



QUANTUM COMPUTING



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Quantum Computing

Introduction : Quantum computing, an avant-garde field at the intersection of physics, mathematics, and computer science, redefines the way we process information. Quantum computing uses quantum bits, or qubits, as opposed to classical computing, which uses binary states. Qubits can live in more than one state at once according to the concepts of superposition and entanglement. Because of this special quality, quantum computers can search large solution spaces, which makes them very effective at resolving complex issues in a variety of fields.

Brief History : Nobel laureate Richard Feynman first proposed the idea that complicated quantum phenomena may be simulated by quantum systems in 1981, which is when quantum computing first emerged. Large numbers could be factorized exponentially quicker by quantum computers than by classical techniques, as shown by Peter Shor's algorithm in 1994. Lov Grover's technique then transformed search functions, demonstrating the unparalleled effectiveness of quantum computing in retrieving unsorted data.

Latest Technologies and their Impact: The subject of quantum computing has entered new frontiers thanks to recent technological developments. Three cutting-edge technologies under investigation are topological qubits, trapped ions, and superconducting qubits. These discoveries have broad ramifications, particularly in the field of cryptography, where quantum computers represent a serious challenge to established encryption techniques. Quantum computers are also very good at solving optimization problems, which makes them very useful in fields like manufacturing, finance, and logistics.

Big Tech Companies in Quantum Computing: Well-known IT companies including Google, Microsoft, Intel, IBM, and Google have invested a lot of money in quantum computing research. Quantum experimentation is now more accessible thanks to IBM's Quantum Experience platform, which provides cloud-based access to quantum processors. The goal of Google's Quantum AI Lab is to create quantum algorithms with practical applications in mind, highlighting the usefulness of quantum computing in resolving challenging problems.

IBM: IBM has been a leader in quantum computing for years, with their Quantum Experience platform providing access to quantum computers for researchers and developers. They have also developed a quantum computer with 65 qubits, the most powerful quantum computer to date.

Google: Google has made significant strides in quantum computing, with their quantum computer achieving quantum supremacy in 2019. They have also developed quantum algorithms for machine learning and chemistry simulations.

Microsoft: Microsoft has been investing in quantum computing research for over a decade, and has developed a quantum computer with 40 qubits. They have also developed a quantum programming language, Q#.

Intel: Intel has been working on developing quantum computers using superconducting qubits, and has partnered with QuTech to develop a 49-qubit quantum computer. They have also developed a quantum simulator for testing algorithms.

Integration into Previous Projects: A careful strategy is necessary when integrating quantum computing into ongoing tasks. Applications of quantum computing are particularly useful in situations requiring large amounts of processing power, such as deciphering cryptographic codes or optimizing complex supply systems. Nonetheless, there are difficulties due to the intricacy of quantum algorithms and the requirement for quantum error correction. The successful integration of quantum computing requires a thorough comprehension of the problem domain and a strategic assessment of the possible benefits of quantum computing relative to the accompanying implementation challenges.

Conclusion: Quantum computing, which promises to solve issues that were previously thought to be intractable, essentially marks the beginning of a new era in computational research. Future developments in which quantum algorithms expand the realm of computational possibilities are being heralded by the cooperative efforts of scientists, business leaders, and legislators. These efforts are guiding quantum computing towards useful applications. With the knowledge that quantum computing has the power to drastically alter our world, we must approach it with a combination of wonder, curiosity, and strategic foresight as we traverse this revolutionary terrain.