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A dynamic stochastic framework for dual process models

Many phenomena in judgment and decision-making are often attributed to the interaction of two systems of reasoning. In neurosciences these systems are sometimes even related to distinct brain areas. While these so-called dual process theories can explain many types of behavior, they are rarely formalized as mathematical or computational models. Rather, dual process models are typically conceptual frameworks and verbal theories, which are difficult to conclusively evaluate or test. That is, unlike conceptual frameworks, computational frameworks guarantee logically valid predictions and allow the derivation of precise quantitative predictions from the underlying assumptions, thereby enabling empirical falsification of these assumptions. In the cases where formal dual process models have been proposed, they are often silent when it comes to the timing of the two systems. In this talk, I present a dynamic dual process model framework of risky decision-making that provides an account of the timing and interaction of the two systems and can explain both choice and response time data. I outline several predictions of the model including how changes in the timing of the two systems as well as time pressure can influence behavior. The purposed framework also allows the user to explore different assumptions about how preferences are constructed by the two systems as well as the dynamic interaction of the two systems. In particular, I examine various different possible functional forms of the two systems and two possible ways the systems can interact (simultaneously or serially). The model versions are fit to existing data sets.