Journal of Computer Science and Information Systems,

ISSN 2535-1451

Feature Selection Optimization in Renewable Energy Grid Management Using Machine Learning Algorithms

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Abstract:

Effective management of renewable energy grids is critical for ensuring a stable, sustainable energy supply, especially with the increasing integration of renewable sources such as solar and wind energy. This study investigates feature selection optimization techniques applied to renewable energy grid management through machine learning algorithms. The research focuses on identifying and selecting the most relevant features from large datasets generated by energy sensors, grid controllers, and weather forecasts. By leveraging machine learning algorithms, including Random Forest, Support Vector Machines (SVM), and Gradient Boosting, the study optimizes the grid's energy distribution and load balancing while improving grid reliability and efficiency. Feature selection methods such as Recursive Feature Elimination (RFE) and Mutual Information (MI) are used to reduce dimensionality, minimize computational complexity, and enhance the performance of predictive models. The results show that the optimized machine learning models, powered by carefully selected features, significantly improve the forecasting accuracy and operational efficiency of renewable energy grids, leading to better integration of renewable resources and optimized energy consumption.

Keywords:

Feature selection, renewable energy, grid management, machine learning, optimization, predictive modelling.

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