Department of Decision Sciences
Statistics Seminar

Rates of contraction of posterior distributions with product priors: beyond Gaussianity

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Abstract

We will discuss the concentration properties of posterior distributions arising in nonparametric settings, from a family of product priors.
In particular, we will focus on a family of product priors with tails that are between exponential and Gaussian. Our motivation for moving from Gaussian tails towards exponential ones, is that the heavier tails promote sparsity (in the MAP estimator at least) which is often desirable in applications.
We will study posterior contraction rates, that is we will assume that the observations are generated from a fixed underlying value of the unknown, and will measure the concentration of the posterior distribution on this underlying value in the infinitely informative data limit.
We will start with a short discussion on sparsity promoting priors in nonparametric settings. We will proceed with an overview of the general posterior contraction theory, where general here refers to general models and general priors.
Then we will recall a contraction result for general models for Gaussian process priors due to van der Vaart and van Zanten. We will then define a family of product measures, which we will call p-exponential measures and will study their concentration properties. Building on these properties as well as on the Gaussian contraction result, we will present a new contraction result for general models for p-exponential priors. Finally, we will apply our contraction result to obtain rates of posterior contraction in the white noise model with ℓ_2-loss, as well as in a density estimation setting with ℓ_∞-loss.

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