Introduction to Quantum Computation

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Abstract

Quantum computers show a exponential speedup in certain tasks compared to classical computers. The origin of the speed up lies in the possibility of performing a computational step on a quantum mechanical superposition of multiple input states. In my talk, I will explain the basics of quantum computations starting from qubits and the gate model for computation. As an example of a quantum algorithm, i will present Shor's algorithm which offers exponential speed up in prime-factorization. Furthermore, I will introduce the criteria on a physical system which could by used to implement quantum computation and present a promising field: Quantum computing with topological states in condensed matter.