Algorithmic breakeven in quantum annealing

Daniel Lidar

Departments of Electrical and Computer Engineering, Chemistry, and Physics, University of Southern California, USA

Abstract

As quantum computing proceeds from perfecting physical qubits towards testing logical qubits and small scale algorithms an urgent question being confronted is how to decide that critical milestones and thresholds have been reached. Typical criteria are gates exceeding the accuracy threshold for fault tolerance logical qubits with higher coherence than the constituent physical qubits and logical gates with higher fidelity than the constituent physical gates. In this talk I will argue in favor of a different criterion I call "quantum algorithmic breakeven" which focuses on demonstrating an algorithmic scaling improvement in an error-corrected setting over the uncorrected setting. I will present evidence that current experiments with commercial quantum annealers have already crossed this threshold. I will also discuss our latest evidence for a "limited quantum speedup" with such devices, and the need to explore alternatives to the traditional setting of adiabatic, "forward" quantum annealing.

References:

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