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Methods for lattice QCD calculations of hadronic observables using stochastic locality

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Stochastic locality, arising from the mass gap of QCD, allows for independent fluctuations in distant regions of lattice gauge field configurations.
This can be used to increase statistics and, in the extreme case of the master-field approach, obtain an error estimate from a single configuration.
However, spatially-separated samples at moderate distances show residual correlation that needs to be taken into account.
Focusing on hadronic observables, we adapt variance estimation methods for autocorrelated Monte Carlo samples to account for correlated spatially-separated samples.
These techniques can be applied to a wide range of observables, including momentum-projected and position-space correlators, and can be combined with standard blocking and bootstrap or jackknife.
Our numerical studies show that, depending on the observable, an effective integrated correlation volume can be estimated already on moderately large ensembles.

Topical area

Theoretical Developments

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