



# International Journal of Innovative Research in Science Engineering and Technology (IJIRSET)

*(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)*



**Impact Factor: 9.935**

**Volume 15, Issue 5, May 2026**

# Revolutionizing Artificial Intelligence with Quantum Computing

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**ABSTRACT:** AI has emerged as Among the most crucial technologies of the modern era, supporting applications in healthcare, finance, education, cybersecurity, and many other domains. Despite its rapid growth, traditional AI systems still face several limitations, particularly in handling extremely large datasets, performing complex computations, and optimizing high-dimensional problems efficiently. Quantum Computing founded on concepts from quantum mechanics, including entanglement and superposition, offers a new computational approach that has the capacity to address these challenges This research paper explores the concept of Combining AI and quantum computing, commonly referred to as Quantum AI, and examines how it can transform current computational capabilities. Quantum algorithms can greatly enhance machine learning processes by enabling faster data analysis, enhanced pattern recognition, and more efficient optimization techniques. The study also addresses hybrid models that incorporate classical AI systems utilizing quantum computing frameworks to achieve practical and scalable solutions. Additionally, it highlights existing challenges such as hardware limitations, error correction issues, and the early-stage nature of quantum technology. The research emphasizes that continued advancements in quantum technologies may redefine The potential for artificial intelligence, making it more powerful, accurate, and efficient in solving real-world problems.

**KEYWORDS:** Artificial intelligence, quantum machine learning, and quantum computing.

## I. INTRODUCTION

Intelligence Artificial (AI) has emerged as a revolutionary technology that enables machines to simulate human intelligence and carry out tasks including learning and reasoning, decision-making, and problem-solving. It is extensively utilized in many fields, such as education, healthcare, and finance, transportation, and cybersecurity. However, as real-world problems become more complex and data-driven, traditional AI systems face limitations in processing speed, computational power, and efficiency when handling large-scale datasets and high-dimensional models. To overcome these challenges, The use of quantum computing has gained attention as a powerful next-generation technology. Superposition and other concepts from quantum mechanics serve as its foundation and entanglement, which allow quantum systems to perform multiple computations simultaneously.

This capability makes quantum computing potentially far quicker than conventional computers for certain types of problems. Quantum computing and artificial intelligence has as led to the emerging field referred to as Quantum Artificial Intelligence (Quantum AI). This combination intends to improve machine learning algorithms, improve optimization methods, and accelerate data analysis processes Quantum AI has the capacity to resolve hard computational problems that are currently difficult or impossible for classical AI systems. This research explores how quantum computing has the potential to transform AI, its possible applications, and the issues that must be resolved for real-world implementation.

## II. LITERATURE SURVEY

### 1. Title: Opportunities and Difficulties in Quantum Artificial Intelligence Systems (2024)

Authors: L. Chen, A. Verma

Abstract: This paper discusses key challenges in Quantum AI such as hardware constraints and error correction. It also presents opportunities where systems of quantum mechanics are able to solve complex AI issues more successfully than traditional methods.

**2. Title: Hybrid Quantum-Classical Models Regarding Machine Learning Applications (2024)**

Authors: M. Johnson, S. Patel

Abstract: This research explains how combining quantum and classical models improves machine learning performance. It shows better results in classification, prediction, and optimization tasks.

**3. Title: Advances in Quantum-Enhanced Machine learning for artificial intelligence (2025)**

Authors: A. Sharma, B. Lee

Abstract: This study reviews quantum-enhanced methods for machine learning enhance artificial intelligence performance. It explains How quantum computing works by increases processing speed, improves pattern recognition, and enhances optimization. The research also highlights hybrid quantum-classical models for solving complex AI problems efficiently.

**4. Title: Quantum Machine Learning for Next-Generation Artificial Intelligence (2025)**

Authors: J. Smith, R. Kumar

Abstract: This study explores how quantum computing works improves machine learning performance by speeding data processing and enhancing AI accuracy. It highlights Quantum-classical hybrid models for better optimization and prediction in AI systems.

**5. Title: Quantum Computing Integration in Intelligent Systems: A Review (2025)**

Authors: M. Davis, S. Kumar

Abstract: This paper explores quantum computing's connection with intelligent AI systems. It shows how quantum algorithms can speed up learning and handle difficult calculations more effectively than traditional methods.

**III. METHODOLOGY****Existing Problem**

Traditional AI systems struggle with limited processing speed, high computational cost, and inefficiency in handling large and complex datasets. Additionally, they struggle with scalability. when solving advanced optimization and real-time decision-making problems, which restricts their performance in modern applications.

