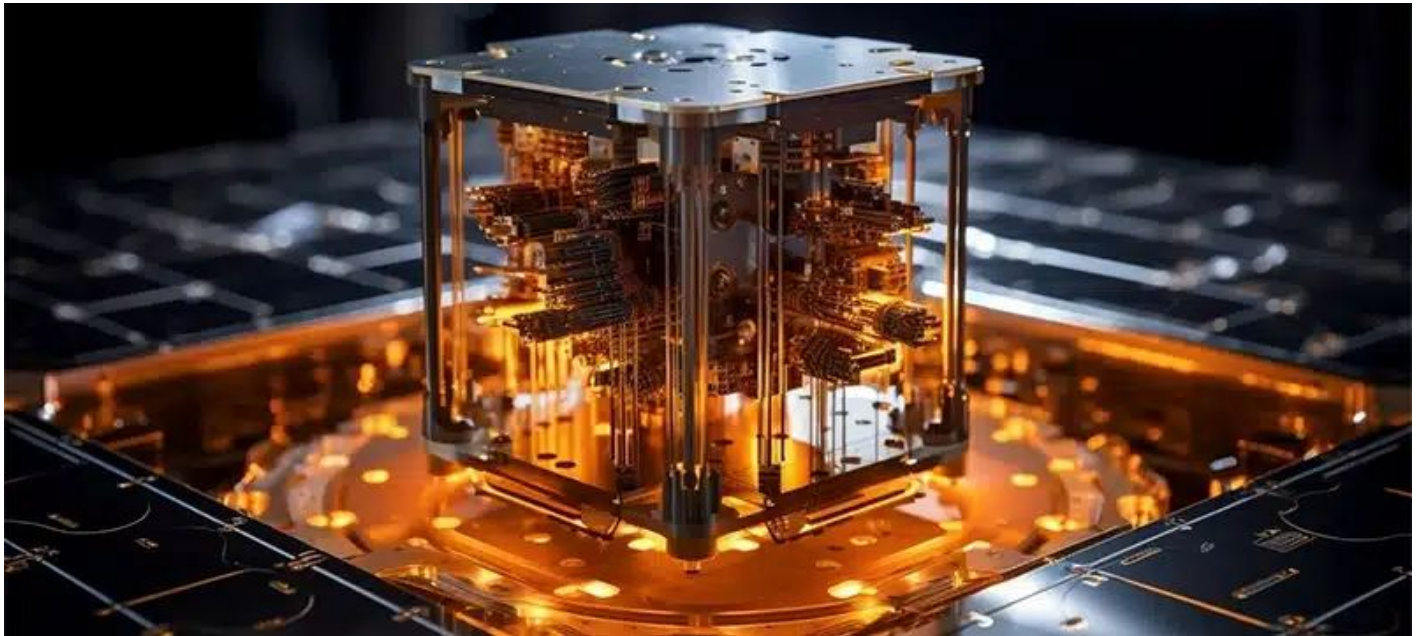


What is Quantum Computing?

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About Quantum Computing

- **Quantum computing** is a cutting-edge technology leveraging the principles of **quantum mechanics** to solve problems too complex for traditional computers.

Quantum Mechanics

- A branch of physics deals with the behaviour of particles such as **atoms**, **electrons**, and **photons** at molecular and sub-molecular levels.
- It introduces phenomena like **superposition** and **entanglement**, enabling quantum computing's revolutionary capabilities.

Key Features

- **Fundamentally Different from Classical Computing:** Classical computers process information in **binary bits** (0 or 1).
 - Quantum computers use **quantum bits (qubits)**, which can exist in states **0, 1, or both** simultaneously (superposition).
- **Superposition:** It enables qubits to hold multiple states at once, allowing quantum computers to perform exponentially more calculations compared to classical systems.
 - Example: Like a spinning coin, a qubit can represent both heads and tails until measured.

- **Entanglement:** A phenomenon where qubits remain intrinsically linked, regardless of distance.
 - Changing the state of one qubit instantly affects its entangled counterpart, enhancing computational speed.
- **Unprecedented computational power:** Quantum computers can solve problems that are **impossible or time-prohibitive** for classical systems, such as cryptographic algorithms, simulations, and optimization tasks.

Milestones in Quantum Computing

- **Origin:** Proposed in **1982** by Richard Feynman to simulate quantum systems, as classical computers struggled with such complexity.
 - **Breakthrough algorithms: Shor's Algorithm (1994):** Revolutionized cryptography by factoring large numbers exponentially faster than classical methods.
 - **Technological advancements**
 - **IBM Q System One (2019):** The first circuit-based commercial quantum computer.
 - **Google Sycamore Processor (2019):** Demonstrated **quantum supremacy** by solving a task in 200 seconds, which would take classical supercomputers 10,000 years.
 - **Google Willow Quantum Chip (2023):** Introduced scalable error-corrected qubits, finishing calculations in minutes that would otherwise take billions of years for classical systems.
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Q1. What is Quantum Technology?

Quantum technology leverages the principles of quantum mechanics, such as superposition, entanglement, and quantum tunnelling, to develop advanced tools and applications.

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