

Physik-Kolloquium

Dienstag, den 04.11.2014, 16.00 Uhr

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Numerical Studies of the Quantum Adiabatic Algorithm

One of the major ongoing debates on the future of quantum annealers pertains to their robustness against the decohering effects of finite temperature and interactions with the environment. We argue that even in an ideal setting of very low temperatures and in the absence of a decohering environment, quantum annealers may find it challenging to solve optimization problems significantly faster than state-of-the-art heuristic classical algorithms. Here, we study the performance of the quantum adiabatic algorithm (QAA) on a variety of constraint satisfaction problems and a spin glass problem by studying the size dependence of the minimum energy gap during the evolution of the QAA. We do so by employing Quantum Monte Carlo schemes as these allow us to study these problems at much larger scales than exact methods would allow. We find that in all cases a quantum phase transition occurs and the minimum gap decreases exponentially with system size, leading to an exponentially large running time for the QAA. Based on these and other results, we discuss potential modifications to the QAA that may improve the scaling of the minimum gap, leading to faster quantum adiabatic algorithms.

Ort: Hörsaal für Theoretische Physik, Linnéstraße 5

Alle Teilnehmer sind ab 15.30 Uhr zu Kaffee vor dem Hörsaal eingeladen.