WOMANIUM HACKATHON 2022

Quantum Maze

Humans vs Quantum Computers (IBM)

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Labels

Quantum Computing

The traditional classical computers that we use today operate on binary bits; which can only take binary values such as 1 and 0. The quantum computer uses the weird properties of quantum mechanics to process information

Qubit

The Quantum Computers work on qubits. It is a two-level quantum system that can exist in either one of its computational basis states (state $|0\rangle$ or $|1\rangle$) or a superposition of both.

Superposition

A qubit can exist in linear combinations of the states $|0\rangle$ and $|1\rangle$ at the same time. This ability of the qubit to exist simultaneously in multiple states at the same time is called the superposition. When a qubit is measured, it immediately collapses into a state $|0\rangle$ or $|1\rangle$

State Vector

In quantum physics we use state vectors to describe the state of quantum system. Each element in the state vector contains the probability of finding the qubit in a certain state.

Quantum gate

Quantum gates are the operations performed on the qubits to make computations.

X gate

It is the equivalent of the not gate in classical computing. It is a flips the state of the qubit from state $|0\rangle$ to state $|1\rangle$ and vice versa.

Y gate

It takes the qubit state from $|0\rangle$ to state $i|1\rangle$, and state $|1\rangle$ to state $-i|0\rangle$.

Z gate

it maps qubit state $|1\rangle$ to state $-|1\rangle$ and leaves state $|0\rangle$ unchanged.

H gate

It maps the state of qubit into equal superposition of the states $|0\rangle$ and $|1\rangle$

Noise

Noise is the worst enemy of quantum computers. Quantum Computers are most vulnerable to errors that can arise from decoherence or noise as it is commonly called. This occurs when the environment interacts with the qubits, resulting in an uncontrollable change in the quantum states and causing loss of information stored by the quantum computer. Decoherence is caused by radiation from the environment, magnetic fields, cosmic rays, etc.

Measurement

After the measurement is completed the qubit will be in either one of its computational basis states (state $|0\rangle$ or $|1\rangle$).