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Using AI for Efficient Statistical Inference of Lattice Correlators Across Mass Parameters

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We study an application of supervised learning to infer two-point lattice correlation functions at one input mass from correlator data computed at a different target mass. Learning across the mass parameters could potentially reduce the cost of expensive calculations involved in light Dirac inversions, which can be a computational bottleneck for performing simulations of quantum chromodynamics on the lattice. Leveraging meson two-point functions computed on an ensemble of gauge configurations generated by the MILC collaboration, we use a simple method for separating the data into training and correction samples that avoids the need for intensive retraining or bootstrapping to quantify uncertainties on our observables of interest. We employ a variety of machine learning models, including decision tree-based models and neural networks, to predict uncomputed correlators at the target mass. Additionally, we apply a simple ratio method which we compare and combine with the machine learning models to benchmark our inference methods. Special attention is given to validating the models we use.

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