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Three ways of calculating mass spectra for the 2-flavor Schwinger model in the Hamiltonian formalism

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We propose three independent methods to compute the hadron mass spectra of gauge theories in the Hamiltonian formalism. The determination of hadron masses is one of the key issues in QCD, which has been precisely calculated by the Monte Carlo method in the Lagrangian formalism. We confirm that the mass of hadrons can be calculated by examining correlation functions, the one-point function, or the dispersion relation in Hamiltonian formalism. These methods are suitable for quantum computation and tensor network approaches. The methods are demonstrated with the tensor network (DMRG) in the 2-flavor Schwinger model, which shares important properties with QCD. We show that the numerical results are consistent with each other and with the analytic prediction of the bosonization technique. We also discuss their efficiency and potential applications to other models.

Topical area

Quantum Computing and Quantum Information

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