Smoothness selection for additive models beyond the exponential family

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Vortrag im Rahmen des Institutskolloquiums
Mittwoch, 08. Januar 2014, 17:15 Uhr
B206 (HGB), Geschwister-Scholl Platz 1

Models built around smooth functions of covariates are appealing well beyond the widely used exponential family setting of generalized additive models (and their various extensions). Examples are negative binomial and Tweedie regression when the 'theta' and 'p' parameters are unknown, beta, ordered categorical and scaled t regression, Cox regression and the GAMLSS models of Rigby and Stasinopoulos. This talk will discuss a general framework for stable and efficient smoothness selection which covers these models. The approach is based on Laplace approximate REML/ Marginal likelihood estimation of the smoothing parameters/ variance components of penalized regression smoothers, and allows new distribution models to be implemented based only on some derivatives of the log density.