Bayes Model Selection with Path Sampling: The Case of Factor Models

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Abstract: Factor Models are one of the most classical Statistical Methods used recently for efficient modeling of sparse variance-covariance matrix. The choice of the number of underlying factors remains one of the most important questions regarding Factor Models. We discuss here a recent work in Model Selection for Factor Models using Path Sampling. We prove a Theorem justifying the regularity conditions which are needed for Path Sampling in Factor Models. We then show that the remaining ingredient, namely MCMC, for calculating the integrand at each point in the path may be seriously flawed, leading to wrong estimates of Bayes Factors. We provide a new method of Path Sampling (with Small Change), PS-SC, that works much better than standard Path Sampling in the sense of estimating the Bayes Factor better and choosing the correct model more often. When the more complex Factor model is true, PS-SC is substantially more accurate. New MCMC diagnostics are provided for these problems in support of our conclusions and recommendations. Some of our ideas for diagnostics and improvement in computation through small changes should apply to other methods of computation of Bayes Factor for model selection.

Biographical Sketch: Ritabrata Dutta currently works as a post-doctoral research scientist at the Finnish Center of Excellence in Computational Inference Research and Helsinki Institute of Information Technology. He graduated from Purdue University with a doctoral degree in Statistics in May 2012. His work concentrates mainly on developing Bayesian methodology for Biological and Language Data. He has been working on computational problems in Model Selection, Topic Models and applications of Bayesian Nonparametric methods. Work presented here is done in Department of Statistics, Purdue University with Professor Jayanta K Ghosh.