DEEP LEARNING APPROACH AND TIME SERIES TO FORECASTING HOURLY SOLAR IRRADIANCE – CASE STUDY RIYADH PROVINCE, SA

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Abstract - The application of flat plate solar dryer for drying agricultural products is dependent on solar energy, which is unobtainable during the night-time or in some places. As such, accurate hourly Solar Irradiance forecasting will be highly valuable in implementing, designing, sizing, and performances analysis of solar running systems. Deep Learning (DL) has been highly common for such jobs. In this paper, several deep neural networks (DNN) models for prediction hourly Solar Irradiance are established and investigated. The considered DNN models include long-short-term memory (LSTM) and onedimensional convolutional neural network (CNN). A dataset of hourly Solar Irradiance recordings collected during January 1, 2010, to December 31, 2020, is used to build and assess the DNN-based models. The parameters affecting the accuracy of the models have been also deeply analyzed. The historical values hourly Solar Irradiance air temperature, wind speed, wind direction, atmospheric pressure and relative humidity have been used to develop the DNN-based. DL toolbox associated with MATLAB have been used to develop and compare the forecasting models. The evaluation indices such as correlation coefficient (r), Mean Absolute Percent Error (MAPE), Mean Absolute Error (MAE), and standard deviation are acquired to evaluate the performance of the prediction models. The obtained results showed that the DNN models have offered generally good performances.

Keywords - Deep learning, LSTM, CNN, Solar radiation