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# Prediction of Wind Speed, Potential Wind Power, and the Associated Uncertainties for Offshore Wind Farm Using Deep Learning 🛒

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## Abstract

Floating offshore wind turbines hold great potential for future solutions to the growing demand for renewable energy production. Thereafter, the prediction of the offshore wind power generation became critical in locating and designing wind farms and turbines. The purpose of this research is to improve the prediction of the offshore wind power generation by the prediction of local wind speed using a Deep Learning technique. In this paper, the future local wind speed is predicted based on the historical weather data collected from National Oceanic and Atmospheric Administration. Then, the prediction of the wind power generation is performed using the traditional methods using the future wind speed data predicted using Deep Learning. The network layers are designed using both Long Short-Term Memory (LSTM) and Bi-directional LSTM (BLSTM), known to be effective on capturing long-term time-

dependency. The selected networks are fine-tuned, trained using a part of the weather data, and tested using the other part of the data. To evaluate the performance of the networks, a parameter study has been performed to find the relationships among: length of the training data, prediction accuracy, and length of the future prediction that is reliable given desired prediction accuracy and the training size.

**Volume Subject Area:**  Renewable Energy Systems
**Keywords:**  offshore wind energy, energy, neural network, long-short-term memory
**Topics:**  Ocean engineering, Uncertainty, Wind farms, Wind power, Wind velocity

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