THE UNIVERSITY OF CHICAGO

Department of Statistics

STATISTICS COLLOQUIUM

PRADEEP RAVIKUMAR

Department of Computer Science
University of Texas at Austin

Winsorized Poisson Graphical Models

MONDAY, April 8, 2013 at 4:00 PM

133 Eckhart Hall, 5734 S. University Avenue

Refreshments following the seminar in Eckhart 110

ABSTRACT

Undirected graphical models are widely used in a variety of applications for modeling distributions over a large number of variables. Popular instances of such models include Gaussian graphical models, Ising, and multinomial/categorical graphical models. These standard instances are however ill-suited to count data, which may not be well modeled by Gaussian or multinomial distributions. Examples of such count data are increasingly ubiquitous in big-data settings, including high-throughput genomic sequencing data, user-ratings data, spatial incidence data, climate studies, and site visits, among others. Accordingly, we first discuss the class of Poisson graphical models: which arise as the joint distributions that correspond to Poisson distributed node-conditional distributions, of nodes conditioned on the rest of the nodes. However, this Poisson graphical model has a key caveat: it can only model negative dependencies, for reasons of normalizability of the joint Poisson graphical model distribution. Accordingly, we discuss two strategies for winsorizing the Poisson graphical model distribution: but show that only one of the strategies leads to a valid joint distribution; we call this the Winsorized Poisson Graphical Model (WPGM) distribution. We propose tractable M-estimators for recovering the graph structure of our Winsorized Poisson graphical model via penalized neighborhood estimation, and provide statistical guarantees even under high-dimensional statistical regimes. We demonstrate the applicability of WPGM via simulation studies, as well on breast cancer microRNA data measured by next generation sequencing.

Joint work with Eunho Yang, Genevera Allen, Zhandong Liu.

For further information and inquiries about building access for persons with disabilities, please contact Dan Moreau at 773.702.8333 or send him an email at dmoreau@galton.uchicago.edu. If you wish to subscribe to our email list, please visit the following website: https://lists.uchicago.edu/web/arc/statseminars.