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# How many qubits do you need, really?

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## Abstract

While quantum computers promise to solve some of the scientifically and commercially valuable problems intractable for classical machines, delivering on this promise will require a large-scale quantum machine integrated with the cloud. Determining how to best navigate the architecture design choices of a large-scale quantum computer that efficiently caters to the performance and quality requirements of practical applications is an open challenge. To this end, we have developed Azure Quantum Resource Estimation, a tool which uses detailed models of the quantum stack to provide resource estimates (such as qubit counts and runtimes) for large-scale algorithms. Understanding the number of qubits required for a quantum program and the differences between qubit technologies allows innovators to prepare and refine their quantum programs to run on future scaled quantum machines and ultimately accelerate their quantum impact. In the talk, we will illustrate the framework that we apply to perform resource estimation and demonstrate how the tool helps to analyze resource requirements for scalable quantum algorithms. You'll leave ready to find out just how many qubits you'll need, really.