



THE UNIVERSITY OF
CHICAGO

Department of Statistics

STATISTICS COLLOQUIUM

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Learning from Binary Multiway Data: Probabilistic Tensor
Decomposition and its Statistical Optimality

MONDAY, November 19, 2018 at 4:30 PM

Eckhart 133, 5734 S. University Avenue

Refreshments before the seminar at 4:00PM in Jones 111

ABSTRACT

Tensors of order 3 or greater, known as higher-order tensors, have recently attracted increased attention in many fields. Methods built on tensors provide powerful tools to capture complex structures in data that lower-order methods may fail to exploit. However, extending familiar matrix concepts to higher-order tensors is not straightforward, and indeed it has been shown that most computational problems for tensors are NP-hard. In this talk, I will present some statistical results on binary tensor decomposition. Instead of observing a real-valued higher-order tensor, we observe a binary tensor in which each tensor entry is quantized into a 0-1 measurement. Such problems arise in several applications such as collaborative filtering, compressed sensing, sensor network localization, and topic modeling. We propose a constrained MLE and give the performance bound under a generalized multilinear model. The obtained rate is optimal in a minimax sense over a class of low-rank tensors. We demonstrate the power of our approach on the tasks of tensor completion and clustering, with improved performance over previous methods. Time allowed, I will present our recent results on tensor-response regression and its application in neuroimaging.

This is a joint work with Yun S. Song and Lexin Li

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