



## **Indo Asian Journal of Management and Entrepreneurship (IAJOME)**

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### **QUANTUM COMPUTING**

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#### **ABSTRACT**

Quantum computing is a revolutionary computing paradigm based on the principles of quantum mechanics. Unlike classical computers that process information using binary bits, quantum computers use quantum bits or qubits that can exist in multiple states simultaneously through superposition. Combined with entanglement and quantum interference, this allows quantum systems to solve highly complex problems more efficiently than traditional computers. Quantum computing has the potential to transform industries such as healthcare, finance, logistics, cybersecurity, artificial intelligence, and scientific research. Although current quantum computers are still in the early stages of development, continuous improvements in hardware, algorithms, and error correction are accelerating progress. This paper explains the concepts, importance, challenges, types, techniques, applications, future scope, and benefits of quantum computing in a simple and comprehensive manner. Quantum computing is a revolutionary computing paradigm based on the principles of quantum mechanics. Unlike classical computers that process information using binary bits, quantum computers use quantum bits or qubits that can exist in multiple states simultaneously through superposition. Combined with entanglement and



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### **KEYWORDS**

Quantum Computing, Qubits, Superposition, Entanglement, Quantum Algorithms, Quantum Gates, Quantum Error Correction, Cryptography, Artificial Intelligence, Quantum Mechanics.

### **INTRODUCTION**

Quantum computing combines computer science with quantum physics to create computers capable of processing information in fundamentally different ways. Classical computers use bits with values of either 0 or 1. In contrast, qubits can exist in both states simultaneously because of superposition. Entanglement enables multiple qubits to share information regardless of distance, allowing faster computation for specific problems. Researchers and technology companies are investing heavily in quantum computing because it has the potential to solve optimization, simulation, and cryptographic problems beyond the capability of classical computers. Although practical quantum computers are still limited by noise and hardware constraints, the field continues to grow rapidly through



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### **IMPORTANCE OF QUANTUM COMPUTING**

Quantum computing can accelerate drug discovery by simulating molecular interactions accurately, improve financial risk analysis, optimize transportation routes, strengthen artificial intelligence models, enhance climate prediction, and support advanced scientific research. It can also improve material science, manufacturing, and energy optimization. Governments and industries consider quantum technology a strategic innovation because of its ability to solve problems that require enormous computational power. Quantum computing can accelerate drug discovery by simulating molecular interactions accurately, improve financial risk analysis, optimize transportation routes, strengthen artificial intelligence models, enhance climate prediction, and support advanced scientific research. It can also improve material science, manufacturing, and energy optimization. Governments and industries consider quantum technology a strategic innovation because of its ability to solve problems that require enormous computational power.



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### **CHALLENGES IN QUANTUM COMPUTING**

Quantum computers are highly sensitive to environmental disturbances, making qubits unstable. Decoherence, quantum noise, limited qubit count, high implementation cost, cooling requirements, and error correction remain major obstacles. Building scalable and reliable quantum systems requires significant engineering advancements and continuous research. Quantum computers are highly sensitive to environmental disturbances, making qubits unstable. Decoherence, quantum noise, limited qubit count, high implementation cost, cooling requirements, and error correction remain major obstacles. Building scalable and reliable quantum systems requires significant engineering advancements and continuous research.

### **HOW TO IMPROVE QUANTUM COMPUTING**

Improvement depends on better qubit technologies, efficient quantum error correction, stable cryogenic systems, advanced quantum algorithms, improved hardware manufacturing, and collaboration between universities, governments, and technology companies. Continuous investment and research will make quantum computers more reliable and commercially useful. Improvement depends on better qubit technologies, efficient quantum error correction, stable cryogenic systems, advanced quantum algorithms, improved hardware manufacturing, and collaboration between universities, governments, and technology companies. Continuous investment and research will make quantum computers more reliable and commercially useful.

### **TYPES OF QUANTUM COMPUTING**



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Gate-based quantum computing performs logical quantum operations using quantum gates. Quantum annealing specializes in optimization problems. Trapped-ion quantum computers use electrically charged atoms as qubits. Superconducting quantum computers use superconducting circuits and are widely researched. Photonic quantum computing uses photons for information processing. Topological quantum computing aims to create fault-tolerant qubits with improved stability. Gate-based quantum computing performs logical quantum operations using quantum gates. Quantum annealing specializes in optimization problems. Trapped-ion quantum computers use electrically charged atoms as qubits. Superconducting quantum computers use superconducting circuits and are widely researched. Photonic quantum computing uses photons for information processing. Topological quantum computing aims to create fault-tolerant qubits with improved stability.

### **QUANTUM COMPUTING TECHNIQUES**

Major techniques include superposition, entanglement, quantum interference, quantum teleportation, quantum error correction, Shor's algorithm for integer factorization, and Grover's algorithm for database searching. Together these techniques enable quantum computers to outperform classical systems in selected computational tasks. Major techniques include superposition, entanglement, quantum interference, quantum teleportation, quantum error correction, Shor's algorithm for integer factorization, and Grover's algorithm for database searching. Together these techniques enable quantum computers to outperform classical systems in selected computational tasks.

### **APPLICATIONS**



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Applications include drug discovery, financial modeling, weather forecasting, artificial intelligence, machine learning, cybersecurity, cryptography, logistics optimization, smart manufacturing, and space research. Applications include drug discovery, financial modeling, weather forecasting, artificial intelligence, machine learning, cybersecurity, cryptography, logistics optimization, smart manufacturing, and space research.

### **FUTURE SCOPE**

Future quantum computers are expected to solve global scientific challenges, improve healthcare, enable secure communication, and revolutionize data processing. As hardware matures, quantum technology will become increasingly accessible across industries. Future quantum computers are expected to solve global scientific challenges, improve healthcare, enable secure communication, and revolutionize data processing. As hardware matures, quantum technology will become increasingly accessible across industries.

### **CONCLUSION**

Quantum computing represents one of the most promising technological developments of the 21st century. Although many technical challenges remain, rapid progress in quantum hardware and software indicates a bright future. Continued research, innovation, and collaboration will enable quantum computing to complement classical computing and solve previously impossible problems, benefiting science, industry, and society. Quantum computing represents one of the most promising technological developments of the 21st century. Although many technical challenges remain, rapid



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### **REFERENCES**

1. Nielsen & Chuang, Quantum Computation and Quantum Information.
2. IBM Quantum Documentation.
3. Microsoft Azure Quantum.
4. Google Quantum AI.
5. IEEE Quantum Computing Journals.