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Real-time scattering processes with continuous-variable quantum computers

Tuesday 25 March 2025 15:30 (20 minutes)

In this talk, I will present a framework for simulating the real-time dynamics of quantum field theories (QFTs) using continuous-variable quantum computing (CVQC). Focusing on (1+1)-dimensional phi4 scalar field theory, the approach employs the Hamiltonian formalism to map the theory onto a spatial lattice, with fields represented as quantum harmonic oscillators. Measurement-based quantum computing techniques enable the implementation of non-Gaussian operations necessary for QFT simulations on CQVC platforms. I will discuss methods for preparing well-defined initial states and evolving them under the interacting phi4 Hamiltonian. Key observables, such as two-point correlation functions, validate the framework against analytical expectations, while scattering simulations provide insights into the effects of mass and coupling strength on field dynamics and energy redistribution. These results highlight the scalability of CVQC for larger lattice systems and its potential for simulating more complex QFTs.

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