Keynotes

A Quantum Probability Framework for Causal Inference

Jennifer S. Trueblood
Vanderbilt University

Reasoning about the causal relationships between events is an important component of cognition, allowing us to make sense of the world. Arguably, the most successful models of causal reasoning, causal Bayes nets, perform well in some situations, but there is considerable variation in how well they are able to account for data, both across scenarios and between individuals. More generally, decades of research have shown that human decision-making often violates the rules of classical (Bayesian) probability theory. Quantum probability (QP) theory provides an exciting new approach for modeling human cognition and decision-making.

In this talk, I will discuss how QP theory can be used to construct a framework for causal reasoning that accounts for behavior in situations where Bayes nets fail. I will discuss how changing assumptions about compatibility (i.e., how joint events are represented) leads to the construction of a hierarchy of models, from 'fully' quantum to 'fully' classical, that could be adopted by different individuals in different situations.

I will illustrate the approach with new laboratory experiments and model comparisons as well as discuss two factors that determine the form of the representation, individual differences in cognitive thinking style and familiarity with the causal reasoning domain. I will conclude by showing how the framework can used to understand real world causal judgments using a large (N=1200) experiment conducted during the US Presidential primaries involving judgments about the outcomes of primaries and the eventual nominations.

Automaton Theories of Human Sentence Comprehension

John T. Hale
Cornell University

The ability to understand what other people are saying, in a language that you know, is a impressive feat of cognition. Within this domain, many fundamental questions remain open. Among them: how does sentence structure figure in the comprehension process? Why is comprehension so fast & effortless most of the time? And which parts of the brain do which subtasks? This talk argues that cognitive architecture gives us a good head-start on these questions. By presenting a few proposals based on Hale (2014) it invites modelers to join in the enterprise.

Hale, J. (2014). *Automaton Theories of Human Sentence Comprehension*. Stanford, CA: CSLI Press.