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B7: Machine Learning Approximated Nucleon Matrix Elements with Domain Wall Fermions

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Nucleon matrix elements are some of the most expensive quantities to calculate within the framework of lattice QCD simulations, as they involve the computation of nucleon three-point correlation functions. Nucleon three-point correlation functions need additional quark propagators compared to two-point correlation functions, and suffer from exponentially worsening signal-to-noise ratios as quark masses approach the physical limit. Here we discuss the machine learning assisted calculation of nucleon matrix elements following a method by B. Yoon et al., which approximates nucleon three-point correlation functions using nucleon two-point correlation functions as input. We will show results for the machine-learning approximated nucleon three-point correlation functions with 2+1 flavor domain wall fermions, and discuss potential improvements to the machine learning architecture. Furthermore, we will discuss a detailed error analysis to fully represent different sources of uncertainties introduced in the machine learning method.

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