
QUANTUM COMPUTING AN INTRODUCTION TO THE NEXT GENERATION OF COMPUTER

**Ashwini Dofe^{*1}, Kanchan Sunkarwar^{*2}, Shradha Nandpatel^{*3},
Kanhaiya Awasaya^{*4}, Chirag Gupta^{*5}, Asst. Prof. Wasik Raza^{*6},
Asst. Prof. Sagar Taiwade^{*7}**

^{*6,7}Asst. Prof. Department of Electronics and Telecommunication Engineering, Shri Shankarprasad Agnihotri
College of Engineering, Wardha, Ms, India.

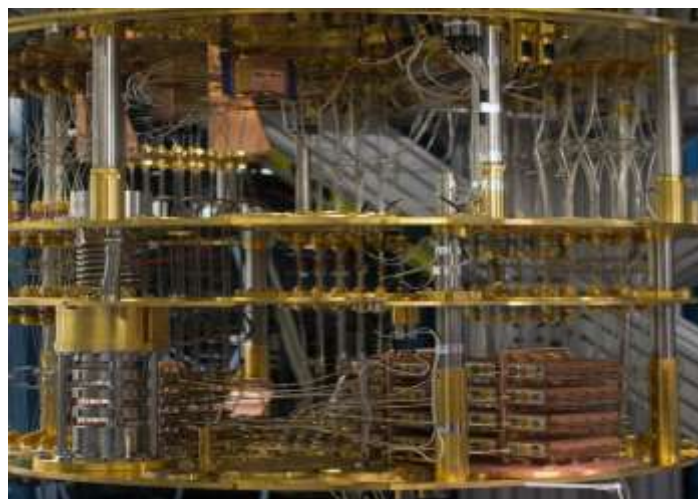
^{*1,2,3,4,5}Students, Department of Electronics and Telecommunication Engineering, Shri Shankarprasad Agnihotri
College of Engineering, Wardha , Ms , India.

ABSTRACT

Quantum Computing is an emerging technology that has the potential to revolutionize the way we process information. Quantum computers use the principles of quantum mechanics to perform operations that are beyond the capabilities of classical computers. This research paper provides an overview of quantum computing, its history, and the basic principles that underlie it. The paper also discusses some of the potential applications of quantum computing, as well as the challenges that must be overcome before it can become a practical technology.

I. INTRODUCTION

Quantum computers are a type of computing technology that uses quantum mechanics to perform calculations. Unlike traditional computers that use bits, which are either 0 or 1, quantum computers use quantum bits, or qubits, which can be in multiple states simultaneously. This allows quantum computers to perform calculations that are much faster than traditional computers, and can solve problems that would be impossible for classical computers



HOW QANTUM COMPUTER WORK:

Quantum computers use the principles of quantum mechanics to perform calculations. Quantum mechanics is the branch of physics that describes the behavior of particles at the atomic and subatomic level. In quantum mechanics, particles can exist in multiple states simultaneously. This is known as superposition. In a quantum computer, qubits can exist in multiple states simultaneously. This allows quantum computers to perform calculations on multiple inputs at the same time, which makes them much faster than traditional computers. Quantum computers also use another principle of quantum mechanics called entanglement. Entanglement occurs when two particles become linked in such a way that the state of one particle affects the state of the other particle.

Application of Quantum Computer:

Quantum computers have the potential to revolutionize many fields, including cryptography finance, and drug discovery. One of the most promising applications of quantum computers is in cryptography. Quantum computers can be used to break many of the encryption algorithms that are currently used to secure data. This has the potential to disrupt many industries that rely on secure communication, such as banking and national security. Another potential application of quantum computers is in finance. Quantum computers can be used to perform complex financial calculations, such as risk analysis and portfolio optimization. This could lead to more efficient and profitable investments. Finally, quantum computer can be used in drug delivery .Drug delivery is a time-consuming and expensive process that requires a lot of computational power. Quantum computers can be used to simulate the behavior of molecules, which could lead to the discovery of new drugs.

Challenges of Quantum computing :

Despite the potential of quantum computers, there are still many challenges that need to be overcome before they become a practical technology. One of the biggest challenges is error correction. Quantum computers are very sensitive to noise and other disturbances, which can cause errors in calculations. Developing error correction algorithms that can deal with these errors is a major area of research in quantum computing. Another challenge is scaling up. Current quantum computers are still relatively small and can only perform simple calculations. To be useful, quantum computers will need to be scaled up to thousands or even millions of qubits. This will require advances in materials science, as well as improvements in the manufacturing processes for quantum computers.

II. HISTORY

The idea of quantum computing was first proposed by physicist Richard Feynman in the 1980s. However, it was not until the 1990s that the first experimental implementations of quantum algorithms were developed. In 1994, Peter Shor developed an algorithm that could factor large numbers exponentially faster than any classical algorithm. This was a significant breakthrough as many cryptographic protocols rely on the difficulty of factoring large numbers.



Prof. Richard Feynman



Prof. Peter Shor

III. CONCLUSION

Quantum is a promising technology that has the potential to revolutionize many fields. Quantum computers use the principles of quantum mechanics to perform calculations that are much faster than traditional computers. They have the potential to break many of encryption algorithms that are currently used to secure data, as well as perform complex financial calculations and drug discovery. However, there are still many challenges that need to be overcome before quantum computers become a practical technology. These challenges include error correction and scaling up the size of the quantum computers.