

What Can A Small Quantum Computer Do?

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Many have heard of Shor's quantum factoring algorithm which is predicted to be exponentially faster than the best conventional algorithm. However, few know that demonstrating a quantum advantage with Shor's algorithm requires a very large fault-tolerant quantum computer—one that is more than a decade away, if it can be constructed at all. What, then, can be done with a small quantum computer? After reviewing the superconducting qubit technology used at IBM and comparing it to other technologies, I will give a demonstration of a quantum algorithm running on our hardware through the IBM Quantum Experience cloud interface. I will then give examples of the problems that we have solved with a small quantum processor. I will close with a discussion of why fault-tolerant quantum computers are so much larger and more difficult to build.