

On adaptive Bayesian inference

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Abstract

We study the rate of Bayesian consistency for hierarchical priors consisting of prior weights on a model index set and a prior on a density model for each choice of model index. Ghosal, Lember and Van der Vaart [2] have obtained general in-probability theorems on the rate of convergence of the resulting posterior distributions. We extend their results to almost sure assertions. As an application we study log spline densities with a finite number of models and obtain that the Bayes procedure achieves the optimal minimax rate $n^{-\gamma/(2\gamma+1)}$ of convergence if the true density of the observations belongs to the Hölder space $C^\gamma[0,1]$. This strengthens a result in [1; 2]. We also study consistency of posterior distributions of the model index and give conditions ensuring that the posterior distributions concentrate their masses near the index of the best model.

AMS 2000 subject classifications: Primary 62G07, 62G20; secondary 62C10.

Keywords: Adaptation, rate of convergence, posterior distribution, density function, log spline density.



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References

- [1] Ghosal, S., Lember, J. and van der Vaart, A. W. (2003). On Bayesian adaptation. *Acta Applicandae Mathematicae*, 79, 165–175. [MR2021886](#)
- [2] Ghosal, S., Lember, J. and van der Vaart, A. W. (2008). Nonparametric Bayesian model selection and averaging. *Electronic J. Statist.* 2, 63–89. [MR2386086](#)
- [3] Ghosal, S., Ghosh, J. K. and van der Vaart, A. W. (2000). Convergence rates of posterior distributions. *Ann. Statist.* 28, 500–531. [MR1790007](#)
- [4] Huang, T. M. (2004). Convergence rates for posterior distributions and adaptive estimation. *Ann. Statist.* 32, 1556–1593. [MR2089134](#)
- [5] Lember, J. and van der Vaart, A. W. (2007). On universal Bayesian adaptation. *Statistics and Decisions.* 25, 127–152. [MR2388859](#)
- [6] Shen, X. and Wasserman, L. (2001). Rates of convergence of posterior distributions. *Ann. Statist.* 29, 687–714. [MR1865337](#)
- [7] Stone, C. J. (1990). Large-sample inference for log-spline models. *Ann. Statist.* 18, 717–741. [MR1056333](#)
- [8] Walker, S. G. (2004). New approaches to Bayesian consistency. *Ann. Statist.* 32, 2028–2043. [MR2102501](#)
- [9] Xing, Y. (2008). Convergence rates of nonparametric posterior distributions.

available at www.arxiv.org: 0804.2733.

[10] Xing, Y. and Ranney, B. (2008). Sufficient conditions for Bayesian consistency. (Preprint).

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