

Day 1

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Title: Single-Qubit Fidelity Assessment of Quantum Annealing Hardware

Abstract:

As a wide variety of quantum computing platforms become available, methods for assessing and comparing the performance of these devices are of increasing interest and importance. Inspired by the success of single-qubit error rate computations for tracking the progress of gate-based quantum computers, this work proposes a Quantum Annealing Single-qubit Assessment (QASA) protocol for quantifying the performance of individual qubits in quantum annealing computers. The proposed protocol scales to large quantum annealers with thousands of qubits and provides unique insights into the distribution of qubit properties within a particular hardware device. The efficacy of the QASA protocol is demonstrated by analyzing the properties of a D-Wave 2000Q system, revealing unanticipated correlations in the qubit performance of that device. A study repeating the QASA protocol at different annealing times highlights how the method can be utilized to understand the impact of annealing parameters on qubit performance. Overall, the proposed QASA protocol provides a useful tool for assessing the performance of current and emerging quantum annealing devices.