

PARTIAL ORDERING OF INHOMOGENEOUS MARKOV CHAINS WITH APPLICATIONS TO MARKOV CHAIN MONTE CARLO METHODS

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Abstract

In this paper, we study the asymptotic variance of sample path averages for inhomogeneous Markov chains that evolve alternatingly according to two different π -reversible Markov transition kernels. More specifically, we define a partial ordering over the pairs of π -reversible Markov kernels, which allows us to compare directly the asymptotic variances for the inhomogeneous Markov chains associated with each pair. As an important application we use this result for comparing different data-augmentation-type Metropolis-Hastings algorithms. In particular, we compare some pseudo-marginal algorithms and propose a novel exact algorithm, referred to as the random refreshment algorithm, which is more efficient, in terms of asymptotic variance, than the Grouped Independence Metropolis Hastings (GIMH) algorithm and has a computational complexity that does not exceed that of the Monte Carlo Within Metropolis (MCWM) algorithm. Finally, we provide a theoretical justification of the Carlin and Chib algorithm used in model selection.