

Machine learning study on the Dirac eigenvalue spectrum of staggered quarks

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We study chirality of staggered quarks on the Dirac eigenvalue spectrum using machine learning technique. As a result of theoretical research, we expect a characteristic pattern, we call leakage pattern, in the matrix elements of the chirality operator sandwiched between two eigenstates of staggered Dirac operator. Machine learning analysis gives 98.7(34)% accuracy per a single normal gauge configuration for classifying non-zero mode quartets in Dirac eigenvalue spectrum. It confirms that the leakage pattern is universal on normal gauge configurations. We choose the multi-layer perceptron (MLP) method which is one of the deep learning models. It happens to give the best performance in our study. The model's prediction is compared with other models', such as XGboost. Numerical study is done using HYP staggered quarks on the 20^4 lattice in quenched QCD.

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