Eco Predict: AI-Based Air Quality Insights

Publisher: IEEE

Cite This

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Abstract:
Air pollution poses a significant threat to global human health, ecosystems, and the climate, maintaining its status as one of the most pressing environmental challenges. Rapid urbanization, along with emissions from vehicles and industrial activities, contributes to high concentrations of pollutants such as PM2.5, SO2, and O3—key factors in the rise of respiratory and cardiovascular diseases. Traditional air quality monitoring methods, which rely on fixed physical sensors, are often limited in geographic coverage, scalability, and predictive capability. Eco Predict addresses these limitations using machine learning techniques, including random forests, support vector machines, and deep neural networks. These models are further enhanced by integrating feature selection methods and Gravitational Search Optimization to improve accuracy and efficiency. Internet of Things (IoT) devices are utilized to collect real-time pollution data, which is transmitted for analysis and presented via