Quantum Computing: Qubits

# Classical computers and Quantum computers

As we dive into studying quantum computing, we must understand the basic differences between a classical computer and a quantum computer.

Classical computers work on Bits. Bits are the fundamental basic unit of information and have two states: 0 and 1. Whereas quantum computers work on qubits and have the ability of simultaneously give two states: ket 1 and ket 2 (Dirac notion)

This power of being an array of million possible outcomes of combined states of ket 1 and ket 2, these computers prove to perform many times faster than a classical computer.

Let a, b € C^2 (complex in 2-dimensional vector space)

Ket | a > = (a0 , a1) [vertical matrice]

All quantum states can be described by density matrice

i.e., normalized, positive Hermitian operators.

# Quantum Circuits

* Circuit model: sequence of building blocks that carry out elementary computations, called gates

Input ->

Gate algo

* output
* Single qubit gates