HUMANITY CENTERED ROBOTICS INITIATIVE

BROWN

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Research Talk: "Probabilistic Programming Languages: Principles, Implementations, and Applications"

Thursday, October 15, 2015
1:30-2:30 pm
CIT Building, Lubrano Conference Room, 477

I will introduce ideas and applications of probabilistic programing languages (PPLs). Probabilistic models have become central to scientific modeling and computer science applications. These models are usually described with a mixture of informal english, math, and box-and-arrow diagrams. Such descriptions can be error prone and are difficult to scale in model complexity. PPLs are formal languages for probabilistic modeling, in which distributions are described via programs with random choices. As a description language PPLs are a convenient and powerful way to construct models; in this talk I will show several examples drawn from recent research in cognitive science (reasoning about player strength and social inference) and graphics (scene synthesis and inverse graphics). Beyond mere description, PPL implementations make it possible to automate the process of inference in probabilistic models. I will discuss a number of techniques for fast and efficient inference in arbitrary probabilistic programs, including Metropolis-Hastings, Hamiltonian Monte Carlo, and Sequential Monte Carlo.

Noah D. Goodman is Assistant Professor of Psychology, Linguistics (by courtesy), and Computer Science (by courtesy) at Stanford University. He studies the computational basis of human thought, merging behavioral experiments with formal methods from statistics and logic. His areas of research include language understanding, social cognition, concept learning, and probabilistic programming languages. He received his Ph.D. in mathematics from the University of Texas at Austin in 2003. In 2005 he entered cognitive science, working as Postdoc and Research Scientist at MIT. In 2010 he moved to Stanford where he runs the Computation and Cognition Lab.