Fully Bayesian variable selection using g-priors

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Abstract. Implementing Bayesian variable selection for linear Gaussian regression models in high dimension data sets is of current interest in many fields. In the commonly used g-priors setup, elicitation of the constant g is central since it has a clear influence on variable selection. We propose a novel perspective on two fronts. Firstly, within a fully Bayesian approach, we present a modified prior for g which is derived from Jeffreys' rule, retains consistency properties and avoids the specification of any hyperparameter. Secondly, we develop an accompanying search algorithm, based on tailoring ideas of Evolutionary Monte Carlo, and designed to work equally well when $n > p$ or under the "large p, small n" paradigm. The methodology is illustrated and compared with a recently proposed search algorithm in an extensive simulation study.

Keywords: Consistency; Evolutionary Monte Carlo; Fast Scan Metropolis-Hastings schemes; g-priors; Linear Gaussian regression models; Truncated Jeffreys' prior; Variable selection.

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