



## Retrospective Markov chain Monte Carlo methods for Dirichlet process hierarchical model

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Inference for Dirichlet process hierarchical models is typically performed using Markov chain Monte Carlo methods, which can be roughly categorised into marginal and conditional methods. The former integrate out analytically the infinite-dimensional component of the hierarchical model and sample from the marginal distribution of the remaining variables using the Gibbs sampler. Conditional methods impute the Dirichlet process and update it as a component of the Gibbs sampler. Since this requires imputation of an infinite-dimensional process, implementation of the conditional method has relied on finite approximations. In this paper we show how to avoid such approximations by designing two novel Markov chain Monte Carlo algorithms which sample from the exact posterior distribution of quantities of interest. The approximations are avoided by the new technique of retrospective sampling. We also show how the algorithms can obtain samples from functionals of the Dirichlet process. The marginal and the conditional methods are compared and a careful simulation study is included, which involves a non-conjugate model, different datasets and prior specifications.

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