

The University of Chicago

Department of Statistics

Seminar

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**“Component Selection and Smoothing
Spline Analysis of Variance Models”**

Monday, January 19, 2004 at 4:00 PM
133 Eckhart Hall, 5734 S. University Avenue

ABSTRACT

We propose a new method for model selection and model fitting in nonparametric regression models, in the framework of smoothing spline analysis of variance. The “COSSO” is a method of regularization with the penalty functional being the sum of component norms, instead of the squared norm employed in the traditional smoothing spline method. The COSSO provides a unified framework for several recent proposals for model selection in linear models and smoothing spline analysis of variance models. Theoretical properties, such as the existence and the rate of convergence of the COSSO estimator, are studied. In the special case of a tensor product design with periodic functions, a detailed analysis reveals that the COSSO does variable selection by applying a novel soft thresholding type operation to the function components. We give an equivalent formulation of the COSSO estimator which leads naturally to an iterative algorithm. We introduce a one step update version of the algorithm that is computationally fast and gives comparable estimates empirically. We compare the COSSO with the MARS, a popular method that builds functional analysis of variance models, in simulations and real examples. The COSSO gives very competitive performances in these studies.
