Model Peramalan Konsumsi Listrik Harian Bandar Udara Menggunakan Metode Analisa Deret Waktu dan Deep Learning = Forecasting Model of Daily Electricity Consumption At Airport Using Time Series Analysis and Deep Learning Methods

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Abstrak

Peramalan beban listrik, juga dikenal sebagai Probabilistic Load Forecasting (PLF), memiliki peran penting dalam industri tenaga listrik, terutama dalam merencanakan operasi sistem tenaga, menjaga stabilitas, dan memfasilitasi perdagangan energi. Di Bandar Udara Internasional Soekarno-Hatta yang merupakan sebuah entitas komersial besar, peramalan yang akurat dan andal sangat penting untuk optimalisasi layanan, kepatuhan terhadap regulasi dan meningkatkan akurasi perencanaan konsumsi energi. Tujuan penelitian ini adalah menentukan model peramalan yang akurat untuk digunakan di Bandar Udara Internasional Soekarno-Hatta. Dalam penelitian ini, empat model berbeda diuji: Seasonal Autoregressive Integrated Moving Average (SARIMA), Seasonal Autoregressive Integrated Moving Average with Exogenous (SARIMAX), serta dua model berbasis neural network, yaitu Long Short-Term Memory (LSTM) dan Gated Recurrent Units (GRU). Kemudian model ini diterapkan pada data historis harian yang dikumpulkan dari perusahaan operator bandar udara dengan rentang waktu 01 Januari 2022 hingga 31 Desember 2022. Hasil penelitian menunjukkan bahwa model LSTM mencapai performa terbaik dalam melakukan peramalan, dengan Mean Absolute Error (MAE) 12.79, Root Mean Square Error (RMSE) 15.47, dan Mean Absolute Percentage Error (MAPE) 1.91%. Sehingga berdasarkan hasil penelitian, model LSTM dapat digunakan untuk meningkatkan akurasi perencanaan konsumsi listrik harian di Bandar Udara Internasional Soekarno-Hatta dan fasilitas serupa lainnya.

.....Electric load forecasting, also known as Probabilistic Load Forecasting (PLF), plays a crucial role in the electricity industry, particularly in planning power system operations, maintaining stability, and facilitating energy trading. At Soekarno-Hatta International Airport, which is a large commercial entity, accurate and reliable forecasting is essential for service optimization, regulatory compliance, and improving the accuracy of energy consumption planning. The aim of this study is to identify an accurate forecasting model to be used at Soekarno-Hatta International Airport. In this study, four different models were tested: Seasonal Autoregressive Integrated Moving Average (SARIMA), SARIMA with Exogenous (SARIMAX), and two neural network-based models, Long Short-Term Memory (LSTM), and Gated Recurrent Units (GRU). The models were subsequently utilized on the daily historical data gathered by the airport operating firm from January 1, 2022, to December 31, 2022. The research findings demonstrated that the LSTM model was the most effective in terms of forecasting performance, with Mean Absolute Error (MAE) of 12.79, Root Mean Square Error (RMSE) of 15.47, and Mean Absolute Percentage Error (MAPE) of 1.91%. Therefore, based on the research findings, the LSTM model can be used to improve the accuracy of daily electricity consumption planning at Soekarno-Hatta International Airport and other similar facilities.