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DEMPSTER AWARD COLLOQUIUM

WEDNESDAY, MAY 6, 2015

TALK: 4:15 PM — SCIENCE CENTER LECTURE HALL E
RECEPTION: 5:15 PM — SCIENCE CENTER, 7TH FLOOR

**“Implicit Stochastic Approximation for Principled Estimation with
Large Datasets”**

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ABSTRACT

The ideal estimation method needs to fulfill three requirements: (i) efficient computation, (ii) statistical efficiency, and (iii) numerical stability. The classical stochastic approximation of Robbins & Monro (1951) is an iterative estimation method, where the current iterate (parameter estimate) is updated according to some discrepancy between what is observed and what is expected, assuming the current iterate has the true parameter value. Classical stochastic approximation undoubtedly meets the computation requirement, which explains its popularity, for example, in modern applications of machine learning with large datasets, but cannot effectively combine it with efficiency and stability. Surprisingly, the stability issue can be improved substantially, if the aforementioned discrepancy is computed not using the current iterate, but using the conditional expectation of the next iterate given the current one. The computational overhead of the resulting implicit update is minimal for many statistical models, whereas statistical efficiency can be achieved through simple averaging of the iterates, as in classical stochastic approximation (Ruppert, 1988). Thus, implicit stochastic approximation is fast and principled, fulfills requirements (i-iii) for a number of popular statistical models including GLMs, GAMs, and proportional hazards, and it is poised to become the workhorse of estimation with large datasets in statistical practice.