ABSTRACT

Forecasting electricity production has an important role in overcoming instability in electricity supply, especially in the context of Solar Power Plants (SPP) which are highly dependent on sunlight. Accurate SPP forecasting can increase the efficiency of electricity supply stability and reduce high operational costs. One of the main challenges in estimating Solar Electricity Production lies in selecting appropriate input features in a deep learning model. External parameters such as different weather conditions play an important role in influencing the availability of electricity in SPP. Therefore, this research focuses on exploring weather parameters and engineering features to determine parameters that can influence electricity production in Solar Power Plants. In addition, to support research, the Bi-directional Long Short-Term Memory (BiLSTM) deep learning model is used to design electricity production in SPP. Apart from exploring weather parameters, this research also adds feature engineering techniques to add features using Fourier Signal Decomposition (FD) and Attention Layers to each deep learning model with the aim of improving the performance of forecasting models in SPP. The research results show that feature engineering techniques with Fourier Signal Decomposition can significantly improve model performance in predicting electricity production in Solar Power Plants. This is also supported by appropriate weather parameters because electricity production at Solar Power Plants depends on highly correlated weather parameters. The addition of the Attention Layer mechanism has a significant impact if the input parameters have good quality. The BiLSTM with Attention model produces the best model with an R-Squared (R^2) value of 0.856, Mean Absolute Error (MAE) of 17.592, and Root Mean Square Error (RMSE) of 32.631.

Keywords: Fourier Transform, Feature Engineering, Solar Power Plant, Deep Learning, Forecasting Solar Electricity Production