

# Review Paper on Big Data Analysis in Quantum Computing

Rohini Sharma<sup>1</sup>, Amitesh mani tiwari<sup>2</sup>, Anoushka Palvia<sup>3</sup>

<sup>1,2,3</sup>*Department of Computer Science & Engineering, Chandigarh University*

**Abstract-** When we look on earth we have seen that lots of product, natural thing being stored. just like as in the world of computing, everything stored in one device which may be one chip or one data computing computer. But at a time come, where data is becoming beyond the storage capacity (known as big data) and but this big data processing cannot be handled by classical computers. There are many big data analytics devices available in the business community, but still, problem in higher rank which could not be resolved in optimal time though by the most advanced computer system. But now time will come, we can discuss a computer that can be solved bid data problem which name is Quantum computer. In this paper, we will review on big data analysis in quantum computing .all of we know computer constructing power depends on a number of transistors used and according to Moore 'slaw today's this power doubles every two years. But quantum computing has come on the basis of superposition of qubit(binary number). It works like physics quantum that shows how the atom is different from classical Physics. In this research review paper we will totally focus on how will quantum computing take an important part in big data analysis and some issues in the quantum computing environment.

**Index Terms-** Quantum computer, qubit, qubyte, bigdata

## INTRODUCTION

We are living in a data world, while uploading images on Facebook or Instagram, sending email through Gmail or writing a message on Twitter or many more, we are nothing doing other than playing data. For just minute we are considering your life is without a computer, data not stored in the computer. What will happen?.

It will look like that life is becoming more complex with an unpractical thing happening in our surrounding. But another point of view we will see that regular bases so many data is increasing exponentially. Data is which is beyond the storage

capacity and processing capabilities of classical computer are called” big data ” and getting some insight from a large amount of data is a very big challenge. World most of the best IT company like Amazon, Google, Twitter, Facebook are managing their big data at a rapid elastic data center. Most of the organization works on the basis of various demand various services like storage (SaaS), Platform (PaaS), etc. But until the involvement of all this process by all big IT company, they are not satisfied and they do not have to believe that in the coming year by this process of storing data by classical computer will be helpful.

So they are finding another opportunity to solve this big data problem.All this big company is focusing on machine learning and artificial intelligence to reduce this big problem. But we discuss a different perspective of computer technology.

We know that the processing speed of classical computers depend on the number of transistor we are using. But now we are going to discuss high-performance computing computers that has dramatically changed in our mind that name is a quantum computer. Their definition has defined all thing which is quantum computing is the use of quantum-mechanical phenomena such as superposition and entanglement to perform computation and provide capabilities to computation in order of  $2^n$  for n qubit performance. The normal computer takes time to manipulate but quantum computer manipulates their data in just seconds due to an only superposition of number.

## SOME FACT ABOUT BIG DATA:-

Big data can be divided into three form:

1. Structured data-Any data can be stored, accessed and processed in the form of fixed format is term as a 'structured data'. Over the period of computer science achieved greater success in

developing techniques for working with such kind of data. However, now days, we are foreseeing issues when the size of such data grows to a huge extent, typical size in the range of zettabytes. G-student data in school computer is structured data.

2. Unstructured-Any data with the unknown form or the structured is classified as unstructured data. A typical example of unstructured data is a heterogeneous data source containing a combination of simple text files, images.
3. Semi-structured – semi-structured data can contain both forms of data. we can see semi-structured data as a structured in the form but it is actually not defined with a table definition in relation DBMS.-personal file which is stored in theXMLfile.

### III. QUANTUM COMPUTER

A quantum computer is a device that regulate calculation based on the laws of quantum mechanics, which is the behavior of particles at the subatomic level.it promises more powerful processing capability than any conventional computer could be ever.

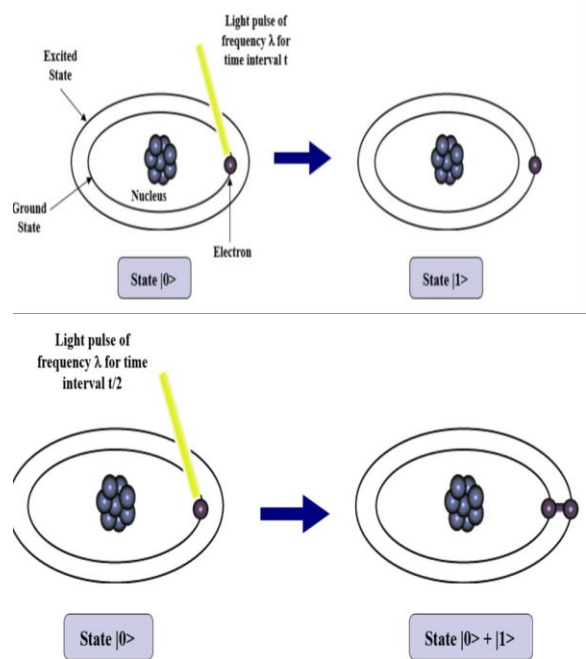
\*1982-Feynman had proposed the idea for creating machines instead of the laws of classical physics.

\*1994-Peter Shor came up with a quantum algorithm to factor very large numbers in polynomialtime.

\*1997-Lov Grover develops a quantum search algorithmwith $O(\sqrt{n})$ .

