Quantum Computing Seminar

Introduction to stabilizer formalism

By

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Abstract: In the finite-dimensional regime certain pure quantum states can be completely characterized by maximal abelian (i.e., commuting) subgroups of the Pauli group. These are called stabilizer states and well-known examples include Bell as well as Greenberger, Horne, Zeilinger (GHZ) states. The stabilizer formalism is a subtheory of finite-dimensional quantum mechanics consisting of stabilizer states, Clifford unitaries (i.e., unitaries that map one Pauli operator to another), and measurement of Pauli observables. The ability to fully describe such quantum states in group theoretic terms makes their analysis extremely convenient and they play an important role in quantum information processing and also quantum error correction. A key result for our purposes in this seminar is the celebrated Gottesman-Knill theorem which establishes that any quantum circuit built out of stabilizer states, Clifford unitaries, and Pauli measurements (called stabilizer circuits) can be efficiently simulated on a classical computer.
References: arXiv:quant-ph/9807006
References: Nielsen/Chuang: QCQI (Ch. 10)

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Place: SA141 - Mathematics Seminar Room & ZOOM
To request the event link, please send a message to selman.ipek@bilkent.edu.tr