STATISTICS COLLOQUIUM

MONDAY, NOVEMBER 12, 2012
TALK: 4:00 PM — SCIENCE CENTER RM. 309
RECEPTION: 5:15 PM — SCIENCE CENTER, 7TH FLOOR

“Latent Variable Modeling: Tensor and Graphical Approaches”

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ABSTRACT

It is widely recognized that incorporating latent or hidden variables is a crucial part of modeling, e.g. there can be unknown relationships between social actors, unknown mechanisms influencing biological pathways, and so on. In general, guaranteed learning of latent variable models is challenging and heuristics such as expectation maximization (EM) are adopted in practice. I will present two tractable and provable approaches in the talk.

In the first part of my talk, I will present a tensor approach for learning a wide class of latent variable models under mild non-degeneracy assumptions, such as Gaussian mixtures, hidden Markov models, and topic models such as latent Dirichlet allocation. The tensor structure is obtained based on low order observable moments. A generalization of singular value decomposition provides a tractable approach for symmetric orthogonal tensor decomposition and we provide perturbation analysis which translates to sample complexity bounds.

In the second part of my talk, I will present a graph-based approach for capturing latent variables via probabilistic graphical models. I will present provable methods for latent models Markov on trees, and more generally, on graphs with long cycles. Experiments on newsgroup data reveals interesting relationships between topics and words in the discovered structure, and similar observations are made in financial and social domains.

Relevant Papers:
[1] "Tensor Decompositions for Learning Latent Variable Models", by A. Anandkumar, R. Ge, D. Hsu, S.M. Kakade and M. Telgarsky. Under preparation.
[2] "Learning Loopy Graphical Models with Latent Variables: Efficient Methods and Guarantees", by A. Anandkumar and R. Valluvan. *Proc. of NIPS* 2012.