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Localized machine learned flow maps to accelerate Markov Chain Monte Carlo simulations

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State-of-the-art simulations of discrete gauge theories are based on Markov chains with local changes in the field space, which however at very fine lattice spacings are notoriously difficult due to separated topological sectors of the gauge field. Hybrid Monte Carlo (HMC) algorithms, which are very efficient at coarser lattice spacings, suffer from increasing autocorrelation times.

An approach, which can overcome long autocorrelation times, is based on trivializing maps, where a proposal of a new gauge configuration can be generated by mapping a configuration from a trivial space to the target one, distributed via the associated Boltzmann factor.

I will discuss applications to the 2D Schwinger model and strategies how to utilize the flow in large scale applications. One possible way is to use the locality of the theory and only update local domains. By defining local maps, defects can be mapped to the target space, which are able to unfreeze the topological charge in the simulation.

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