Contribution ID: **26** Type: **not specified**

Interpolation as a means of shift selection in multilevel Monte Carlo with lattice displacements

Monday 15 August 2022 15:10 (40 minutes)

The calculation of disconnected diagram contributions to physical signals is a computationally expensive task in Lattice QCD. To extract the physical signal, the trace of the inverse Lattice Dirac operator, a large sparse matrix, must be stochastically estimated. Because the variance of the stochastic estimator is typically large, variance reduction techniques must be employed. Multilevel Monte Carlo (MLMC) methods reduce the variance of the trace estimator by utilizing a telescoping sequence of estimators. Frequency Splitting is one such method that uses a sequence of inverses of shifted operators to estimate the trace of the inverse lattice Dirac operator, however there is no a priori way to select the shifts that minimize the cost of the multilevel trace estimation. We present a sampling and interpolation scheme
that is able to predict the variances associated with Frequency Splitting under displacements of the underlying space time lattice. The interpolation scheme is able to predict the variances to high accuracy and therefore choose shifts that correspond to an approximate minimum of the cost for the trace estimation. We show that Frequency Splitting with the chosen shifts displays significant speedups over multigrid deflation, and that these shifts can be used for multiple configurations within the same ensemble with no penalty to performance.

Authors: Dr WHYTE, Travis (College of William & Mary); Dr STATHOPOULOS, Andreas (College of William & Mary); Dr ROMERO, Eloy (JLab); Dr ORGINOS, Kostas (College of William & Mary/Jlab)

Presenter: Dr WHYTE, Travis (College of William & Mary)

Session Classification: Stochastic Trace Estimation