

Machine Learning Applications in Air Quality Monitoring Systems for Urban Smart Cities Optimization

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Abstract:

Air quality management is a vital component of sustainable urban development, particularly in the context of smart cities. This study explores the application of machine learning algorithms in enhancing the performance of air quality monitoring systems through real-time data analytics and predictive modeling. Utilizing IoT-enabled sensors distributed across urban zones, the system collects environmental data such as PM_{2.5}, PM₁₀, NO₂, and CO concentrations. Various machine learning models—including Random Forests, Support Vector Machines (SVM), and Gradient Boosting—are employed to forecast pollution levels, detect anomalies, and support decision-making processes for pollution control. The integration of these models facilitates adaptive environmental governance and targeted policy interventions. Experimental results demonstrate the system's capability to provide accurate, location-specific air quality predictions, thereby enabling more effective environmental planning and public health protection in smart cities.

Keywords:

Air quality, machine learning, smart cities, pollution monitoring, IoT, urban optimization.

REQUEST FOR FULL TEXT

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