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Scaling Normalizing Flows for Lattice Gauge Theories

In varying action parameters in a lattice gauge theory towards a critical point, such as the continuum limit, generic Markov chain Monte Carlo algorithms incur dramatic sampling penalties. Proof-of-principle studies in applying flow-based generative models to lattice gauge theories have suggested that such methods can mitigate against critical slowing down and topological freezing. There remains a question in how normalizing flows perform in state-of-the-art calculations. In this work, we aim to quantify how well these algorithms scale as we increase the number of degrees of freedom in the system. In particular, we study the scaling behaviour of flows for SU(2) and SU(3) gauge theories in two and four spacetime dimensions while also incorporating a variety of architectural improvements to enhance sampling efficiency.

AI keywords

Normalizing Flows; Variational Inference; Training models at scale

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