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Editorial introduction

This special issue of *Statistica Neerlandica* deals with a broad range of issues connected to Bayesian Model Selection. All the papers were presented and discussed at a workshop on Bayesian Model Selection held in July 2004 in Utrecht, The Netherlands. This workshop was financially supported by NWO, the Netherlands Organisation for Scientific Research (number 460-03-035).

In this volume a number of topics can be distinguished. In some papers the focus is on applications of Bayesian model selection and Bayes factors in specific types of models. The paper by Berger and Molina, focuses on Bayesian model selection for the variable selection problem in large model spaces. A path-based search algorithm is presented as well as the corresponding Bayes factors induced from pairwise Bayes factors and the 'chain rule'. The paper by Klugkist, Kato and Hoijtink discusses Bayesian model selection for models that are specified using inequality constraints. They show that for these models a so-called encompassing prior can be defined such that the model selection is virtually independent of the encompassing prior. Zijlstra, Van Duijn and Snijders apply Bayesian model selection to the p_2 model for directed graphs, a model developed in the context of social network analysis. In this paper an empirical study is made of an approximation of Bayes factors, in an example dealing with networks of high school pupils. Van der Linde provides an information theoretic review of some criteria for posterior predictive model assessment in variable selection problems. In particular the posterior predictive entropy is related to the target yielding DIC and modifications thereof.

Two papers focus merely on the estimation of marginal likelihoods. In the paper by Chen the proposed estimates use only a *single* Markov Chain Monte Carlo (MCMC) output from the joint posterior distribution and it does not require the specific structure of the form of the MCMC sampling algorithm which is used to generate the MCMC sample to be known. Chib and Jeliazkov describe a method for estimating the marginal likelihood when simulation from the posterior distribution of the model parameters is by the accept–reject Metropolis–Hastings (ARMH) algorithm.

Finally, three papers deal with Bayesian inference using p values in null hypothesis testing. In the paper by Galindo-Garre and Vermunt classical (asymptotic) p values are compared with bootstrap and posterior predictive p values for inequality constrained log–linear models. The paper by Maris shows that the classical posterior predictive p value may be inadequate. An alternative approach is presented, which uses the marginal posterior instead of the null posterior of the nuisance parameters. Fox and Glas present Bayesian modification indices that provide information for the process of model evaluation and model modification. In an example dealing with an

item response theory model, they investigated how violations to multi-parameter models can be evaluated in a Bayesian framework. With this approach many model violations for all items can be assessed without complicated and time consuming computations.

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