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High-order Path Integral Monte Carlo methods for solving strongly correlated fermion problems[1] SIU A. CHIN, Texas A&M Univ — In solving for the ground state of a strongly correlated many-fermion system, the conventional second-order Path Integral Monte Carlo method is plagued with the sign problem. This is due to the large number of anti-symmetric free fermion propagators that are needed to extract the square of the ground state wave function at large imaginary time. In this work, I show that optimized fourth-order Path Integral Monte Carlo methods, which uses no more than 5 free-fermion propagators, in conjunction with the use of the Hamiltonian energy estimator, can yield accurate ground state energies for quantum dots with up to 20 polarized electrons. The correlations are directly built-in and no explicit wave functions are needed.

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