Modelling of wake velocity and turbulence intensity of a wind turbine using machine learning algorithms

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Abstract

In this talk, three machine learning (ML) algorithms viz. Support Vector Regression (SVR), Artificial Neural Networks (ANN), and Extreme Gradient Boosting (XGBoost) are implemented to predict wake velocity and turbulence intensity from a wind turbine at different downstream distances. To this end, a set of high-fidelity numerical simulations are performed for the NREL Phase VI wind turbine to produce training and test datasets for the three machine learning algorithms. Using the trained model, the wake flow field downstream of the blade and turbulence intensity are predicted on the test datasets which are hidden from the trained model. The prediction of wake velocity deficit and turbulence level in the wake from the machine learning algorithms are commensurate to the Computational Fluid Dynamics (CFD) simulations while running as fast as low-fidelity wake models. The wake velocity and turbulence intensity obtained from the ML models are also compared with some of the analytical wake models. The results reveal that machine learning-based algorithms can approximate wake and turbulence intensity characteristics better than the traditional analytical wake models**.**

Keywords: *Wake velocity, turbulence intensity, Support Vector Regression (SVR), Artificial Neural Networks (ANN), eXtreme Gradient Boosting (XGBoost)*

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Short biography

Eddie is elected as:
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He has published numerous papers in SCI-IF int. journal (430); int. conf. proceedings (130), textbook chapters (>105) and others (32) over the 29 years. Co-edited 14 books in STEM areas.
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