MODELING CONDITIONAL DENSITIES USING FINITE SMOOTH MIXTURES

FENG LI, MATTIAS VILLANI, AND ROBERT KOHN

ABSTRACT. Smooth mixtures, i.e. mixture models with covariate-dependent mixing weights, are very useful flexible models for conditional densities. Previous work shows that using too simple mixture components for modeling heteroscedastic and/or heavy tailed data can give a poor fit, even with a large number of components. This paper explores how well a smooth mixture of symmetric components can capture skewed data. Simulations and applications on real data show that including covariate-dependent skewness in the components can lead to substantially improved performance on skewed data, often using a much smaller number of components. Furthermore, variable selection is effective in removing unnecessary covariates in the skewness, which means that there is little loss in allowing for skewness in the components when the data are actually symmetric. We also introduce smooth mixtures of gamma and log-normal components to model positively-valued response variables.
KEYWORDS: Bayesian inference, Markov chain Monte Carlo, Mixture of Experts, Variable selection