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Distillation and position-space sampling for local multiquark interpolators

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The distillation method in lattice QCD is a smearing method that uses the eigenvectors of the spatial Laplacian to construct an N-dimensional subspace in which the Dirac operator can be fully inverted. This approach works well for nonlocal operators such as meson-meson or baryon-baryon interpolators. But when studying exotic hadrons we also want to include local multiquark interpolators with four or more quarks to arrive at the correct spectrum. This is computationally expensive within distillation because of the large rank of the involved tensors: the cost scales as N^5 or N^7 for tetraquark or hexaquark interpolators respectively. I will present a position-space sampling method which addresses this issue by computing the momentum projection only over a sparse grid instead of over the full spatial lattice. I will show the efficiency of this method for simple two-point functions. Our first real application is the doubly charmed tetraquark $T_{cc}^{+}(3875)$ observed at LHCb for which I may show spectroscopy results for local tetraquark interpolators in combination with nonlocal meson-meson interpolators using the variational method.

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