Machine Learning-Driven Optimization for Sustainable Smart City Infrastructure Development

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Abstract

The rapid urbanization and the growing need for sustainable development have driven the adoption of smart city technologies. This paper presents a comprehensive study on the implementation of machine learning algorithms to optimize infrastructure development in smart cities. The primary objective is to enhance resource efficiency, reduce environmental impact, and improve the quality of urban life. The methodology involves collecting and analyzing large datasets from various urban systems, including transportation, energy consumption, and waste management. Advanced machine learning models, such as neural networks and reinforcement learning, are employed to identify patterns and predict future urban trends. The results demonstrate significant improvements in energy efficiency, traffic management, and waste reduction. Case studies from multiple cities showcase successful applications and highlight the potential for scalability. The conclusion emphasizes the importance of integrating machine learning with urban planning to achieve sustainable smart cities. Future research directions include exploring more robust algorithms and expanding the data sources to further enhance the optimization process.

Keywords

Smart City, Machine Learning, Sustainable Development, Infrastructure Optimization, Urban Planning, Neural Networks, Energy Efficiency, Traffic Management