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Applications of flow models to the generation of correlated lattice QCD ensembles

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Machine-learned normalizing flows can be used in the context of lattice quantum field theory to generate statistically correlated ensembles of lattice gauge fields at different action parameters. In this talk, we show examples on how these correlations can be exploited for variance reduction in the computation of observables. Three different proof-of-concept applications are presented: continuum limits of gauge theories, the mass dependence of QCD observables, and hadronic matrix elements based on the Feynman-Hellmann approach. In all three cases, statistical uncertainties are significantly reduced when machine-learned flows are incorporated as compared with the same calculations performed with uncorrelated ensembles or direct reweighting.

Primary author: ROMERO-LOPEZ, Fernando (MIT)

Presenter: ROMERO-LOPEZ, Fernando (MIT)

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