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Quantum Computing Applications in Cancer Diagnosis Using Medical Imaging and Bioinformatics Optimization

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Abstract:

The diagnosis of cancer through medical imaging and bioinformatics has made significant advancements in recent years, but challenges remain in terms of processing power, accuracy, and computational efficiency. This study explores the application of quantum computing techniques to optimize cancer diagnosis, specifically by enhancing medical imaging analysis and bioinformatics workflows. Quantum algorithms, including Quantum Support Vector Machines (QSVM) and Quantum Neural Networks (QNN), are applied to large datasets derived from medical imaging modalities such as MRI and CT scans, as well as genomic data. These quantum algorithms are designed to improve the accuracy of cancer detection, facilitate the analysis of complex genetic patterns, and accelerate computational processes. The results demonstrate that quantum computing outperforms traditional computing methods in terms of processing speed and accuracy, offering substantial improvements in early cancer detection and personalized treatment planning. This research suggests that quantum computing has the potential to revolutionize cancer diagnostics, paving the way for more efficient and precise healthcare solutions.

Keywords:

Quantum computing, cancer diagnosis, medical imaging, bioinformatics, optimization, medical data analysis.

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