efficiency, and material optimization.

Pt can be extracted through chemical leaching and precipitation. Common chemicals that are used are amines, chlorides, and nitrates which use ammonium compounds to precipitate out elemental platinum through heating or reducing agents. This study focuses on using a chloride and nitrate based aqua regia along with ammonium chloride to extract elemental platinum from a Pt-based halide perovskite thin film. This thin film is placed in the aqua regia, and then ammonium chloride is added to form a precipitate. Through heating of the precipitate, elemental platinum powder can be produced. The step-by-step reactions are listed below:

3Pt + 4HNO3 + 18HCl ? 3H2PtCl6 + 4NO? + 8H2O

PtCl2 + 2HNO3 + 4HCl ? H2PtCl6 + 2NO2? + 2H2O

PtCl4 + 2HCl ? H2PtCl6

H2 PtCl6 + 2NH4 Cl ? (NH4 )2PtCl6? + 2HCl

3(NH4)2PtCl6 = 3Pt + 16HCl + 2NH4Cl + 2N2?

To evaluate the purity of the platinum extracted, x-ray diffraction (XRD) can be used which can help

Keywords: [no keywords provided]

Mentor(s):

Shubhra Bansal (Engineering); Huilong Liu (Engineering)

Other Acknowledgement(s):

**Virtual Presentation Abstract Number: 9030**
*Presentation Time: Nov. 19-26, 2024*

**SoCet ViP 17911**

Innovative Technology / Entrepreneurship / Design

Author(s):

Eric Chase Williams† (Engineering); Michael Brayden Hudson† (Engineering); Jacob Tyler Renta† (Engineering); Tsz Pui Jiang† (Engineering); YuKuan Lu† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: SoCET; VIP

Mentor(s):

Arvind Krishna Radhakrishnan (Engineering); Steve Clayton Rausch (Engineering)

Other Acknowledgement(s):

**Virtual Presentation Abstract Number: 9031**
*Presentation Time: Nov. 19-26, 2024*

# neuralink

Innovative Technology / Entrepreneurship / Design

Author(s):

Yutong Wu† (Engineering); Sayee Sabri Anand† (Engineering); Aditya Hegde† (Engineering); Hao-Chen Li† (Engineering)

Abstract:

[Abstract Redacted]

Keywords: [no keywords provided]

Mentor(s):

Steve Clayton Rausch (Engineering)

Other Acknowledgement(s):

# OURConnect

PURDUE'S UNDERGRADUATE RESEARCH PORTAL

## RECRUITMENT

**POST & MANAGE** project administration
**SEARCH & APPLY TO** research positions

## REPORTING

**TRACK & RECORD** projects over time
**COMPLETE** undergrad research learning contracts

## CONFERENCE MANAGEMENT

**SUBMIT & UPDATE** presentation abstracts
**APPROVE** presentations and availability

Login to update your profile to
**CONNECT** with the possibilities

# FALL EXPO NOTES

## SAVE THESE DATES:

**MARCH 27, 2025: Undergraduate Research Pitch Competition**

**APRIL 8 & 10, 2025: Spring Undergraduate Research Conference**

**JULY 30, 2025: Summer Undergraduate Research Symposium**

**NOVEMBER 18 & 19, 2025: Fall Undergraduate Research Expo**

ABSTRACT BOOK

PURDUE UNIVERSITY | Office of Undergraduate Research