Posterior concentration rates for Bayesian high-dimensional sparse additive models

In the last decades, many publications have investigated the asymptotic properties of Bayesian posterior distributions in nonparametric and high-dimensional models from a frequentist point of view. Posterior concentration rates have been established for many different models and many different priors.

A popular approach to establish that the posterior concentrates around the true parameter at a certain rate is the Kullback-Leibler and testing strategy (see Rousseau, 2016). Song and Liang (2017) apply the Kullback-Leibler and testing strategy in the context of sparse high-dimensional linear regression. They derive sufficient conditions for the prior and the model such that the posterior contracts around the true parameter at near-optimal rate. Bai et al. (2020) introduce the spike-and-slab group lasso (SSGL) and extend the concentration results of Song and Liang (2017) to sparse high-dimensional additive models.

The main goals of this master's thesis are to familiarize oneself with the general theory of posterior concentration rates and the Kullback-Leibler and testing strategy, to give a detailed explanation of the asymptotic theory of Bai et al. (2020) in the context of additive models and to discuss possible extensions of their theory.

References:

Rousseau, Judith. "On the frequentist properties of Bayesian nonparametric methods." *Annual Review of Statistics and Its Application* 3 (2016): 211-231. https://www.annualreviews.org/doi/abs/10.1146/annurev-statistics-041715-033523

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