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Quantum computation with superconducting qubits

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Improvements in the control and coherence of artificial atoms built from superconducting circuits have enabled the development of noisy processors with over 50 qubits, and the exploration of problems addressable by these devices that are intractable to classical computation. In this talk, I shall present a brief summary of superconducting qubit technology at IBM, and highlight some of the outstanding challenges. I shall then discuss results from small-scale demonstrations of algorithms for quantum simulation. These experiments highlight the detrimental effect of decoherence and measurement errors on computations with noisy quantum processors. In this context, I shall introduce “error mitigation” techniques that can extend the computational reach of these noisy processors, without requiring any additional hardware resources.