

Quantum Approaches
Speaker Series

A NASA perspective on quantum computing: Algorithmic opportunities and challenges

Abstract

In the last couple of decades, the world has seen several stunning instances of quantum algorithms that provably outperform the best classical algorithms. For most problems, however, it is currently unknown whether quantum algorithms can provide an advantage, and if so how to design quantum algorithms that realize such advantages. Today, classical heuristics are used to solve many of the most challenging computational problems arising in the practical world, algorithms that have been shown to be effective empirically but have not been mathematically proven to outperform other approaches. With the advent of quantum advantage, the ability of current quantum hardware to do certain computations beyond the ability of even that largest supercomputers, we have an unprecedented opportunity to explore heuristic quantum algorithms. The next few years will be exciting as empirical testing of quantum heuristic algorithms becomes more and more feasible. The talk will begin overview of the NASA QuAIL team's ongoing quantum computing investigations, and then focus on both near-term and longer term algorithms for optimization, including distributed algorithms.



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