IBM

Lecture - 1
10/11/20

Qubit x Qubit by The Coding School

IBM Quantum Sponsor

Quantum is the future

What builds a quantum Community

→ Open Source
→ Education
→ Leadership.

quantum-computing.ibm.com

What does Quantum mean.

Quantum Mechanics :- Describes how object behave at Small Scale

* Describes physics at the microscopic level
* Seemigly incompatible with types of Observation made in Everyday lives

* Leads to Counter-intuitive effects
* Used for describing the behaviour of atom

## Quantum Computing

Uses quantum phenomena to perform Computation.

* Quantum mechanics is is an additional tool used by Quantum Computers
* Solve Certain Computational problems that normal Computers Cannot

→ "Quantum Computing is an application of Quantum Mechanics."

Why Go Quantum

-> Some problems are just too hard for Classical Computer to Solve

"finding vaccine is really bad in classical Computing Stimulation."

"factoring large numbers are very hard in Classical Computer

Moore's law :- Computational power gets doubled Every 18 months.

* However, our Computation power isn't increasing as rapidly as it used to be.

"In past the progress has lowerd down"

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# [Qu] Bit of Quantum History

1980 :- Russian mathematican Yuri, Manin Proposed

1981 :- Feynman proposes a framework for the ~~the~~ ~~Simulation~~ Simulating evolution of Quantum Systems. [Conceived the possibility]

1994 : Peter Shor shows that Quantum Computer can factorize large integers efficiently

1998 : first experimental demonstration of a quantum algorithm. A working 2qubit NMR quantum Computer

2012 :- few-qubit processors & Error detection

2017 :- Cloud based Quantum Computing

2019 : Quantum Supermacy. [The term was Coined in 2012 by American theoretical physicist John Preskill

## What is Quantum Supremacy

Quantum Supermacy is the goal of building Quantum Computing System that can Solve a problem that no classical Computer or Super Computer Can Solve in a reasonable amount of time.

## Quantum Hardware platform

Screen

Bit is ~~like~~ in classical Computing 0, 1

like a Switch only one possibility at a time

0 → ON

1 → off

Qubit : Quantum Computing

It's like dial has both the possiblites either 1 or 0 or both at Same Time

These three weird quantum properties enable the design of quantum algorithms which can Compute in ways classical Computers Cannot, making quantum Compulers more powerfull for Solving Cirtain types of problems.

→ Superposition

→ Entanglement

→ Quantum interference

Superposition: Quantum Systems can exist in two states at once.

Entanglement: "Spooky action at a distance"

Schoel kopf's law

In Quantum Computing, roughly every 3 years, quantum decoherence can be delayed by a factor of 10

Neven's Law:

Quantum Computers are gaining Computational relative to classical ones at a "doubly exponential" rate.