

MATHEMATICS DEPARTMENT
North Carolina State University

ALGEBRA AND COMBINATORICS SEMINAR

Friday, October 31, 2008

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Algebraic and combinatorial aspects of Gaussian graphical models

ABSTRACT: Graphical models are a family of statistical models where graphs are used to represent dependence structures between collections of random variables. For example, a directed edge pointing from random variable X to random variable Y might mean that X affects Y in some way.

In the case where all the random variables are jointly normal, the model (that is, the set of all possible probability distributions consistent with a given graph) is parametrized by an algebraic subset of the cone of positive definite covariance matrices. While the constraint sets of these models are well understood in the case that all random variables are observed, it is a major open problem to describe these sets in the case that some of the random variables are hidden.

I will describe two results for Gaussian graphical models with hidden variables. The first is a complete characterization of algebraic constraints on hidden tree models. The second is a global combinatorial characterization of the vanishing of subdeterminants of the covariance matrix in terms of a new separation criterion in the graph. Along the way, we will see some familiar algebraic objects and combinatorial tools, like degenerations of the Grassmannian and the Gessel–Viennot Theorem.

I will try to make the statistical and algebraic background accessible to a broad audience.

4:00 - 4:50 pm HA 335

Faculty, students and post-docs are encouraged to attend.