Multilevel Markov Chain Monte Carlo Methods with Applications in Subsurface Flow

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ABSTRACT

We address the prohibitively large cost of Markov chain Monte Carlo for large-scale PDE applications with high dimensional parameter spaces. We propose a new multilevel Metropolis-Hastings algorithm, and give an abstract theorem on its cost. For a typical model problem in subsurface flow, we then provide a detailed analysis of the assumptions in the theorem and show gains of at least one order in the ε-cost over standard Metropolis-Hastings both theoretically and numerically.