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### Deep Learning for Optimized Air Quality Monitoring in Urban IoT-Based Smart City Frameworks

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#### Abstract:

Air pollution is a growing concern in urban environments, significantly impacting public health and environmental sustainability. This study proposes a deep learning-based framework integrated with Internet of Things (IoT) infrastructure for enhanced air quality monitoring in smart city contexts. The system utilizes distributed sensor networks to collect real-time environmental data such as particulate matter (PM2.5, PM10), nitrogen dioxide (NO<sub>2</sub>), and carbon monoxide (CO) which is then processed using advanced deep neural networks including convolutional neural networks (CNNs) and long short-term memory (LSTM) models. These models improve the accuracy of pollution level predictions, anomaly detection, and spatial-temporal forecasting. Moreover, the framework supports adaptive learning for dynamic environmental conditions and supports decision-making for municipal planning and public health interventions. Results show a marked improvement in detection precision, responsiveness, and scalability, positioning the proposed solution as a pivotal tool in future smart city infrastructure.

### **Keywords:**

deep learning, air quality monitoring, IoT, smart cities, environmental sensing, pollution prediction

# **REQUEST FOR FULL TEXT**

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