



The University of Chicago
Department of Statistics

Seminar Series

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Regularized Estimation of Large Covariance Matrices

MONDAY, October 15, 2007 at 4:00 PM
133 Eckhart Hall, 5734 S. University Avenue

Refreshments following the seminar in Eckhart 110.

ABSTRACT

Estimation of covariance matrices has a number of applications, including principal component analysis, classification by discriminant analysis, and inferring independence and conditional independence between variables. It has long been known that the sample covariance matrix has many undesirable features in high dimensions unless regularized. This talk will present several types of covariance regularization, focusing on methods that work directly with the inverse covariance (the concentration matrix). When variables have a natural notion of distance, we show that "banding" the Cholesky factor of the concentration matrix produces a consistent estimator even when the data dimension grows much faster than the sample size. An adaptive banding approach based on a novel nested lasso penalty is shown to work well in practice. We also propose a penalized likelihood method for producing a sparse estimator of the concentration matrix in situations where there is no natural ordering in the variables. We obtain explicit convergence rates and develop an efficient optimization algorithm for this permutation-invariant estimator. The methods will be illustrated with examples from mass spectroscopy and gene expression data.

This talk includes joint work with Peter Bickel (UC Berkeley), Adam Rothman (University of Michigan), and Ji Zhu (University of Michigan).