1157-35-355 **Yulong Lu***, Department of Mathematics, Duke University, Durham, NC 27705. *Accelerating Langevin sampling with birth-death processes.*

A fundamental problem in Bayesian inference and statistical machine learning is to efficiently sample from multimodal distributions. Due to metastability, multimodal distributions are difficult to sample using standard Markov chain Monte Carlo methods, such as the algorithms based on Langevin diffusion. We propose a new particle algorithm based on a birth-death mechanism to accelerate the mixing of Langevin diffusion. Our algorithm is motivated by its mean field partial differential equation (PDE), which is a Fokker-Planck equation supplemented by a nonlocal birth-death term. This PDE can be viewed as a gradient flow of the Kullback-Leibler divergence with respect to the Wasserstein-Fisher-Rao metric. We prove that under some assumptions the asymptotic convergence rate of the nonlocal PDE is independent of the potential barrier, in contrast to the exponential dependence in the case of the Langevin diffusion. Some analytical and numerical examples demonstrate that the proposed particle algorithm far outperforms the Langevin diffusion (Received February 02, 2020)