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Optimization of IoT-Based Energy Systems in Smart Cities Using Machine Learning Algorithms

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Abstract:

The integration of Internet of Things (IoT) technologies in smart cities has revolutionized energy management by enabling real-time monitoring and control of energy systems. This study explores the application of machine learning algorithms to optimize IoT-based energy systems in urban environments. The research investigates various machine learning models, such as supervised learning, reinforcement learning, and deep learning, to predict energy consumption patterns, optimize load distribution, and enhance the efficiency of renewable energy integration. By using IoT-enabled sensors to collect real-time data on energy usage, weather conditions, and grid performance, the system dynamically adjusts energy flows, reducing waste and maximizing sustainability. Simulation results demonstrate significant improvements in energy efficiency, cost reduction, and system stability. The proposed machine learning-driven approach provides a scalable, intelligent solution for managing energy systems in smart cities, aligning with sustainability and carbon reduction goals.

Keywords:

IoT-based energy systems, smart cities, machine learning, optimization, renewable energy, sustainability.

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