Department of Statistics

DISSERTATION PRESENTATION AND DEFENSE

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Estimation and Inference for High Dimensional Data with Structured Signals

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Jones 111, 5747 S. Ellis Avenue

ABSTRACT

In high dimensional statistics, estimation and inference are often done by making use of the underlying signal structures. In this talk, we consider the cases of sparse, low rank and shape-restricted signal structures for a variety of problems, and propose new approaches for estimating related quantities and make valid inference.

We first discuss selective inference for group sparse linear models. We develop tools to construct confidence intervals and p-values for testing selected groups of variables in a linear model with group sparsity. Then we will study one dimensional isotonic regression which is an example of shape-restricted nonparametric regression. We characterize the contractive property of the isotonic projection with respect to any norm and use this to analyze the convergence properties of isotonic regression. We then consider variable ranking in high dimensional sparse linear regression with rare and weak signals. We propose a two-step approach to rank variables so that signal variables tend to have higher rank than noise variables. The last topic is regarding the problem of decomposing a large covariance matrix into a low rank part plus a diagonally dominant part. We propose several algorithms to perform such task and demonstrate its usefulness in estimating large covariance matrices for high dimensional data.
