

Comparison of Classical and AI-Based Methods for Short-Term Hourly Electricity Demand Forecasting in Türkiye

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Abstract

Accurate short-term electricity demand forecasting is essential for balancing supply and demand, reducing operating costs, and improving system reliability. This study analyzes hourly nationwide electricity consumption data from Energy Exchange Istanbul (EXIST) for the 2021–2025 period. It compares classical time series, machine learning, and deep learning models within a common chronological evaluation framework. The motivation of the study is that many previous studies use different data partitions and report model performance mainly through error metrics, which makes direct comparison difficult. To provide a more transparent benchmark, we split the dataset by time: the last 14 days for validation and the last 30 days for testing, with the remaining observations used for training. Model performance is evaluated using MAE, RMSE, MAPE, and sMAPE, and the ranking of competing models is further examined with the Diebold–Mariano test. Results show that the XGBoost-Full model, enriched with calendar and periodic features, achieves the strongest and most statistically reliable performance. The findings highlight that effective feature engineering and a transparent evaluation protocol can be more decisive than model complexity alone.

Keywords

Electricity Demand Forecasting, EXIST, XGBoost, LSTM, Diebold–Mariano Test.