Learn Quantum Computing: QuBes

Summer 2021

Sunday 2:00 - 3:30 pm EST/11:00 am - 12:30 pm PST
Zoom Link
Password: quantum

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Course Webpage URL

Website

Course Goals

This course is a fun introduction to quantum computing. It aims to rigorously cover the minimal math background necessary to understand several fascinating topics in quantum computing. The course is targeted for juniors and seniors in high school interested in math and science, with at least a high school algebra background (no calculus needed).

What will you learn

- Basics of quantum mechanics, linear algebra and classical computing
- Qubits, quantum gates, and programming quantum algorithms
- Superposition, interference, and entanglement.
- Some simple and fascinating phenomena in quantum computing.

Python

While a scientific program language is not a prerequisite for this course, we will be using the language Python in this course. Any and all use of the programming language will be explained during the course of the class. Proficiency in Python is not expected, nor required, to have successful completion of the course.

Modules

Number	Subject	Date
00	Introduction	June 27
01	Quantum Mechanics	June 27
02	Classical Computing	July 4
03	Math background: Complex Numbers	July 11
04	Math background: Linear Algebra	July 18
05	Qubit and Quantum Gates	July 25
06	Writing Quantum Programs	August 1
07	Multi-Qubit Gates	August 8
08	Deutsch algorithm	August 15
09	Non-local Games	August 22
10	Quantum Algorithms Discussion	August 29

This course is an approximately ten week, in-depth look into not only quantum computing, but the math and physics behind quantum computing. The week of each module is subject to change based on student's progress and overall comfort with the material, this table just serves as a quick reference.

Exercises

All of the modules have exercises and problems that help supplement the pre-recorded video lectures and live zoom lectures. The exercises correspond to that week's lecture material and are meant to help students grasp abstract, complex ideas more concretely. Questions while working on these exercises are mostly to be asked in office hours, while the solutions will be presented in class the week after they are opened.

Office Hours

Since the students enrolled in this course are high school students, the idea of office hours may be foreign. The overarching idea of office hours is a time where you get to interact with your teacher/teaching assistant in a more informal environment. The purpose of this interaction is ask questions and clarify details about the lecture material, as well as the QuBes exercises. Office hours are completely voluntary, even in college, but are highly recommended, especially if you are having some trouble understanding the material.