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Quantum Computing for Water Resource Management Optimization in IoT-Based Smart Cities Systems

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Abstract:

Efficient water resource management is a cornerstone of sustainable urban development, especially in the context of rapidly expanding smart cities. This study investigates the application of quantum computing techniques to optimize water distribution and usage through IoT-enabled smart city infrastructures. By leveraging the parallelism and computational power of quantum algorithms, the system addresses complex optimization problems that arise in real-time monitoring, predictive analytics, and decision-making processes. The proposed framework integrates IoT sensors for data collection with quantum-enhanced machine learning models to dynamically allocate water resources based on demand patterns, climatic conditions, and system constraints. Simulation results demonstrate significant improvements in response time, resource allocation accuracy, and system scalability. This research highlights the transformative potential of quantum computing in enhancing the sustainability and intelligence of urban water systems.

Keywords:

Quantum computing, water management, IoT, smart cities, optimization, sustainability.

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