

Asymptotic behaviour of empirical Bayes posteriors

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In Bayesian nonparametrics it is common to consider a family of prior distribution indexed by some hyper parameters. The best choice of the prior out of this collection crucially depends on certain characteristics (e.g. smoothness, sparseness,...) of the unknown functional parameter of interest, which are usually not available. Therefore in practice it is common to apply data dependent choices for the hyper-parameters.

Arguably, the maximum marginal likelihood empirical Bayes method is one of the most well-known data-dependent Bayesian procedure. The frequentist behaviour of this method was investigated only in a few papers and mostly in specific models. Our aim is to investigate the performance of this method in a general nonparametric framework.

We provide a general theorem describing the asymptotic behaviour of the empirical Bayes posterior distribution under “standard” and “natural” assumptions. Then we apply the main theorem for various models (Gaussian white noise model, nonparametric regression, density function estimation) and families of prior distributions, recovering some of the existing results in the literature, along side with new ones.

This is a joint work with Judith Rousseau.