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TITLE: Big Data Analysis By Quantum computing

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Abstract

This paper proposes how we can analyze large amount of data using quantum computing . The idea of using the concept of quantum computing for processing the big data is advised . Quantum computing is the advanced computing technology where we think beyond conventional binary bits. This is based on the quantum physics principle according to it material can be at more than one place at a time. If we combine this principle with our conventional computing then , will have the third bit called the superimposed bit that can be in two state at a same time. which increase our computing speed. The big data means extremely large amount data sets . The data is increasing exponentially. According to a study conducted by McKinsey Global Institute, the data volume is growing 40% every year and with the increasing number of users and research areas, one can expect much more growth in the data volume. With this kind of growing data, the need arises for faster processing and analysis methods giving better performance to the end users and the analytics this we can achieve with quantum computing.

Index Terms: *Quantum Computing ,Big data* etc.

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1. Introduction

1.1 Big Data

As day by day internet getting evolved the biggest problem arises it was storing and processing large data i.e. big data . The internet users generate huge amount of [1]data at every second and even every millisecond. The term big data is used to refer to this ever growing data of various types, captured from various sources. Every day the number of users and there data is increasing exponentially and with this the data. A simple example that can be considered here is the social networking sites like Twitter etc. whereas the data input is very high and the type varies we have the images, videos, text etc. The big data is defined in terms of the three characteristics(3V's) i.e. Variety, Velocity and Volume. Variety describes the different types of data available. Conventional structured data types, and our current unstructured and semi structured data types. Volume describes the amount or quantity of the data. Velocity describes about the frequency or the rate at which the data is being generated. The sources of data can be many such as, sensor data, Social networking data, online survey data, online shopping data etc.

Fig. 1 Big Data

Hence in this growing era there is need of some different approaches to analyze data rather than conventional approaches .The better and faster the big data is processed and better the analysis. For some organization some GB's of data may be big data and for some may not be. It is entirely organization/institution specific. Our main concern in any case is the better processing of the big data. Unless and until

the captured big data is processed, the data does not make any sense.

1.2 Quantum Computers

Future computers not contain any transistors or chips. Think of a computer that is much faster than a traditional silicon computer. This might be a quantum computer. Theoretically it can run without energy utilization and billion times [2] faster than today's computers. Scientists already think about a quantum computer, as a next generation of normal classical computers. Gershenfeld says that if making transistors smaller and smaller is continued with the same rate as in the past years, then in the upcoming years, the width of a wire in a computer chip will be no more than a size of a single atom. In today era we require a new technology or approach for design computers. Computers designed on today's chip technology will not continue to get cheaper and better. Because of its great power, quantum computer is an attractive next step in computer technology.

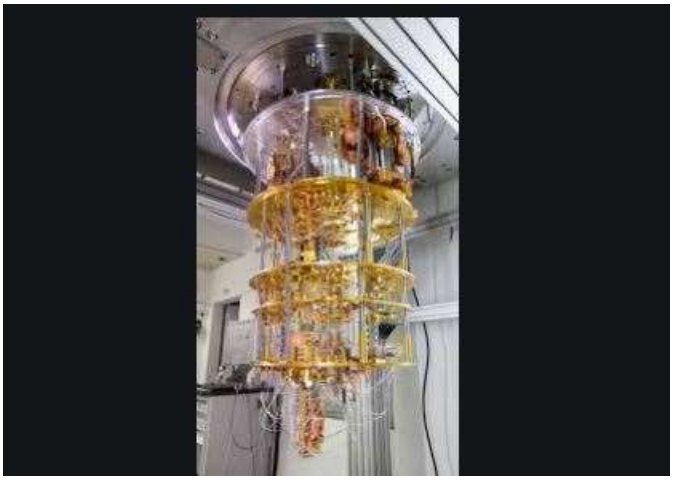

Fig 2. Quantum Computer

A technology of quantum computers works on qubits. Quantum mechanics laws are completely different from the laws of a classical physics. A qubit can exist not only one states corresponding to the logical values 0 or 1 as in the case of a classical bit, but also in a superposition state. A qubit is a bit of information that can be both zero and one simultaneously (Superposition state). Thus, a computer working on a qubit rather than a standard bit can make calculations using both values simultaneously and make quantum computer faster than normal computers. (Quantum Computers & Moore's Law,p.1)According to Chuang a supercomputer needs about a month to find a phone number fromt he database consisting of world's phone books, where a quantum computer is able to solve this task in 27 minutes. Massachusetts Institute of Technology, Oxford University, IBM and Los Alamos National Laboratory are the most successful in development of quantum computer.

