

## **1. What is Entanglement?**

Entanglement is a fundamental feature of quantum mechanics and refers to the correlation between two or more particles, where the state of one particle instantaneously influences the state of another, regardless of the distance between them. In classical physics, the interaction between two objects depends on their previous states and their proximity. However, in quantum mechanics, when particles become entangled, one particle can instantly affect the state of another, even over large distances.

Entanglement was proposed in a paper by Einstein, Podolsky, and Rosen in 1935, known as the "EPR Paradox." It is considered a fundamental aspect of quantum physics and has significant applications in quantum communication, quantum computing, and quantum cryptography.

## **2. What is Entanglement importance in Quantum Computing?**

The importance of entanglement in Quantum Computing is significant because this feature represents the parallel computing capabilities of quantum computers. While traditional computers operate with classical bits, the ability of qubits (quantum bits) to be entangled greatly enhances the processing capacity.

Entanglement allows for the strong correlations between qubits, enabling information to be processed in parallel. This enables quantum computers to solve certain computational problems much faster than classical computers. For example, complex mathematical problems like Shor's factoring algorithm can be solved much more quickly using entanglement in quantum computers.

Entanglement also plays a crucial role in areas such as quantum communication and cryptography. In quantum communication, entanglement enables secure transmission of information to the recipient. In quantum cryptography, entanglement can be utilized for secure key distribution and communication.

In conclusion, the importance of entanglement in Quantum Computing lies in its ability to enable quantum computers to compute faster and securely, providing new possibilities in various application domains.