

Metropolis–Hastings Algorithms with acceptance ratios of nearly 1

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Abstract We develop the results on polynomial ergodicity of Markov chains and apply to the Metropolis–Hastings algorithms based on a Langevin diffusion. When a prescribed distribution p has heavy tails, the Metropolis–Hastings algorithms based on a Langevin diffusion do not converge to p at any geometric rate. However, those Langevin based algorithms behave like the diffusion itself in the tail area, and using this fact, we provide sufficient conditions of a polynomial rate convergence. By the feature in the tail area, our results can be applied to a large class of distributions to which p belongs. Then, we show that the convergence rate can be improved by a transformation. We also prove central limit theorems for those algorithms.

Keywords Metropolis–Hastings algorithm · Polynomial ergodicity · Langevin diffusion · Metropolis adjusted Langevin algorithm