

Quantum Algorithms in Machine Learning

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Abstract. This paper explores the integration of quantum algorithms into machine learning processes, showcasing their potential to exponentially speed up computations and data handling. We delve into various quantum techniques and their applicability to complex machine learning tasks, addressing both potentials and limitations. Fundamental concepts of quantum computing are introduced, followed by an analysis of quantum-enhanced machine learning models. The findings suggest that quantum algorithms can outperform classical counterparts in specific scenarios, particularly in data-intensive applications. However, practical implementations remain challenging due to current technological constraints. This study offers insights into bridging the gap between theoretical quantum algorithms and practical machine learning applications.

Keywords: quantum, machine learning, algorithms, computing, data

Introduction: The rapid advancement of machine learning technologies has revolutionized various fields, from healthcare to finance, by enabling the analysis and interpretation of vast datasets. However, as datasets continue to grow exponentially, traditional computational methods are struggling to keep pace with the demand for increased processing power and speed. Quantum computing promises a paradigm shift, offering new horizons for computing power. In this paper, we examine how quantum algorithms can be effectively integrated into machine learning models, with the goal of enhancing computational efficiency and accuracy. By leveraging the principles of quantum superposition and entanglement, these algorithms offer the potential to solve complex problems at unprecedented speeds. This paper aims to provide a comprehensive overview of recent developments in quantum-enhanced machine learning, evaluating the current state of research and its

future

trajectory.

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References

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