



Understanding Quantum Computer

A quantum computer is a real or theoretical computer that exploits computer phenomenon like superposition and entanglements in an essential way.

By **Hamna Tariq** | University of Agriculture Faisalabad | Published: October 2026
✉ hamnatariq943@gmail.com | Position: Software Engineer

Introduction

Quantum computing is an exciting and rapidly growing field that blends Quantum mechanics and computer science. It has the potential to solve Problems that are difficult or impossible for classical computers. For students studying at the Bachelor of Science (BS) level, understanding the basics of Quantum computing is an essential step toward mastering future technologies.

"Quantum is no longer rumour it become real."

Technology Overview

What is Quantum computer?

Quantum computer is a new type of computer that use the principle of quantum machines to process information in way that classical computer cannot. While classical computer use bit as a smallest unit od data (0,1). Quantum computers use quantum bits or qubits.

Qubits: The Basics

Unlike classical bits, qubits can exist in a state of 0,1 and both at the same time. This property known as **superposition**. In addition, qubits can also be entangled, meaning that the state of one qubit is linked with the state oh another qubit, even across large distance. This phenomenon enables quantum computer to perform calculations simultaneously.

Technology used:

Qubits used the technology like superconducting circuits (Josephson function), trapped icons, neutral atoms in optical lattices, and silicone-based spin-based quantum dots.

Key Findings & Impact

Superposition:

A qubit can be in a combination of both 0 and 1 simultaneously. This is Known as superposition. For example, a quantum system may exist in a State that is a weighted sum of the 0 and 1 states.

Entanglement:

Qubits can be entangled such that the state of one qubit affects the state of Another, even at a distance. This property is known as quantum entanglement and is one of the key features of quantum computing.



Quantum Interference

Quantum interference allows quantum computers to amplify the correct answers to a problem and cancel out incorrect ones. This property is essential for ensuring that the quantum system provides useful results.

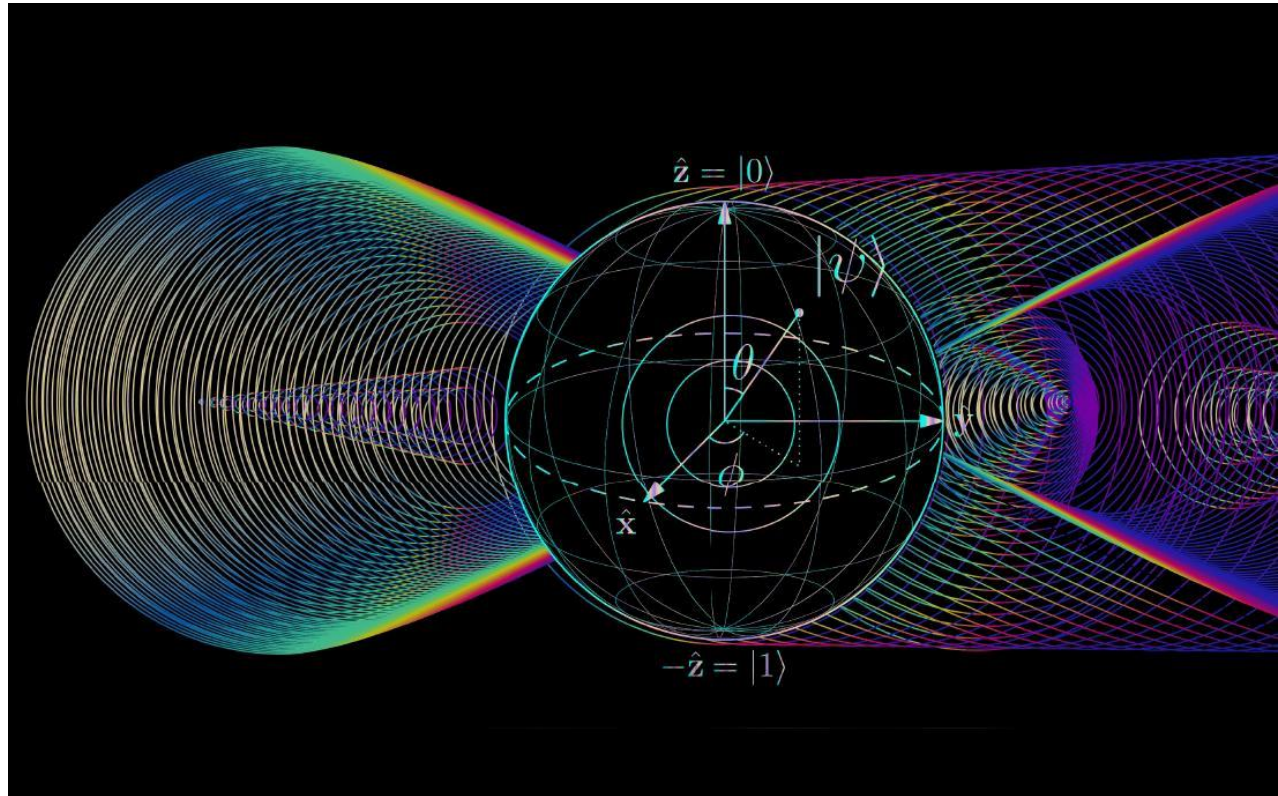


Figure 1:A bit or two about qubits| 1Qubits. Credit: Harnessing physics in computational/ Goggle

What's Next?

Quantum computer is still in early stage, and many challenging remains. These includes maintaining qubits stability (coherence)and reducing errors in quantum systems. Researchers are working on building more powerful and reliable quantum computer, which can revolution in different fields such as Science, Medical and Artificial intelligence.

Conclusion:

Quantum computer represents a performed lead forward in our ability to solve complex problems. As the field mature, quantum computer plays a critical role in transforming industries like Cryptography, artificial intelligence and medicine. Understanding the foundation principles of quantum machines and quantum systems will prepare the world for upcoming new future.

About the Author

Author can be reached at hamnatariq943@gmail.com.

Keywords: Artificial Intelligence; Cybersecurity; IoT; Software Engineering; Pakistan Tech

References

[1] Smith, J. (2024) Artificial Intelligence in Industry, *Tech Journal*, 5(2), pp. 12–20.