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Jet Discrimination with Quantum Complete Graph Neural Network

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Machine learning, particularly deep neural networks, has been widely used in high-energy physics, demonstrating remarkable results in various applications. Furthermore, the extension of machine learning to quantum computers has given rise to the emerging field of quantum machine learning. In this paper, we propose the Quantum Complete Graph Neural Network (QCGNN), which is a variational quantum algorithm based model designed for learning on complete graphs. QCGNN with deep parametrized operators offers a polynomial speedup over its classical and quantum counterparts, leveraging the property of quantum parallelism. We investigate the application of QCGNN with the challenging task of jet discrimination, where the jets are represented as complete graphs. Additionally, we conduct a comparative analysis with classical models to establish a performance benchmark.

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