

Quantum Computing for Air Quality Monitoring Optimization in IoT and Smart Cities Systems

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Abstract:

As urban environments face increasing challenges in managing air pollution, the integration of advanced computational paradigms is essential to enhance monitoring and decision-making processes. This study investigates the application of quantum computing for optimizing air quality monitoring systems within Internet of Things (IoT)-enabled smart cities. By leveraging the computational advantages of quantum algorithms—such as quantum annealing and quantum support vector machines—alongside real-time IoT sensor data, the proposed framework aims to improve the speed and accuracy of air pollutant detection, prediction, and spatial-temporal data processing. The hybrid architecture integrates classical and quantum computational resources to support efficient resource allocation, anomaly detection, and adaptive environmental response strategies. The results underscore the transformative potential of quantum computing in reshaping environmental intelligence infrastructures and promoting sustainable urban living.

Keywords:

Quantum computing, air quality monitoring, IoT, smart cities, environmental optimization, quantum algorithms.

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