STATISTICS COLLOQUIUM

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TALK: 4:00 PM — SCIENCE CENTER, ROOM 309
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“Bayesian Models of Human Learning and Inference”

Joshua B. Tenenbaum
Associate Professor of Computational Cognitive Science
Massachusetts Institute of Technology

ABSTRACT

In everyday learning and inference, people routinely draw successful generalizations from very limited evidence. Even young children can infer the meanings of words, the hidden properties of objects, or the existence of causal relations from just one or a few relevant observations. How do they do it? I will argue that people's everyday inductive leaps can be understood as a form of intuitive statistics -- specifically, as approximations to Bayesian inference over probabilistic models of the world. These models have several essential features. They can have rich latent structure based on abstract knowledge representations, what cognitive psychologists have sometimes called "intuitive theories", "mental models", or "schemas". They typically have a hierarchical structure, supporting inference at multiple levels: abstract knowledge may itself be learned from experience, at the same time as it guides more specific generalizations from sparse data. Finally, they may be defined nonparametrically, with an effective complexity that grows in response to observed data. These properties allow human learners to balance strongly constraining inductive biases -- necessary for rapid generalization -- with the flexibility to adapt to the structure of new environments, learning new inductive biases for which our brains could not have been pre-programmed.

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