The University of Chicago
Department of Statistics

SUMMER Seminar Series

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Algebraic Statistics for Random Graph Models

MONDAY, August 8, 2011, at 4:00 PM
110 Eckhart Hall, 5734 S. University Avenue

ABSTRACT

Algebraic statistics has flourished in recent years as a branch of applied algebraic geometry. This field is fundamentally connected to and driven by methods from computational algebraic geometry and combinatorics. The algebraic methods have applications to statistical models where standard computational tools do not scale well, for example, phylogenetics, social networks, and graphical models. In turn, some of the open problems suggest developments on the computational frontier.

The p_1 model is a directed random graph model used to describe dyadic interactions in a social network in terms of effects due to differential attraction (popularity) and expansiveness, as well as an additional effect due to reciprocation. This talk will focus on two problems related to the geometry of the p_1 model, and directly relevant to the estimation and conditional goodness-of-fit testing problems. The first problem is the construction of Markov bases for the model, where sampling constraints present the main difficulty in applying algebraic methods directly, and reveal interesting geometry. The second problem is concerned with the existence of maximum likelihood estimators when the supremum of the likelihood function is achieved on the boundary of the model polytope, only certain linear combinations of the natural parameters are estimable. I will describe polyhedral conditions for the existence of the MLEs for the p_1 model. The talk will conclude with extensions to two related models: the Bradley-Terry model for paired comparisons, and random graphs with fixed degree sequence, and a discussion of related asymptotic results.

For further information and about building access for persons with disabilities, please contact Laura Rigazzi at 773.702.8333 or send email (lrigazzi@galton.uchicago.edu). If you wish to subscribe to our email list, please visit the following website: https://lists.uchicago.edu/web/arc/statseminars.