### IV.SOME IMPORTANT FACT ABOUT QUANTUM COMPUTER:

1. Quibit-In quantum computer we use qubit (bit equivalent as in conventional computer ) for storing data.A bit of data is represented by a single atoms that is in one of two states denoted by  $|0\rangle$ and  $|1\rangle$ . A single bit of this form is known 'QUBIT'.
2. Genearation-Small particles like electrons, photons have spins and that spins can be measured by magnetic field. If we bring electron in a magnetic field ,then it has spin in different direction and all at a same time called quantum superpositions of them we have n bits then due to superpositions of them we will get  $2n$  Qubits.



\*\*Examine a 3 bit qubit an equally weighted superposition of all possible states would be denoted by

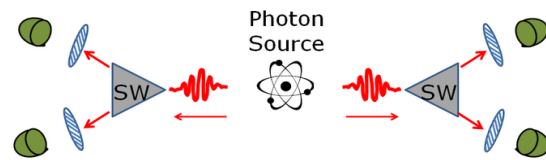
### SUPERPOSITION:-REPRESENTATION OF DATA

A single qubit could forced into a superposition of the two states denoted by the sum of two vectors.

$$\Psi = \alpha_1|0\rangle + \alpha_2|1\rangle$$

Where  $\alpha_1$  and  $\alpha_2$  are complex number and  $|\alpha_1|^2 + |\alpha_2|^2 = 1$

A qubit in superposition is in both of the states  $|1\rangle$  and  $|0\rangle$  at the same time.



### INTRODUCTION TO QUANTUM COMPUTING

#### Pauli Matrices

$$\text{Pauli-X} \equiv \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$$

$$\text{Pauli-Y} \equiv \begin{bmatrix} 0 & -i \\ i & 0 \end{bmatrix}$$

$$\text{Pauli-Z} \equiv \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$$

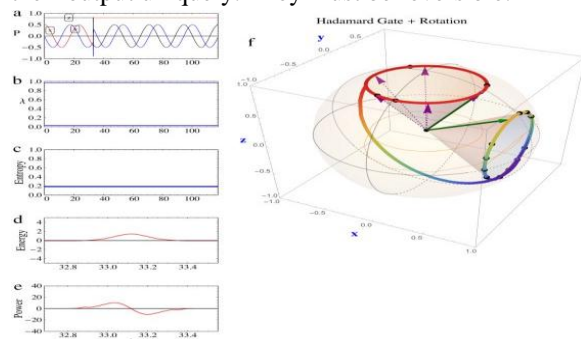
#### Hadamard Gate

$$\text{Hadamard} \equiv \frac{1}{\sqrt{2}} \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}$$

Pauli-X : Not gate  
 Pauli-Y: Not gate with i multiple  
 Pauli-Z: Flips sign of second entangled state

Quantum Entanglement: Two objects if they quantum mechanically entangled then they are strongly related to each other even though they are vast distance apart. It means that superposition of bits and all at a same time. An atom surrounding electron exist in quantized energy levels. Most of the electron surrounding atom produced standing waves, in close to the vibrating waves one observes on a tightly held piece of string. Such type of two individual levels can be isolated to configure the basis states for a qubit.

Quantum gates: Quantum Gates are similar to classical gates, but do not have Degenerate output .i.e their original input state that can be derived from their output uniquely. They must be reversible.



Two Hadamard gates used in succession can be used as a not gate

#### HOW QUANTUM COMPUTER CAN DEAL WITH BIG DATA OF ALL 5V's:-

A quantum machines with n bits can be in Superposition of  $2^n$  states at the same time .thus an n-qubit computer could analysis  $2^n$  parallel states in a single operation. comparison A n-bit classical computer can analysis one state.to achieve the same solution as the quantum computer has to repeat this operation  $2^n$  times .this powerful potential can be easily exploited to deal with big data .

“Quantum algorithm for BIG DATA that are used to analyze the data can predict the state have potential to speed up due to their superposition of data.”

RESEARCH BY IUCRC-industry-university collaborative research center (IUCRC) has promoted further research in quantum machine learning for data analytics and optimization. Benefits of an IUCRC is including leveraging academic-corporate partnerships, expanding material science research, and acting on market incentive. Further research in quantum machine learning for data analysis is

necessary before it can be of use to industries for practical application, Chen said, and an IUCRC would make tangible progress.

#### QUANTUM COMPUTING PROBLEM

\*Current technology 40 qubit operating machine needed to rival current classical equivalent.

#### ERRORS:

Decoherence the tendency of a quantum computer to decay from given quantum state into an innocent state into incoherent state with environment -error rates are typically proportional to the ration of operating time to decoherence time.

#### CONCLUSION

Finally time has come where I will give review on big data analysis in quantum computing. After getting every information regarding quantum computing .We had seen several benefits of quantum computing on classical computer. We got optimization power of quantum computer is more than classical computer. Although quantum computing is on intial stage but after some decade it will become more famous and big data analysis will totally conclude by quantum computing. Because they save enormous amount of heat. Now most of the quantum computing research work is doing by IBM, GOOGLE, NASA ETC. If we are able to make quantum computer then we can generate 600-800 qubit computer. It can totally help to minimize the problem of big data.

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