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Prior-free Inference for Objective Bayesian Analysis and Model Selection

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Abstract: A new approach to Bayesian inference, named the *prior-free inference*, is introduced for developing objective Bayesian analysis based on information-theoretic approach. This new approach is essentially a Bayesian method but it does not depend on a prior distribution for unknown parameters. Thus, this approach not only has the advantages of the Bayesian approach but also can avoid the difficulty, the traditional Bayesian approach encounters due to a lack of prior information. Several examples are illustrated to show the procedure and the performance of the prior-free inference. A new information criterion, named *prior-free information criterion* (PFIC), is introduced as an extension of the procedure of the prior-free inference. Then, minimum PFIC method for model selection is developed based on the use of PFIC. Simulation results show that the minimum PFIC method performs very well.

Keywords: *Non-informative priors; prior-free inference; objective Bayesian analysis; model selection; information criterion.*

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