

Smart Cities Infrastructure Optimization Through Machine Learning Applications in CO₂ Emission Reduction

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Abstract:

Urban infrastructure plays a pivotal role in contributing to greenhouse gas emissions, particularly CO₂, making emission mitigation a priority in smart city development. This research presents a machine learning-driven framework to optimize smart city infrastructure for effective CO₂ emission reduction. By integrating data from traffic systems, energy grids, environmental sensors, and public transport networks, various supervised and unsupervised machine learning models—such as random forests, support vector machines (SVM), and k-means clustering—are employed to identify emission hotspots and inefficiencies in resource utilization. Predictive analytics support real-time decision-making for energy distribution, traffic flow control, and urban planning strategies aimed at minimizing carbon output. The results show that the proposed framework enables intelligent, adaptive control mechanisms that significantly lower emissions and enhance urban sustainability.

Keywords:

Smart cities, machine learning, CO₂ emission reduction, infrastructure optimization, urban sustainability, predictive analytics.

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