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Review on Quantum Computing for Lattice Field Theory

Monday, 8 August 2022 11:00 (45 minutes)

In this talk, we review recent advances in applying quantum computing to lattice field theory. Quantum technology offers the prospect to efficiently simulate sign-problem afflicted regimes in lattice field theory, such as the presence of topological terms, chemical potentials, and out-of-equilibrium dynamics. First proof-of-concept simulations of Abelian and non-Abelian gauge theories in (1+1)D and (2+1)D have been accomplished, and resource efficient formulations of gauge theories for quantum computations have been proposed. The path towards quantum simulations of (3+1)D particle physics requires many incremental steps, including algorithmic development, hardware improvement, methods for circuit design, as well as error mitigation and correction techniques. After reviewing these requirements and recent advances, we discuss the main challenges and future directions.

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