

Abstract Submitted
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Accurate Variational Description of Adiabatic Quantum Optimization GIUSEPPE CARLEO, Theoretische Physik, ETH Zurich, 8093 Zurich, Switzerland, BELA BAUER, Station Q, Microsoft Research, Santa Barbara, CA 93106-6105, USA, MATTHIAS TROYER, Theoretische Physik, ETH Zurich, 8093 Zurich, Switzerland — Adiabatic quantum optimization (AQO) is a quantum computing protocol where a system is driven by a time-dependent Hamiltonian. The initial Hamiltonian has an easily prepared ground-state and the final Hamiltonian encodes some desired optimization problem. An adiabatic time evolution then yields a solution to the optimization problem. Several challenges emerge in the theoretical description of this protocol: on one hand, the exact simulation of quantum dynamics is exponentially complex in the size of the optimization problem. On the other hand, approximate approaches such as tensor network states (TNS) are limited to small instances by the amount of entanglement that can be encoded. I will present here an extension of the time-dependent Variational Monte Carlo approach to problems in AQO. This approach is based on a general class of (Jastrow-Feenberg) entangled states, whose parameters are evolved in time according to a stochastic variational principle. We demonstrate this approach for optimization problems of the Ising spin-glass type. A very good accuracy is achieved when compared to exact time-dependent TNS on small instances. We then apply this approach to larger problems, and discuss the efficiency of the quantum annealing scheme in comparison with its classical counterpart.

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