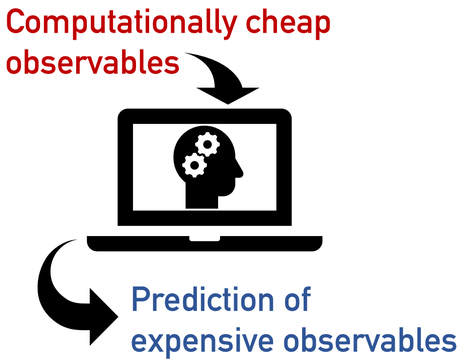
Novel Lattice QCD Calculation Approach using Machine Learning

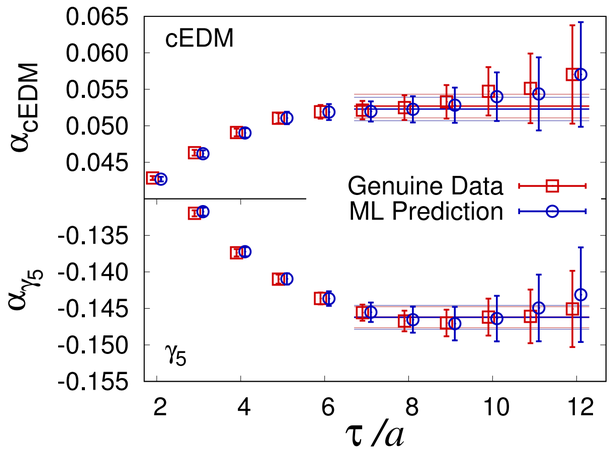
Objectives

- Develop novel lattice QCD (LQCD) calculation approach enhanced with machine learning technique
- Reduce computational cost for LQCD measurements by exploiting correlation between observables on a gauge configuration captured by machine learning algorithms

Impact

- Computationally expensive LQCD measurements can be replaced by computationally cheap machine learning predictions
- Developed algorithms for machine learning prediction error analysis and bias correction are generally applicable to other field of science using machine learning on statistical data





ML prediction of CPV phase

Accomplishments

- Established a LQCD calculation approach predicting unmeasured computationally expensive observables from the measurements of computationally cheap observables
- Developed an error analysis procedure that corrects any possible bias in the machine learning predictions
- Feasibility of the algorithm is successfully demonstrated for nucleon charges and CP violating phase calculations
- B. Yoon, T. Bhattacharya, R. Gupta, arXiv:1807.05971

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