Title:	The Wasserstein Distance Using QAOA:
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Abstract:	This paper examines the implementation of Topological Data Analysis methods based on Persistent Homology to meet the requirements of the telecommunication industry. Persistent Homology based methods are especially useful in detecting anomalies in time series data and show good prospects of being useful in network alarm systems. Of crucial importance to this method is a metric called the Wasserstein Distance, which measures how much two Persistence Diagrams differ from one another. This metric can be formulated as a minimum weight maximum matching problem on a bipartite graph. We here solve the combinatorial optimization problem of finding the Wasserstein Distance by applying the Quantum Approximate Optimization Algorithm (QAOA) using gate-based quantum computing methods. This technique can then be applied to detect anomalies in time series datasets involving network traffic/throughput data in telecommunication systems. The methodology stands to provide a significant technological advantage to service providers who adopt this, once practical gate-based quantum computers become ubiquitous.
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