Abstract

Markov Chain Monte Carlo (MCMC) is a class of methods for the simulation of stochastic processes having probability densities known up to a constant of proportionality. MCMC samples from a probability distribution by constructing a Markov chain that has the desired distribution as the equilibrium distribution. The states of the simulated chain after selection are then used as a sample of the desired distribution. This thesis investigates the MCMC related algorithms, proof of convergence and applications, especially examining one adaptive MCMC method.

The first part reviews some important concepts in the topic of Markov chains as well as two common MCMC algorithms, namely the Metropolis-Hasting and Gibbs sampling.

The second part begins with a brief review of K-copy Metropolis-Hastings algorithm, explaining its intuition and the relationship between K-copy format and single copy format.

Then I prove step by step that K-copy Metropolis-Hastening algorithm will eventually converge.

Lastly, multiple examples are constructed to illustrate further properties of the adaptive MCMC method mentioned in the paper.