

Towards Objective Priors and Nonparametric Regression and Classification

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In the univariate normal means hypothesis testing problem, Jeffreys recommended a Cauchy prior distribution to ensure consistency of Bayes factors under several situations. In the multiple regression setting, Zellner and Siow suggested multivariate Cauchy prior distributions obtained as a scale mixture of normal g-priors. Alternatively, independent Cauchy prior distributions are attractive, particularly in nonparametric regression problems where the number of potential predictors may greatly exceed the number of observations. In this talk we discuss the role of symmetric alpha-stable, in particular the Cauchy, process priors as a means to specifying prior distributions on infinite dimensional function spaces in nonparametric regression and classification problems. We show how the alpha-stable process priors may be represented as the limit of independent scale mixtures of normal priors and provide a generalization of the improper priors used in Tipping's Relevance Vector Machines in the framework of kernel regression. We discuss feature selection (variable selection) in the context of multivariate kernels. Finally, we present simulated and real data to illustrate the model performance.