

Machine Learning Optimization for Sustainable Energy Management in IoT-Based Renewable Energy Grid Systems

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Abstract:

The increasing integration of renewable energy sources into power grids demands advanced energy management solutions to ensure sustainability and efficiency. This study presents a machine learning-based optimization framework designed for IoT-enabled renewable energy grid systems. The proposed model utilizes real-time data collected from distributed IoT sensors across solar, wind, and storage infrastructures to forecast energy production and consumption patterns. Various machine learning algorithms—such as Support Vector Regression (SVR), Long Short-Term Memory (LSTM) networks, and ensemble learning methods—are employed to enhance predictive accuracy and grid stability. Furthermore, optimization techniques are applied to balance energy load, reduce system losses, and improve resource allocation. The results demonstrate significant improvements in energy efficiency and operational resilience, supporting smart grid development and sustainable urban energy strategies.

Keywords:

Machine learning, sustainable energy, IoT, renewable energy grid, energy management, smart grid optimization.

REQUEST FOR FULL TEXT

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