Data Science Institute
COLUMBIA UNIVERSITY

Colloquium Series Event

A Survey of Probabilistic Programming

Date: **Tuesday, February 17, 2015**
Time: **6:00 p.m.**
Location: **Davis Auditorium,**
   Schapiro Center, 412 CEPSR
   530 West 120th Street, 4th Floor

Followed by a light reception in the lobby.

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ABSTRACT:

Probabilistic inference is a widely-used, rigorous approach for processing ambiguous information based on models that are uncertain or incomplete. However, models and inference algorithms can be difficult to specify and implement, let alone design, validate, or optimize. Additionally, inference often appears to be intractable. Probabilistic programming is an emerging field that aims to address these challenges by formalizing modeling and inference using key ideas from probability theory, programming languages, and Turing-universal computation.

This talk will use real-world applications of three probabilistic programming systems to illustrate the principles of probabilistic programming:

1. BayesDB, a Bayesian database that enables users to directly query the probable implications of data tables without training in statistics. Short queries in BQL, an SQL-like language, have been used to discover validated findings from a broad class of databases, including Earth satellites, country-level measures of economic development, and US hospitals.

2. Picture, an imperative probabilistic language for 3D scene perception. Picture uses deep neural networks and statistical learning to invert generative models based on computer graphics. 50-line Picture programs can infer 3D models of human poses, faces, and other object classes from single images.

3. Venture, a general-purpose probabilistic programming platform with programmable inference. Venture aims to be sufficiently extensible, expressive, and efficient for general-purpose use, and has been successfully applied in fields such as robotics and statistics.

BIOGRAPHY:

Vikash Mansinghka is a postdoctoral research scientist at MIT CSAIL, where he leads the Probabilistic Computing Project. Vikash holds S.B. degrees in Mathematics and in Computer Science from MIT, as well as an M.Eng. in Computer Science and a PhD in Computation. He also held graduate fellowships from the National Science Foundation and MIT's Lincoln Laboratory. His PhD dissertation on natively probabilistic computation won the MIT George M. Sprowls dissertation award in computer science. He co-founded a venture-backed startup based on this research that was acquired by Salesforce.com in 2012. He served on DARPA's Information Science and Technology advisory board from 2010-2012, and currently serves on the editorial boards for the Journal of Machine Learning Research and the journal Statistics and Computation.

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