

Qubits and optimization

What is a quantum computer?

A quantum computer is a machine that can perform calculations based on the laws of quantum mechanics.



From the outside, a quantum computer might look like this

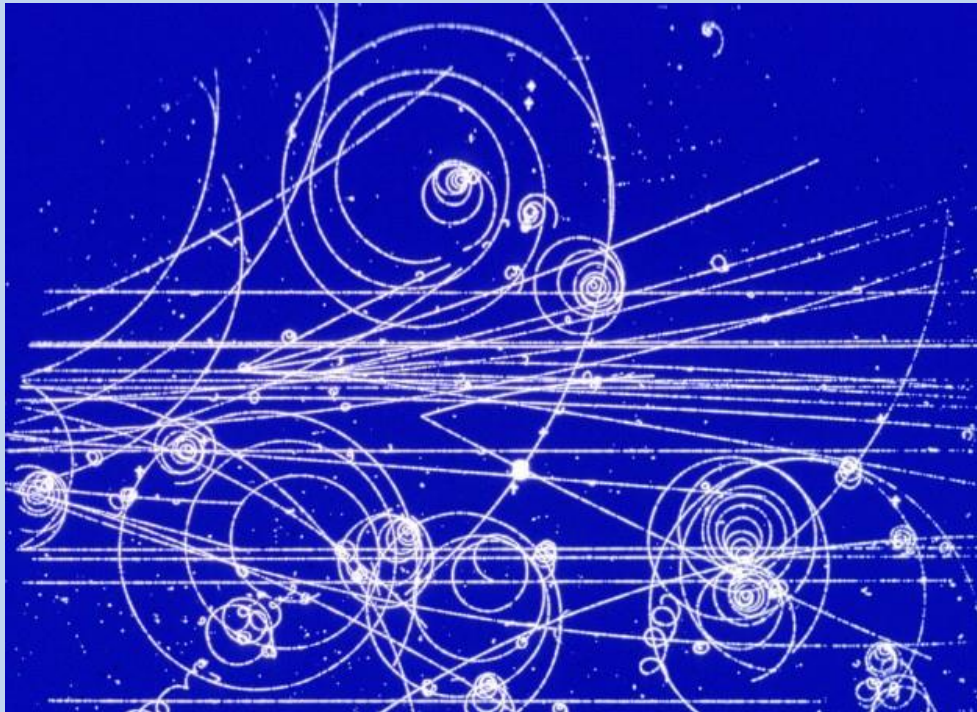


... and inside, it might look like this

What is quantum mechanics?

It is our best mathematical description of the world at atomic and subatomic size.

It studies the structure and behaviour of sub-atomic particles.

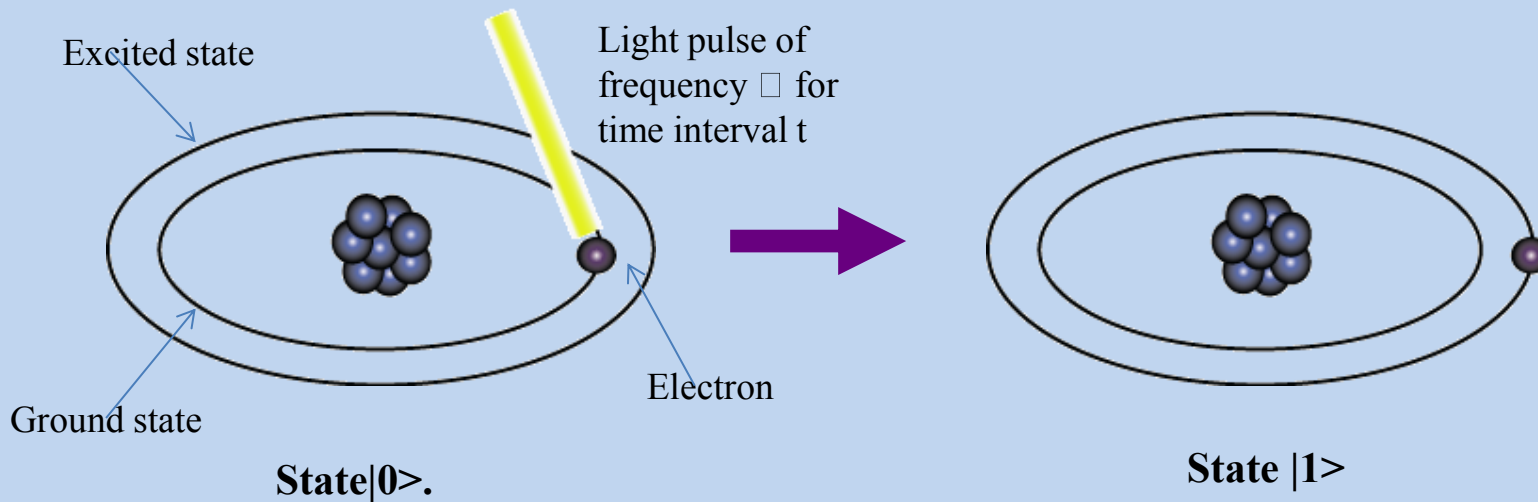


What is a Qubit?

A bit of data is represented by a single atom that is in one of two states denoted by $|0\rangle$ and $|1\rangle$. A single bit of this form is known as a **qubit**.

A physical implementation of a qubit could use the two energy levels of an atom.

An excited state is represented by $|1\rangle$ and a ground state is represented by $|0\rangle$.



Superposition

A single qubit can be forced into a superposition, where it is in both states $|0\rangle$ and $|1\rangle$ at the same time



Entanglement

Entanglement is the ability of quantum systems to exhibit correlations between states within a superposition. This means that two entangled qubits will exhibit the same state when measured.