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Adaptive Priors based on Splines with Random Knots

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Splines are useful building blocks when constructing priors on nonparametric models indexed by functions. Recently it has been established in the literature that hierarchical priors based on splines with a random number of equally spaced knots and random coefficients in the B-spline basis corresponding to those knots lead, under certain conditions, to adaptive posterior contraction rates, over certain smoothness functional classes. In this paper we extend these results for when the location of the knots is also endowed with a prior. This has already been a common practice in MCMC applications, where the resulting posterior is expected to be more "spatially adaptive", but a theoretical basis in terms of adaptive contraction rates was missing. Under some mild assumptions, we establish a result that provides sufficient conditions for adaptive contraction rates in a range of models.

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