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Comparative Analysis of MLP and CNN-LSTM Models for Solar Power Generation Forecasting
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Abstract
Solar energy, a cornerstone of renewable energy, for optimal grid integration and management, requires precise forecasting. Photovoltaic (PV) forecasting must be accurate to ensure energy stability and maximize resource utilization. This study compares Multi-Layer Perceptron (MLP) and Convolutional Neural Network-Long Short-Term Memory (CNN-LSTM) models for forecasting solar power generation. Both models were trained with 13 features using an open-source dataset from 10 PV sites in Hebei Province, China, spanning 300 days (2018-07-01 to 2019-06-13). The CNN-LSTM was configured with 50 epochs and particular hyperparameters. CNN-LSTM demonstrated superior performance, with Mean Absolute Error (MAE), Mean Squared Error (MSE), and Root Mean Squared Error (RMSE) values of 0.088, 0.051, and 0.227 versus MLP's 0.260, 0.156, and 0.395. The findings demonstrate CNN-LSTM's potential for enhancing solar power forecasting and facilitating the management of renewable energy sources. © 2023 IEEE.

Author Keywords
Convolutional Neural Network; Long Short-Term Memory; Multi-Layer Perceptron; Photovoltaic dataset; renewable energy management; Solar power forecasting

Index Keywords
Brain, Convolution, Convolutional neural networks, Errors, Forecasting, Mean square error, Multilayer neural networks, Solar energy, Solar energy conversion, Solar power generation; Convolutional neural network, Memory modeling, Multilayer perceptrons neural networks (MLPs), Multilayers perceptrons, Photovoltaic dataset, Photovoltaics, Power forecasting, Renewable energies, Renewable energy management, Solar power forecasting; Long short-term memory

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