

# Monte Carlo estimation techniques for model evaluation and criticism in Bayesian hierarchical models

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Especially in an epidemiological context, but also in many other fields like economics or meteorology, statistical models are used to predict future observations. Model comparison and model criticism should ideally be based on such probabilistic predictions, taking into account not only the point prediction, but also the statistical uncertainty associated with it. In a Bayesian context, different scoring rules can be calculated to evaluate probabilistic forecasts. There are also useful tools to perform predictive model criticism, e.g. the calculation of PIT (probability integral transform) values.

In this talk we will generally describe such Bayesian methods for quantitative assessment of out-of-sample predictions for longitudinal data. Multivariate extensions of model comparison and criticism tools will be discussed. We will show possibilities to estimate these measures using Markov chain Monte Carlo techniques. The performance of these quantities for longitudinal data sets and Bayesian hierarchical models will be demonstrated in some illustrative examples.