MACQUARIE UNIVERSITY
DEPARTMENT OF MATHEMATICS AND STATISTICS
SEMINAR SERIES

Speaker: Dr Rachel Wang, School of Mathematics and Statistics, The University of Sydney
Date: Wednesday 24 October 2018, Time 2-3pm
Venue: Room 803, 12 Wally's Walk

Title: Metropolis-Hastings MCMC with dual mini-batches

Abstract:
For many decades Markov chain Monte Carlo (MCMC) methods have been the main workhorse of Bayesian inference. However, traditional MCMC algorithms are computationally intensive. In particular, the Metropolis-Hastings (MH) algorithm requires passing over the entire dataset to evaluate the likelihood ratio in each iteration. We propose a general framework for performing MH-MCMC using two mini-batches (MHDB) of the whole dataset each time and show that this gives rise to approximately a tempered stationary distribution. We prove that MHDB preserves the modes of the original target distribution and derive an error bound on the approximation for a general class of models including mixtures of exponential family distributions, linear binary classification and regression. To further extend the utility of the algorithm to high dimensional settings, we construct a proposal with forward and reverse moves using stochastic gradient and show that the construction leads to reasonable acceptance probabilities. We demonstrate the performance of our algorithm in neural network applications and show that compared with popular optimisation methods, our method is more robust to the choice of learning rate and improves testing accuracy.

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