عنوان مقاله:

Novel Deep Learning Model for Predicting Wind Velocity and Power Estimation in Advanced INVELOX Wind Turbines

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خلاصه مقاله:

Wind energy is a renewable energy source that has grown rapidly in recent decades. This energy is converted into electricity using advanced INVELOX wind turbines. However, the wind velocity is critical, and predicting this velocity in real-time is challenging. As a result, a deep learning (DL) model has been developed to predict the velocity in advanced wind turbines using a novel enhanced Long Short-Term Memory (LSTM) model. The LSTM enhancement is executed by employing the Black Widow optimization with Mayfly optimization in the Python platform as application software. The dataset has been prepared using Ansys Fluent fluid flow analysis. In addition to that, the wind turbine power generation was computed analytically. A subsonic wind tunnel test is also performed by employing a ۳-Dimensional printed physical model to validate the simulation dataset for this innovative design. The proposed MFBW-LSTM model (Enhanced LSTM with BWO and MFO) predicts efficiently, with an accuracy of ۹۵.۳۴%. Furthermore, the performance of the proposed model is compared to LSTM, BW-LSTM, and MF-LSTM. Accuracy, MAE, MAPE, MSE, and RMSE are among the performance criteria the proposed DL model achieves efficiently. As a result, the proposed DL model is best suited for velocity prediction of an Advanced INVELOX wind turbine in various cross sections with high accuracy.

کلمات کلیدی:

Deep Learning, Advanced INVELOX Wind Turbine, Long Short-Term Memory, Black Widow optimization, Mayfly Optimization, Python, Velocity Prediction

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