LITERATURE SURVEY

PAPER TITLE : Predicting the energy output of wind turbine based on weather condition Features.

1) Forecasting of Wind Turbine Output Power Using Machine learning.

AUTHOR: Waqar Haider

Published In: September 2020.

Most of the countries around the world are facing huge environmental impact, and the most promising solution to mitigate these is the use of renewable energy, especially wind power. Though, the use of offshore wind energy is rapidly increasing to meet the elevating electricity demand. The researchers and policymakers have become aware of the importance of providing near accurate prediction of output power. Wind energy is tied to variabilities of weather patterns, especially wind speed, which are irregular in climates with erratic weather conditions. In this paper, we predicted the output power of the wind turbines using the random forest regressor algorithm .The SCADA data is collected for two years from a wind farm located in France. The model is trained using the data from 2017. The wind direction, wind speed and outdoor temperature are used as input parameters to predict output power. We test our model for two different capacity factors. The estimated mean absolute errors for the proposed model in this study were 3.6% and 7.3% for 0.4 and 0.2 capacity factors, respectively. The proposed model in this study offers an efficient method to predict the output power of wind turbine with preferably low error.

2) Anomaly Detection of Wind Turbine Gearbox based on SCADA Temperature Data using Machine Learning.

AUTHOR: Haroon Rashid

Published In: January 2021

Wind energy is becoming an essential source of power for countries which have the aim to reduce greenhouse gases emission and mitigate the effects of

global warming. The Wind Turbines (WTs) installed around the globe is increasing significantly every year. The dramatic increase in wind power has encountered quite a few challenges, among which the major issues are availability and reliability. The unexpected failure in WTs Gearbox (GB) ultimately increases the Operation and Maintenance (O&M) cost. The identification of faults in the earlier stages before it turns to catastrophic damage to other components of WT is crucial. This research deals with the prediction of WT failures by using a Supervisory Control and Data Acquisition (SCADA) system. The main aim is to forecast the temperature of the WTs GB to predict the impending overheating of the GB at an early stage. The earlier prediction will help to optimize the maintenance period and to save maintenance expenses and, even more important, generate warnings in due time to avoid major damages or even technical disasters. In the proposed method we compared six different machine learning (ML) models based on error and accuracy of prediction. The bagging regressor is the best ML model, which results in the mean square error of 0.33 and R of 99.8 on training data. The bagging regressor is then used to predict the fault in the WT GB, which detected the anomalous behaviour of WT GB 59 days earlier than the actual failure. This model also detects the extremely unusual behaviour of the GB 9 days earlier than a complete failure.

3) Forecasting Wind Power from Multiple Numerical Weather Prediction

AUTHOR: Abiodun Olaoye

Published In: Jul 27, 2020

with renewed interest in wind energy production in the United States and across Europe, it is timely to revisit important factors such as variability and predictability of the renewable energy resource. A dependable energy resource needs to have low variability and high predictability. While moderate variation is tolerable, poor predictability is unacceptable and can result in huge revenue loss. Wind energy variability is due to strong dependence on weather which changes during the course of the day and seasonally. So, accurate weather prediction is necessary to achieve useful wind power forecast .It is well known

that accuracy of weather predictions improves with shorter forecast horizon. In addition, combining predictions from models using different numerical techniques can be beneficial. Hence, wind farms rely on multiple sources of weather predictions across models generated at different time of day or day of week. Although weather cannot be controlled, the wind industry can tap into the advancement of artificial intelligence technologies to improve predictability of the energy resource.

4) Current advances and approaches in wind speed and wind power forecasting for improved renewable energy integration

AUTHOR : Madasthu Santhosh, Chintham Venkaiah, D.M. Vinod

Wind power is playing a pivotal part in global energy growth as it is clean and pollution-free. To maximize profits, economic scheduling, dispatching, and planning the unit commitment, there is a great demand for wind forecasting techniques. This drives the researchers and electric utility planners in the direction of more advanced approaches to forecast over broader time horizons. Key prediction techniques use physical, statistical approaches, artificial intelligence techniques, and hybrid methods. An extensive review of the current forecasting techniques, as well as their performance evaluation, is here presented. The techniques used for improving the prediction accuracy, methods to overcome major forecasting problems, evolving trends, and further advanced applications in future research are explored.

5) Short-Term Prediction Of Wind Power Considering the Fusion of Multiple Spatial and Temporal Correlation Features

AUTHOR : Fangze Wu , Mao Yang , Chaoyu Shi

Published In : 27 April 2022

As the wind power penetration increases, the short-term prediction accuracy of wind power is of great importance for the safe and cost-effective operation of the power grid in which the wind power is integrated. Traditional wind farm power prediction uses numerical weather prediction (NWP) information as an important input but does not consider the correlation characteristics of NWP information from different wind farms. In this study, a convolutional neural network–long short-term memory based short-term prediction model for wind farm clusters is proposed. Additionally, a feature map is established for multiposition NWP information, the spatial correlation of NWP information from different wind farms is fully explored, and the feature map is trained using the spatiotemporal model to obtain the short-term prediction results of wind farm clusters. Finally, as a case study, the operational data of a wind farm cluster in China are analyzed, and the proposed model outperforms traditional short-term prediction methods in terms of prediction accuracy.