Quantum algorithms for Hamiltonian simulation with unbounded operators
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Abstract: Recent years have witnessed tremendous progress in developing and analyzing quantum computing algorithms for quantum dynamics simulation of bounded operators (Hamiltonian simulation). However, many scientific and engineering problems require the efficient treatment of unbounded operators, which frequently arise due to the discretization of differential operators. Such applications include molecular dynamics, electronic structure theory, quantum control and quantum machine learning. We will introduce some recent advances in quantum algorithms for efficient unbounded Hamiltonian simulation, including Trotter type splitting and the quantum highly oscillatory protocol (qHOP) in the interaction picture. The latter yields a surprising superconvergence result for regular potentials. In the end, I will discuss briefly how Hamiltonian simulation techniques can be applied to a quantum learning task achieving optimal scaling. (The talk does not assume a priori knowledge on quantum computing.)

Meet and Greet following the talk in SEO 300 at 4:30 pm