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Electricity Load and Price Forecasting Using Deep Learning: A Hybrid LSTM Approach

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Abstract: *Currently, the electricity market is characterized by much volatility in electric load and prices due to a higher penetration of renewable energy sources, smart grid technologies, and market deregulation. Conventional forecasting models such as ARIMA and exponential smoothing have been challenged to capture the dynamic nonlinearities and long-term dependencies present in the load and price time series. This paper introduces a novel hybrid forecasting model based on deep Long Short-Term Memory networks combined with an attention mechanism. By leveraging historical load and price data while incorporating external factors like weather and economic indicators, our model adequately captures both the short-term oscillations and long-term trends. Through extensive experiments on datasets from several regions, a large reduction in forecasting errors, as measured by Mean Absolute Percentage Error and Root Mean Squared Error, is observed. The proposed approach allows for greater grid stability, better resource allocation, and improved strategic decision-making among stakeholders in the energy market.*

Keywords: Electricity forecasting, deep learning, LSTM, attention mechanism, time-series prediction, renewable energy, energy management

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