The University of Chicago
Department of Statistics

Seminar Series

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Oracular Model Selection via Penalized Composite Quantile Regression

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Refreshments following the seminar in Eckhart 110.

ABSTRACT

The concept of model selection oracle introduced by Fan and Li (2001) characterizes the optimal behavior of a model selection procedure. In the sparse linear regression model case, the error distribution is often unspecified and hence coefficient estimation and variable selection is routinely done in the penalized least squares (LS) framework. Oracle-like estimators such as the SCAD and the adaptive Lasso mimic the least-squares oracle. However, the least-squares oracle theory breaks down if the error variance is infinite. Moreover, for some non-normal error models with finite variance, the least-squares oracle estimator has unsatisfactory efficiency.

In this talk we introduce a new oracle estimator using a new regression technique called composite quantile regression (CQR). We employ the adaptive Lasso penalty to produce a penalized CQR estimator that mimics the CQR-oracle estimator. We show that the oracle model selection theory using the CQR oracle works beautifully even when the error variance is infinite. When the error variance is finite, CQR still enjoys great advantages in terms of estimation efficiency. We show that the relative efficiency of CQR-oracle compared to the least-squares oracle is greater than 0.864 regardless the error distribution. Moreover, the CQR-oracle could be much more efficient and sometimes arbitrarily more efficient than the least-squares oracle. The same conclusions hold when comparing a CQR-oracular estimator with a LS-oracular estimator.