1.2 Quantum Computing

Quantum computing (Quantum Information Processing) (QIP) is a new computation approach work on the base of quantum physics. quantum computing is an application of quantum mechanics concepts in the field of information processing .Quantum physics is a branch of science that deals with discrete, indivisible units of energy called quanta A key feature of quantum physics is the ability of the quantum wave function to exist in multiple states at the same time. A quantum computer is able to perform two computations simultaneously. In a quantum computer, a single quantum processor is able to perform multiple computations on its own by utilizing the fact that the qubits exists in multiple states simultaneously. It makes quantum computer to faster than the traditional computer. Quantum parallelism arises from the ability of a quantum memory register to exist in a super position of base[3] states. In the quantum computing model we have a basic unit of information called the "quantum bit" or "qubit". A qubit can be represented as a vector in a two dimensional complex Hilbert space where $|0\rangle$ and $|1\rangle$ form a basis in the space. The difference between traditional bits and qubits is that a bit as only one state, either 0 or 1 where as in qubits there is three probabilities $|0\rangle$ or $|1\rangle$ or both at the same time. It is also possible to form linear combination of states, often called superposition. The traditional computers use the binary bits for processing. The binary bits can be in either 0 or 1stateata time. Hence traditional computer process 2N instructions where in quantum computing the bit called the "qubit" can be in a superimposed state meaning to state that they can be in either of the state at the same time due to that it process 2^N instructions at a time. This "qubit" thus provides huge performance benefits over the traditional computing. By allowing the computation to be performed on different values at once, the single unit in itself can behave as parallel processor

2. Big Data

2.1 Current scenario of processing

By three stages Acquiring, Organizing and Analyzing we can process big data. NoSql database is used for acquiring .NoSql is the model developed by Oracle, highly suitable for the unstructured data [1]sets. Apache Hadoop is used to Organized big data. Hadoop is the technology widely used to organize and process the big data; mainly uses the concept of cluster Hadoop File system (HDFS). We have the Mad Reduce programming model that is used at large scale to process datasets. We have Google Map Reduce and Apache Map Reduce. In simple terms Map Reduce is worked on

concept of divide and conquer. The processes can be discussed under two phases; Map phase and Reduce phase. Map phase is responsible for dividing the problem under consideration into modules that can be easily passed onto to reduce phase for processing. Reduce phase is responsible for merging the processed results and producing the final result. With quantum computing the processing can be made random instead of the regular sequential processing and thus better performance. In that ways big data is processed using Hadoop Technology.

2.2 Processing By Quantum Computers

Quantum processor processing quantum bits which can be in superimposed state. Once the processor receives the input it decide its state and perform the processing on the multiple states at a time returning the result back in reduced time. Since the single processor itself behaves as parallel processor due to the superimposed state of the bits, the processing time here can be expected to be reduced toa greater extent when compared to the traditional computers, where we require multiple processors and parallel processing to be set up. The processor will be capable of processing the multiple bits at the same time. And hence we processed large amount of data rapidly. we can achieve critical jobs related to processing of large dataset.

3. Applications of Big data Analysis using Quantum computing

3.1 Machine Learning

Artificial intelligence process large datasets of image, video and text. In fact, there may be an overabundance. Big data is out there to be analyzed, but we need more powerful computers or approach to process this huge datasets.

Quantum computing could empower machine learning by enabling AI programs to search through these gigantic datasets concerning medical research, consumer behavior and financial markets—and make sense of them.

3.2. Biomedical Simulations

With quantum computing, we can create, simulate and model molecular structures. Researchers at Harvard University used a D-Wave One quantum computer to solve the puzzle of how some proteins fold .“The model consisted of mathematical representations of amino acids in a lattice, connected by different interaction strengths,” writes Geoffrey Brumfiel in a news article for Nature about the Harvard researchers’ protein folding models. “The D-Wave computer found the lowest configurations of amino acids and interactions, which corresponds to the most economical folding of the proteins.”

3.3. Financial Services

Quantum computing is also used in financial sectors. Financial sectors processed huge amount of data in order to calculate and minimize risk factors. D-wave, a company backed by Goldman Sachs and Bezos Expeditions, among others, deployed its first commercial quantum computer: the D-Wave 2000Q, a quantum annealing system with 2000 qubits and advanced feature controls.

4. Future Scope

As we evolving day by day we making such systems which require as less time as possible. We can't achieve it with the normal computers hence in the future normal computers are replaced with quantum computers .By using large data processing using quantum computing we can solve critical unsolved math problems, By applying we can calculate various space research calculations which require large time period. Also using quantum computing we can developed new medicines and study unsolved puzzles.

5. CONCLUSION

In that way we use quantum computing for processing big data, the analytics and the processing will provide better and greater meaning. This can be made use in almost all the areas Analyzing customer data, machine learning, Biomedical stimulation, Sensor data, Banking data etc. Quantum computing and big data in itself is one of the most challenging areas. The understanding and exploiting these areas will prove to be a great achievement in the current internet universe, which is all about processing the data.

REFERENCES

[1]. Pradip Kumar K.G,"PQ KEY-A NOVEL KEY GENERATION ALGORITHM FOR PROCESSING BIG DATA USING QUANTUM COMPUTING", Department of Computer Science ,SDM Institute of Technology

[2]. Archil Avaliani,"Quantum Computers",International University December 1,2002.

[3]. Tawseef Ayoub Shaikh and Rashid Ali," Quantum Computing in Big Data Analytics: A Survey ", Department of Computer Engineering, 2016 IEEE International Conference on Computer and Information Technology