Department of Decision Sciences

Occasional Seminar for Sabbatical Leave

Adaptive nonparametric Bayesian inference using mixture models

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Abstract

The last decade has witnessed a tremendous progress in the area of nonparametric Bayesian inference from both theoretical and applied sides. New discrete priors proposed in the literature have been employed as an alternative to the Dirichlet process in a Bayesian hierarchical model for density estimation. When using these models in concrete applications, a preliminary investigation of their theoretical properties is mandatory. In this talk, we present results on the frequentist behaviour of Bayesian nonparametric mixture models based on stick-breaking priors for density and regression estimation. Using a novel approximation result, the resulting procedure with a second-order kernel, like the Gaussian density, is shown to be fully rate-adaptive to any smoothness level, including "analytic" smoothness, of the sampling density, without requiring any ad hoc selection of tuning parameters in the prior. The Bayesian approach to density estimation using mixture models reveals to be particularly appealing in offering a simple adaptive procedure producing bona fide estimators versus frequentist kernel density methods based on super-kernels which have the defect of yielding estimators whose realizations may not be probability density functions, thus requiring corrections.

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