

IoT-Based Solutions for Real-Time Air Quality Monitoring and Optimization in Smart Cities

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Abstract:

With rapid urbanization and the growing concern over air pollution, real-time air quality monitoring has become essential for sustainable urban development. This study proposes an Internet of Things (IoT)-based framework for real-time air quality monitoring and optimization within smart city environments. By deploying a network of interconnected, low-cost air quality sensors, the system collects real-time environmental data, including particulate matter (PM_{2.5}, PM₁₀), nitrogen dioxide (NO₂), carbon monoxide (CO), and ozone (O₃) levels. Advanced data analytics powered by machine learning models are applied to analyze spatial and temporal patterns, predict pollution trends, and support decision-making for urban planning and environmental regulation. The integration of cloud computing and edge AI further enhances data processing efficiency and system scalability. The proposed solution demonstrates significant potential in enabling proactive air quality management and supporting health-conscious urban living.

Keywords:

IoT, air quality monitoring, smart cities, machine learning, environmental optimization, real-time systems

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