Robust Bayesian model selection for heavy-tailed linear regression using finite mixtures

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Abstract

In this paper we present a novel methodology to perform Bayesian model selection in linear models with heavy-tailed distributions. The new method considers a finite mixture of distributions to model a latent variable where each component of the mixture corresponds to one possible model within the symmetrical class of normal independent distributions. Naturally, the Gaussian model is one of the possibilities. This allows a simultaneous analysis based on the posterior probability of each model. Inference is performed via Markov chain Monte Carlo - a Gibbs sampler with Metropolis–Hastings steps for a class of parameters. Simulated studies highlight the advantages of this approach compared to a segregated analysis based on arbitrary model selection criteria. Examples with real data are presented and an extension to censored linear regression is introduced and discussed.
Keywords: Finite mixture, heavy-tailed errors, linear models, model selection, MCMC.