

The University of Chicago
Department of Statistics

Seminar

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**“Inferring Response Times of a Latent, Error-Free
Cognitive Process”**

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ABSTRACT

Many experiments on human cognition involve having a subject make a judgment as quickly and accurately as possible. Both reaction times and error rates are widely used indices of human performance in such experiments. A difficulty in relying on either one of these indices alone is the problem of a speed/accuracy tradeoff; subjects who react quickly are more likely to have higher error rates, whereas subjects who are more accurate are likely to have slower reaction times. Another difficulty arises when subjects respond slowly and inaccurately (rather than quickly but inaccurately), e.g., due to a lapse of attention. We introduce an approach that combines response time and accuracy information that addresses both situations. The modeling framework assumes two latent competing processes. The first, the error-free process, always produces correct responses. The second, the residual process, results in all observed errors and some of the correct responses (but does so via non-specific processes, such as guessing in compliance with instructions to respond on each trial). Inferential summaries of the speed of the error-free process provide a principled assessment of cognitive performance reducing the influences of both fast and slow guesses. Likelihood analysis is discussed for the basic model and extensions.

This is joint work with Jeremy Gray (Washington University in St. Louis) and Carlos Morales (Boston University)
