

New Submission for QCE24 (Poster Submissions -- deadline July 22)

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Title and Abstract

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Title: * Multi-Task Quantum Annealing for Rapid Multi-Class Classification

Abstract: * Quantum computing offers new paradigms in machine learning, notably through Quantum Annealing (QA), which offers promising approaches to optimization problems. This study introduces an application of Multi-tasking Quantum Annealing (MTQA) to enhance multi-class Support Vector Machines (SVMs). Traditional QA methods require multiple cycles to classify multi-class datasets, significantly increasing computational demands. In contrast, MTQA embeds multiple SVM classifiers in parallel on a quantum annealer, thereby reducing the number of required annealing cycles to a single cycle. Utilizing the D-Wave Advantage 6.4 system, we evaluated our method across three benchmark datasets: a synthetic dataset (Blob), subsets of handwritten digits, and the Iris dataset with different feature focuses. Our findings demonstrate that MTQA achieves accuracy equivalent to that of classical Sequential Minimal Optimization (SMO), Simulated Annealing (SA), and standard QA methods while significantly improving computational efficiency. Despite the current limitations in quantum technology and the empirical selection of model parameters, these results highlight the emergent potential of quantum computing in machine learning. Further

Keywords

Type a list of keywords (also known as key phrases or key terms), **one per line** to characterize your submission. You should specify at least three keywords.

Keywords: *

Quantum annealing, Multi-tasking Quantum Annealing (MTQA), Support Vector Machines (SVMs), Machine Learning Optimization, Quantum Computing Applications

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