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State of the art multi-grid algorithms in QUDA

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The era of exascale computing enables the generation of ever-finer gauge configurations, capturing gauge-fermion physics with unprecedented accuracy. This approach to the continuum comes with a super-linear increase in the cost of the iterative Krylov solve of the Dirac fermion operator, the phenomena of critical slowing down. Multi-grid methods are the optimal approach to addressing this crisis of cost. In this talk we describe the state-of-the-art implementations of multigrid algorithms for Wilson-clover, HISQ, and domain wall fermions in the QUDA library for GPUs. This will include a discussion of the unique approaches to multigrid for each fermion formulation.

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