

Merging Markov Chain Monte Carlo Subposteriors through Gaussian Process Approximation

Abstract. Markov chain Monte Carlo (MCMC) algorithms have become powerful tools for Bayesian inference. However, they do not scale well to large-data problems. Divide-and-conquer strategies, which split the data into batches and, for each batch, run independent MCMC algorithms targeting the corresponding subposterior, can spread the computational burden across a number of separate workers. The challenge with such strategies is in recombining the subposteriors to approximate the full posterior. By creating a Gaussian-process approximation for each log-subposterior density we create a tractable approximation for the full posterior. This approximation is exploited through three methodologies: firstly a Hamiltonian Monte Carlo algorithm targeting the expectation of the posterior density provides a sample from an approximation to the posterior; secondly, evaluating the true posterior at the sampled points leads to an importance sampler that, asymptotically, targets the true posterior expectations; finally, an alternative importance sampler uses the full Gaussian-process distribution of the approximation to the log-posterior density to reweight any initial sample and provide both an estimate of the posterior expectation and a measure of the uncertainty in it.

Biography. Dr. Svetlana Amirova completed B.Sc and M.Sc with distinction in Applied Mathematics and Physics from Moscow Institute of Physics and Technology (State University, Moscow Russia) in 2005, then obtained PhD in applied Mathematics from Keele University UK in 2008. After that she was appointed as a research assistant at Engineering Department of University of Leicester UK and then subsequently got position of research associate at Mathematical Department of University of Exeter UK. After short affiliation as a postdoctoral research fellow at Engelhardt Institute of Molecular Biology (Russian Academy of Sciences, Moscow) she obtained a Visiting Assistant Professor position at Mathematical Department of University of Texas at El Paso TX USA. Currently she is affiliated with the Department of Mathematics at East Carolina University.



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Friday December 2, 2016
1:00pm – 1:50pm
Bate Building, Room 1001

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