"Markov Chain Monte Carlo applied to the study of neuronal interactions based on experimental measurements"

The main goal of this work was propose a method to estimated the graph which best represents the interaction between a set of neurons whose activity were experimentally measured. In principle, given the experimental data one could calculate the posterior probability for any possible graph of a given set. However, the amount of possible graphs makes this procedure unfeasible (for a set of only 20 neurons there are $2^{190} \sim O(10^{57})$ possible undirected graphs). Therefore, we adopt a simple probabilistic model based on a two-dimensional Ising model, and a Markov Chain Monte Carlo (MCMC) over a graph space has been used to obtain the maximum likelihood estimation for the model. The proposed methodology was then applied to experimental data containing recorded spikes of individual neurons over time [1]. I would like to discuss the key ideas used in the implementation of a very efficient algorithm for a MCMC over graph space.

[1] S. Ribeiro et al. Frontiers in Neuroscience 1(1), 43-55 (2007).