21 Default model selection with non-local priors

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We aim to develop default Bayes approaches that remain effective in high-dimensional and non-standard problems. A recurrent theme is to induce parsimony, as this helps simultaneously to explain the studied phenomenon in an easier manner and improve prediction accuracy. Although the Bayesian model selection paradigm automatically induces some parsimony, we recently showed that the extent to which parsimony is induced is insufficient in high dimensions, e.g. posterior probabilities in variable selection failing to converge and spurious parameters being incorporated into the model. We investigate the use of non-local priors (NLPs), a family shown to be a necessary condition to achieve consistency of posterior probabilities (hence parsimony). We illustrate that, with a straightforward incorporation of the model separation principle into our favourite Bayesian formulation, we may improve statistical inference at a negligible computational effort. We also illustrate that with a bit more work NLPs may in fact reduce computational costs by an order of magnitude. Beyond foundational considerations, we show some practical implications such as parameter estimation, flexible residual models or mixture models.