University of California, Irvine
Statistics Seminar

Who Does That? Using Order-Restricted Inference to Understand Qualitative and Quantitative Individual Differences in Cognition

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(Bldg. #314 on campus map)

Cognitive psychology is the study of how we think. Research questions center on how structure in the environment is mentally represented, manipulated, combined, stored, retrieved, and evaluated. And one of the key questions is how people might differ in these activities. One fruitful distinction is between qualitative and quantitative individual differences. Qualitative individual differences refer to variation in how people represent or process information. For example, it is widely thought that numbers are mentally represented in an analog fashion on mental number line. Yet, suppose some people represent numbers as propositions without explicitly encoding a number-line representation (much like a computer). Quantitative individual variation refers to differences in speed or resolution within common representations and processes. In this talk, I discuss how psychological theory corresponds well to weak orders, and the qualitative/quantitative distinction can be formulated as a problem of order-restricted inference. In this case, the question is whether a potentially large collection of order constraints holds simultaneously. Analysis is convenient in the Bayesian framework, and Bayes factors for competing weak orders are computed using nothing more sophisticated than counting MCMC posterior samples in specified regions. This approach is used to assess whether individual differences in attention are quantitative or qualitative in nature.