Mathematics > Statistics Theory

On adaptive posterior concentration rates

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We investigate the problem of deriving posterior concentration rates under different loss functions in nonparametric Bayes. We first provide a lower bound on posterior coverages of shrinking neighbourhoods. This lower bound relates the metric or loss under which the shrinking neighbourhood is considered, and an intrinsic (pre)-metric linked to frequentist separation rates. The result sheds some light on proof strategies to derive posterior concentration rates. In the context of the Gaussian white noise model, we construct feasible priors based on a spike and slab procedure reminiscent of wavelet thresholding that achieve adaptive rates of contraction under L^2 or L^∞ metrics when the underlying parameter belongs to a collection of H\"older balls and that moreover achieve our lower bound. We also discuss some consequences on the asymptotic behaviour of posterior credible balls. Our results are appended with an upper bound for the contraction rate under an arbitrary loss in a generic regular experiment. The upper bound is attained for certain sieve priors and enables in particular to extend our adaptation results to the model of density estimation.

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