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How to build a quantum computer with superconducting qubits

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Quantum computing has emerged as a promising paradigm for solving computationally challenging problems. Superconducting qubits have garnered significant attention due to their scalability and potential for achieving fault-tolerant quantum computation. In this project, I discuss the basic theoretical and experimental requirements for creating a quantum computer using superconducting qubits. From the physics of a single qubit and the fabrication of a single Josephson junction to the material and architectural challenges involved in fabricating a full quantum processor. To progress from the current noisy intermediate-scale quantum (NISQ) era to a stage where quantum computing is utilized for solving real-world problems, quantum processors must scale to millions of qubits. This can be achieved through hybrid systems that incorporate technologies beyond superconducting circuits or through the implementation of modular architectures.

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