Futuristic deep learning algorithm for long term solar power prediction

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Abstract

Prediction of solar output power is a valuable research work for analyzing photovoltaic(PV) power. This study develops a futuristic deep-learning algorithm that predicts solar power output. The solar output data is collected in real-time for a series-parallel combination of PV systems with a 1 KW capacity that is available in our laboratory. The collected data is pre-processed via, initialization, normalization, and validation for accurate prediction. The normalization process is used to create the data set needed to fill in the missing values. The k-nearest neighbor (KNN) algorithm and the interpolation method are used to fill in the missing value. Then, the data is validated using a newly proposed deep long short-term memory (DLSTM) algorithm for solar output power prediction. Also as a new approach, the DLSTM algorithm and a recurrent neural network (RNN) are combined with the capture of time-series data in the validation process to improve the prediction accuracy. To prove its superiority, the proposed DLSTM-RNN model is compared with other exciting models, like the artificial neural network (ANN), long-short-term memory (LSTM), and recurrent neural network (RNN). All the models are trained and tested using three different activation functions viz Sigmoid, ReLU, and tanh with different epoch values. Finally, the accuracy is evaluated in terms of different performance error indexes, such as the basic error index (BEI) and the promoting percentage error index (PPEI).

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