**Disadvantages**

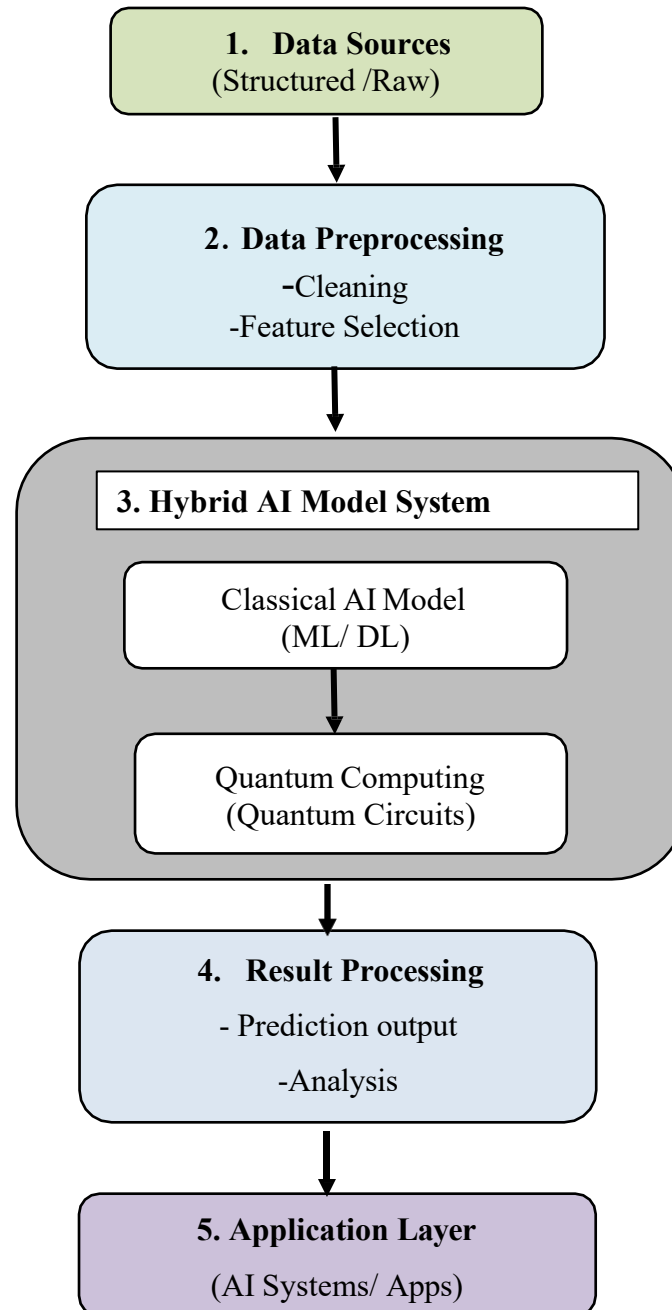
- High computational cost and heavy resource usage.
- Slow processing for complex and large datasets.
- Poor scalability in real-time applications.
- Limited efficiency in handling dynamic problems.

**Proposed Solution:**

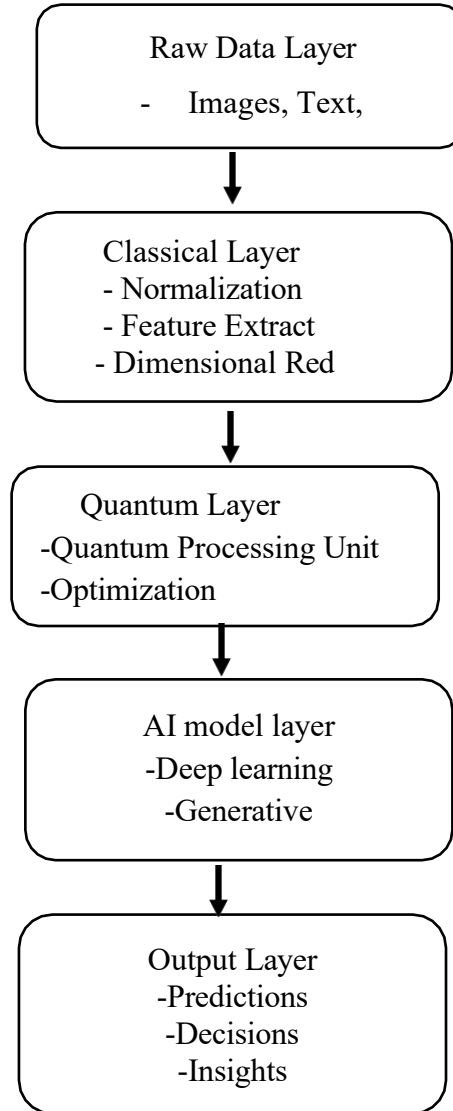
This research proposes artificial intelligence and quantum computing together to improve processing speed, accuracy, and optimization. By using quantum algorithms and hybrid models, complex data can be handled efficiently, enabling faster learning, better predictions, and improved real-time decision-making.

