# Perturbation Bounds for Monte Carlo within Metropolis via Restricted Approximations

Abstract:

The Monte Carlo within Metropolis (MCwM) algorithm, interpreted as a perturbed Metropolis-Hastings (MH) algorithm, provides a simple approach for approximate sampling when the target distribution is doubly-intractable or contains latent variables. We assume that the associated unperturbed Markov chain is geometrically ergodic and show explicit estimates of the difference between the n-th step distributions of the perturbed MCwM and the unperturbed MH chains. These bounds are based on novel perturbation results for Markov chains which are of interest beyond the MCwM setting. To apply the bounds, we need to control the difference between the transition probabilities of the two Markov chains, at least in the center of the state-space. Moreover, we need to verify stability of the perturbed chain, either through a Lyapunov condition, or by restricting it to the center of the state space. The talk is based on joint work with Felipe Medina-Aguayo and Daniel Rudolf.