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Stochastic Normalizing Flows for lattice gauge theory

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Non-equilibrium Markov Chain Monte Carlo simulations based on Jarzynski's equality represent a powerful method to compute differences in free energy and also to sample from a target probability distribution without the need to thermalize the system under study.
If the target distribution suffers from long autocorrelation times, they provide a promising candidate to mitigate critical slowing down. These out-of-equilibrium simulations can be naturally combined with Normalizing Flows into a recently-developed architecture called Stochastic Normalizing Flows (SNF). In this talk we first outline our implementation of SNFs in the four-dimensional $SU(3)$ lattice gauge theory and then we focus on their promising scaling with the volume, both in terms of training and sampling. We discuss future systematic improvements and how a mitigation of topological freezing in simulations of lattice gauge theories at large volumes can be realistically achieved in the short term.

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