**Introduction:**

**Quantum Computing has been the latest hype in the tech market recently majorly due to its perceived extra-ordinary capabilities compared to classical computers. When I say ‘extra-ordinary’, you immediately tend to think about exponential enhancements in calculations or computation power. Trust me this is much beyond that! So lets unveil the pandora’s box to explore the extra-ordinary.**

**Fundamentals:**

**The basic fundamental building block of a quantum computer is a Quantum bit or Qubit similar to a binary bit in classical computers. The term “classical” implies that these computers follow the Newtonian Mechanics and do not defy the laws of nature. The term “quantum” however, implies that the computers follow Quantum Mechanics and defy all possible laws of nature!**

**What is a qubit?**

**To answer this, lets first know what is a bit(*short for binary digit*). It can be in to states, either 0 or 1. A classical computer only understands the language of bits hence it translates all the data into bits before performing any task. A qubit is kind of a bit but with 0 & 1 and many more possible states.**

**Put notations..clear collapse**

**Quantum bit(qubit) : c1|0> + c2|1> where c1^2 , c2^2 represents probabilities of attaining |0> & |1> respectively when the system is measured. Naturally c1^2+c2^2 = 1 to ensure that the system will definitely collapse to some state.**

**So c1 and c2 can take any values and hence, a single qubit can be a linear combination of |0> and |1> states also. Now you know how can a qubit exist in multiple states. This is the first “extra-ordinary” capability of the qubit that differentiates the operation of quantum computer from classical computer.**

**Quantum Superposition :**

**If you take 2 classical bits together, the total possible states will be 2^2 ie. Each bit can be either 0 or 1. Therefore total possible states are 00,01,10,11 and only one of these cases will exist at one time instance**

**In case of 2 qubits, we know that each qubits can exist as c1|0>+c2|1>. Therefore if we take**