

COLLOQUIUM

Department of Statistics and Probability
Michigan State University

David Ruppert
Cornell University

Semiparametric Regression, Penalized Splines, and Mixed Models

Thursday, April 14, 2011

A405 Wells Hall

10:20 a.m. - 11:10 a.m.

Refreshments: 10:00 a.m.

Abstract

Semiparametric regression models combine parametric and nonparametric components. Penalized splines can model the nonparametric components using a predetermined basis that is rich enough to avoid underfitting. Overfitting is prevented by a roughness penalty. Penalized splines include, as a special cases, both classical smoothing splines and Eilers and Marxs P-splines. A penalized spline can be viewed as a BLUP in a mixed model or as an empirical Bayes estimator. The mixed model viewpoint is especially convenient for applications because of its conceptual simplicity, because it allows the use of readily available software, and especially because it can incorporate random subject-specific effects as well. The first part of this talk will be an overview of mixed-model splines for semiparametric regression circa 2003 when *Semiparametric Regression* was published by Ruppert, Wand, and Carroll. Several case studies will be presented. The second half of the talk will survey recent work on the asymptotic theory of penalized splines. Two types of asymptotics have been studied. In one, the number of knots is a smoothing parameter and the asymptotics are similar to those of unpenalized least-squares splines. In the second, the number of knots increase sufficiently fast that it does not play the role of a smoothing parameter. In this type of asymptotics, which is the more relevant to statistical practice, the asymptotics are similar to those of smoothing splines and, somewhat surprisingly, the asymptotic distribution does not depend on the degree of the spline, only the order of the penalty. If time permits, very recent work on bivariate splines will be discussed.

To request an interpreter or other accommodations for people with disabilities, please call the Department of Statistics and Probability at 517-355-9589.