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Abstract:

Statistical inference on infinite-dimensional parameters in Bayesian framework is investigated. The main contribution of our work is to demonstrate that nonparametric Bernstein-von Mises theorem can be established in a very general class of nonparametric regression models under a novel tuning prior (that is indexed by a non-random hyper-parameter). Surprisingly, this type of prior connects two important classes of statistical methods: nonparametric Bayes and smoothing spline at a fundamental level. The association with smoothing spline greatly facilitates both theoretical analysis and practical implementation for nonparametric Bayesian inference. For example, we can select a proper tuning prior, under which global/local credible sets are frequentist valid, through generalized cross validation. A collection of probabilistic tools such as Cameron-Martin theorem and Gaussian correlation inequality are employed in this work.