**Proposed Methodology**

The system collects child and maternal health parameters, preprocesses the dataset by handling missing values and normalizing features, then applies feature selection and trains machine learning models to classify risk levels and receive real-time, accurate early health risk predictions

**Fig 1: Workflow of the Proposed Methodology****IV. SYSTEM ARCHITECTURE & DESIGN**

The proposed system presents a hybrid architecture that integrates classical AI techniques utilizing quantum computing components to enhance computational efficiency, optimization, and prediction accuracy. Unlike traditional AI systems, the proposed design leverages quantum concepts to address intricate issues that are computationally expensive for classical models. This architecture is conceptual in nature and illustrates how different modules interact to form an intelligent and scalable system.



**Fig 2: Architecture of hybrid AI–Quantum system**

#### **IV. RESULTS & DISCUSSION**

The proposed hybrid system combining Artificial intelligence and quantum computing together demonstrates promising potential based on theoretical analysis. It should get better prediction accuracy, computational speed, and optimization efficiency in contrast to conventional AI models. The incorporation of quantum techniques enables better handling of complex and large-scale data, making the system more scalable and effective. Additionally, current market trends indicate rapid growth in quantum technologies, supporting the relevance of this approach. However, the results are conceptual and lack experimental validation, as practical implementation depends on developments in quantum hardware as well as integration methods, emphasizing the necessity of additional investigation in this emerging field.

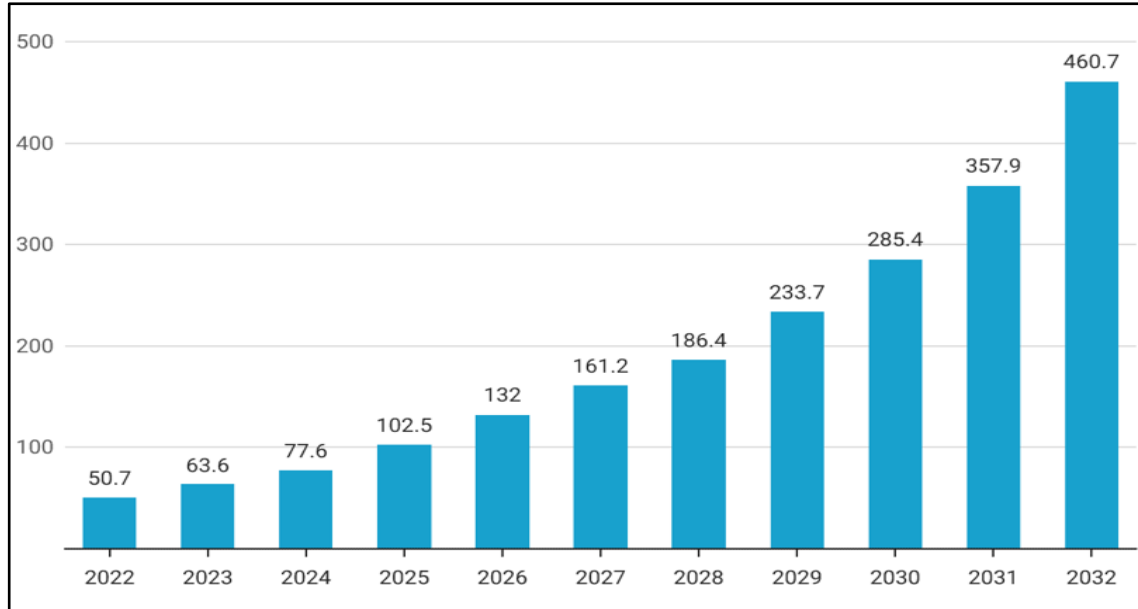


Fig 3: Revenue Growth in the Quantum Computing Market (2022–2032)

## VI. CONCLUSION

A conceptual structure that integrates artificial intelligence was offered in this research with quantum computing to deal with the shortcomings of traditional AI systems. The proposed hybrid approach highlights the possibility of improved computational efficiency, accuracy, and scalability in handling complex problems. By combining classical learning methods with quantum optimization capabilities, the system offers a forward-looking solution for next-generation intelligent applications. Although the design is theoretical and not experimentally validated, it establishes a solid basis for the future research. As quantum technologies continue to evolve, the integration with AI is expected to have a major part in advancing innovative and high-performance computing solutions.

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