

Understanding Quantum Annealing using projective Monte Carlo algorithms

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Quantum Monte Carlo simulations are emerging as a useful tool to understand the behavior of quantum annealing devices [1, 2] and to shed light on the potential superiority of adiabatic quantum computers compared to classical optimization methods [3].

We investigate the efficiency of projective QMC methods based on the Diffusion Monte Carlo algorithm in solving double-well and multi-well optimization problems, and we compare the DMC algorithm with Path Integral Monte Carlo simulations as well as with the real-time and the imaginary-time dynamics [4].

Furthermore, we implement a DMC algorithm for Quantum Ising models and we show that the DMC tunneling dynamics has the scaling behavior of incoherent quantum tunneling, even in models where PIMC simulations display a pathological slowdown [5].

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