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Neural Network Applications in CO_2 Emission Reduction Through Smart Cities Energy Optimization Techniques

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Abstract:

Urban CO_2 emissions represent a major challenge to global climate sustainability, particularly within the rapidly expanding infrastructure of smart cities. This study explores the application of neural networks to optimize energy consumption and reduce CO_2 emissions through intelligent urban energy management systems. A multilayered data acquisition framework collects energy usage, traffic flow, weather patterns, and environmental sensor data across city sectors. Neural network models—such as multilayer perceptrons (MLPs) and long short-term memory (LSTM) networks—are employed to predict emission trends, identify inefficiencies, and recommend optimization strategies. The system integrates with IoT-based energy infrastructure to enable real-time adaptive control of lighting, heating, and transportation systems. Simulation results indicate a substantial reduction in emissions and improved energy efficiency, providing a scalable and intelligent approach to environmental sustainability in smart urban ecosystems.

Keywords:

CO_2 emissions, neural networks, smart cities, energy optimization, environmental sustainability, IoT.

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