Womanium Quantum Hackathon 2022

Quantum-Hardware-Education-Challenge---QWorld

Quantum Mechanics for Computer Scientists

Contents:

Unit 4: <u>Quantum Circuits</u>

i) Quantum Algorithms
ii) Single Qubit Operations
iii) Controlled Operations
iv) Measurement
v) Universal Quantum Gates
    a. Two-level unitary gates are universal
    b. Single qubit and CNOT gates are universal
    c. A discrete set of universal operations
    d. Approximating arbitrary unitary gates
    e. Quantum computational complexity
vi) Simulation of quantum systems
vii) Exercise
viii) Problem Set

Unit 5: <u>Applications</u>

i) Quantum Simulation of the Schrödinger Equation
    a) Problem description
    b) Algorithm Explanation
    c) Algorithm Implementation
ii) Quantum Random Walks
    a) Problem description
    b) Example
    c) Algorithm Implementation
iii) Quantum Tomography
    a) Problem description
    b) Example
    c) Algorithm Implementation