Scalable Rejection Sampling for Bayesian Hierarchical Models

Michael Braun
Cox School of Business
Southern Methodist University
Dallas, TX 75275
braunm@smu.edu

Paul Damien
McCombs School of Business
University of Texas at Austin
Austin, TX 78712
paul.damien@mccombs.utexas.edu

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Abstract

Bayesian hierarchical modeling is a popular approach to capturing unobserved heterogeneity across individual units. However, standard estimation methods such as Markov chain Monte Carlo (MCMC) can be impracticable for modeling outcomes from a large number of units. We develop a new method to sample from posterior distributions of Bayesian models, without using MCMC. Samples are independent, so they can be collected in parallel, and we do not need to be concerned with issues like chain convergence and autocorrelation. The algorithm is scalable under the weak assumption that individual units are conditionally independent, making it applicable for large datasets. It can also be used to compute marginal likelihoods.