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Properties and uses of approximate trivializing maps in lattice QCD

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While approximations of trivializing field transformations for lattice path integrals were considered already by early practitioners, more recent efforts aimed at ergodicity restoration and thermodynamic integration formulate trivialization as a variational generative modeling problem. This enables the application of modern machine learning algorithms for optimization over expressive parametric function classes, such as deep neural networks. After a brief review of the historical origins and current status of this research program, I will focus on spectral coupling flows as a particular parameterization of gauge-covariant field diffeomorphisms. The concept will be introduced by explicitly constructing a systematically improvable solution for SU(3) gauge theory in (1+1)d, followed by a presentation of recent results in (3+1)d. Specifically, I will discuss the application of machine-learned flow maps to parallel tempering of defects for the mitigation of topological freezing. To close the talk, I will comment on pressing issues such as the incorporation of dynamical fermions, and provide an outlook on future work.

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