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Towards a Renormalization-Group Preconditioned Conjugate Gradient for Domain Wall Fermions

Thursday 6 November 2025 15:30 (20 minutes)

Recent advances such as multigrid and deflation have significantly accelerated Dirac operator solves in lattice QCD. However, the substantial setup costs of these methods have impeded their application in the repeated Dirac inversions required for HMC ensemble generation. Building on earlier work at Columbia University, which showed that renormalization-group (RG) blocked coarse lattices with $a^{-1} = 1$ GeV provide a good approximation of the low-mode structure of Mobius domain wall fermion (MDWF) Dirac operators on $a^{-1} = 2$ GeV lattices, we investigate how to exploit this correspondence in practice. Specifically, we study how filters and Wilson flow on the coarse lattices can be used to control the influence of higher modes in the coarse-fine mapping. Because RG blocking is computationally inexpensive, this approach could provide a way to incorporate multigrid-style acceleration directly into ensemble generation.

Parallel Session (for talks only)

Algorithms and artificial intelligence

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