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Probing Loop Dynamics in 2+1-Dimensional SU(2) Lattice Gauge Theory

Friday 7 November 2025 14:30 (20 minutes)

Simulating the real-time dynamics of non-Abelian lattice gauge theories in more than 1+1 dimensions presents a significant computational challenge. We present an exact diagonalization study of 2+1-dimensional SU(2) lattice gauge theory, leveraging the gauge-invariant Loop-String-Hadron (LSH) framework. By harnessing GPU-based computation, we have successfully pushed the classical simulation frontier to systems of up to 16 plaquettes. This talk will detail our computational strategy and present the first results on the real-time evolution of electric flux loop dynamics within the pure gauge sector. Our work provides crucial benchmarks for near-term tensor network simulators as well as quantum simulators and opens a new avenue for studying fundamental phenomena like thermalization directly from the Hamiltonian perspective in higher dimensions.

Parallel Session (for talks only)

Theoretical developments and applications beyond Standard Model

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