The University of Chicago
Department of Statistics

Seminar Series

FLORENTINA BUNEA

Department of Statistics
Florida State University

On ℓ_1 Regularization and Sparsity in High Dimensions

MONDAY, March 3, 2008 at 4:00 PM
133 Eckhart Hall, 5734 S. University Avenue
Refreshments following the seminar in Eckhart 110.

ABSTRACT

The topic of ℓ_1 (Lasso) regularized empirical risk estimation has received considerable attention over the past decade. The method is very popular in problems where the number of parameters is larger than the sample size : efficient algorithms abound and the solution is sparse. In this talk I will discuss how one can exploit the latter quality for inference in regression models with either continuous or binary response, and in functional data problems.

I will present a new class of sparsity oracle inequalities in regression models. These are non-asymptotic results and state that if the true parameter is sparse, the ℓ_1 penalized estimator will adapt to this unknown sparsity, with very high probability. The results require minimal assumptions and a certain degree of regularity of the correlation matrix of the covariates. I will consider in more detail binary response regression models, with emphasis on the logistic and square loss. I'll show that properly calibrated ℓ_1 estimators can be used to identify, at any pre-specified confidence level, a small set of variables associated with the response, when the initial number of variables is larger than the sample size. As a consequence, we obtain conditions under which the false discovery rate, the specificity and sensitivity can be controlled. An application to SNPs identification in genetics studies will be used to illustrate the method.

Finally, I will show that the ℓ_1 type estimates can be used to construct honest confidence sets for the mean of a stochastic process. The inference is based on a sample of trajectories of the process, each observed at discrete times and corrupted by noise.

Please send email to Mathias Drton (drton@galton.uchicago.edu) for further information. Information about building access for persons with disabilities may be obtained in advance by calling Karen Gonzalez (Department Administrator and Assistant to Chair) at 773.702.8335 or by email (karen@galton.uchicago.edu).