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C4: Algorithms for quantum state preparation in the Schwinger Model

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An important aspect to consider in practical applications of quantum computing is the computational cost of a quantum state preparation. Quantum adiabatic evolution is a possible technique based on the slow time evolution of the Hamiltonian from a simple one to the target one. A different approach is the so-called Rodeo algorithm, where stochastically, and in a recursive manner, all states outside a given energy interval are removed.

We discretize the Schwinger model Hamiltonian with a θ term, using staggered fermions, and compare the convergence properties of the two algorithms. We also study the impact of increasing the step-size in the Trotter evolution, to assess the feasibility of these type of calculations on a real quantum device.

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