EECS 498: Quantum Computing for the Computer Scientist

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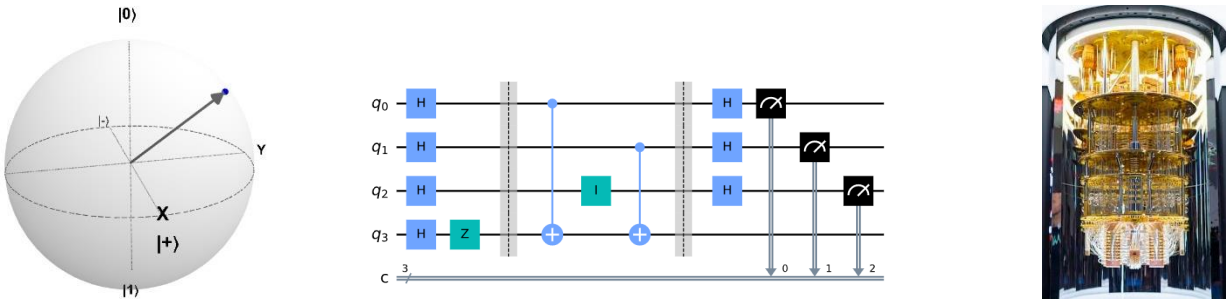

Left to right: visualization of a quantum bit (qubit) - implementation of a quantum algorithm using Qiskit - Q System One, IBM's first commercial quantum computer

Course Overview

Quantum computing, should current technical barriers be overcome, makes bold promises to revolutionize key applications including cryptography, machine learning, and computational physics. This course will explore the potential impact and limitations of this paradigm shift from a computer science perspective. Lectures will cover the bare physics and mathematics needed to investigate how each layer of the computing stack (logic, system architecture, algorithm, and application design) is impacted. Labs and programming assignments will provide students a hands-on approach towards writing quantum programs, simulating their execution, deploying them to real quantum hardware available on the cloud, and analyzing their performance.

Prerequisites

EECS 203, 281, 370

Prior experience with Python and linear algebra is helpful but not required

No physics background is required

List of Topics

Linear algebra primer, postulates of quantum mechanics, quantum logic and circuit design, quantum algorithms and computational complexity, post-quantum cryptography, quantum machine learning, ion trap and superconducting architectures, error correction