

Wind AI Forecast

Resilient Saturdays AI Team
Wind Energy Challenge
Adaptation



Waif

Improving energy supply

Context

Wind power dominates growth of world's energy sector. As well, wind is one of the fastest growing renewable energy sources of electricity in Canada.

Problem

Due to the natural and *anthropogenic* variability of wind, the integration of wind energy into electrical power systems is challenging due its intermittency. One approach to deal with wind intermittency is forecasting future values of wind power production.

Solution

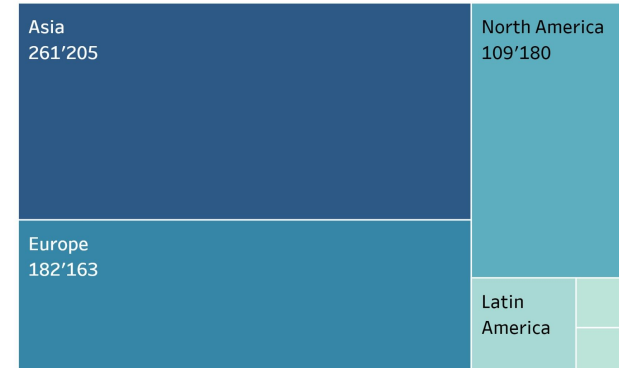
Develop an artificial neural network to improve wind speed and wind power production forecasting.

Impact

Improve energy supply for a market for which demand is increasing.

GLOBAL WIND INSTALLATIONS

Total Installed Capacity by Sub-/Continent
[MW]

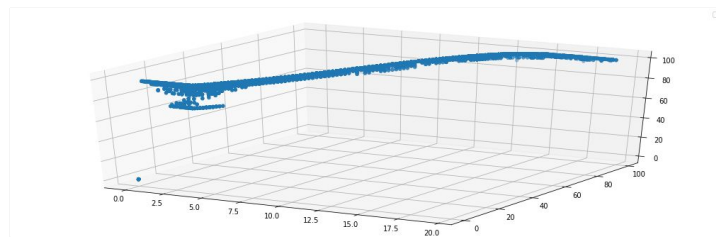
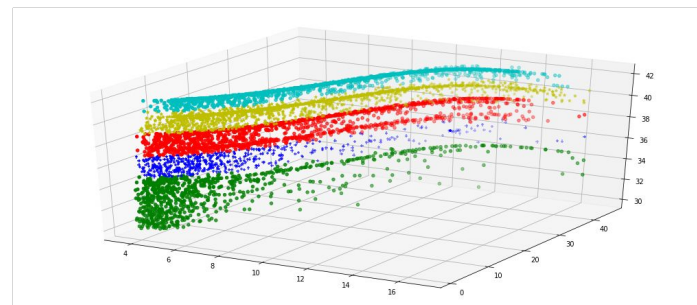
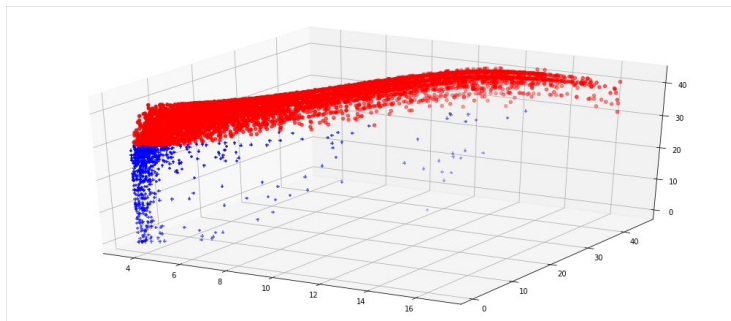
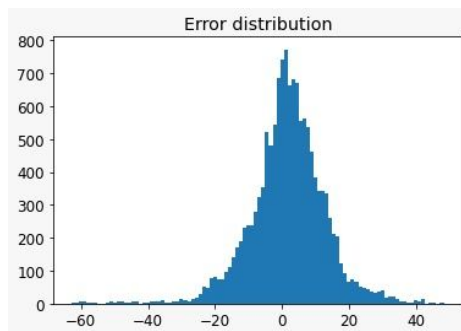
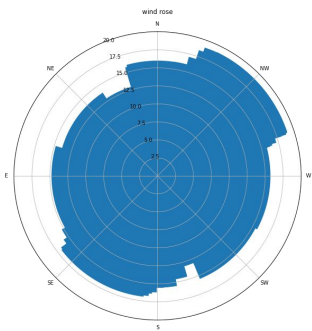


Data analysis and modeling

1. Data ingestion
2. EDA (data visualization, NaN)
3. Data preparation (interpolation for raw data, calm winds)
4. Train and model testing

Features:

- **Model 1:**
Input: year, month, day hour, minute, availableMW, windspeed, windPower, windDic, WSF_int
Output: wind power production
- **Model 2:**
Input: year, month, day hour, minute, availableMW, windspeed, windPower, windDic, WSF_int, lag
Output: wind power production



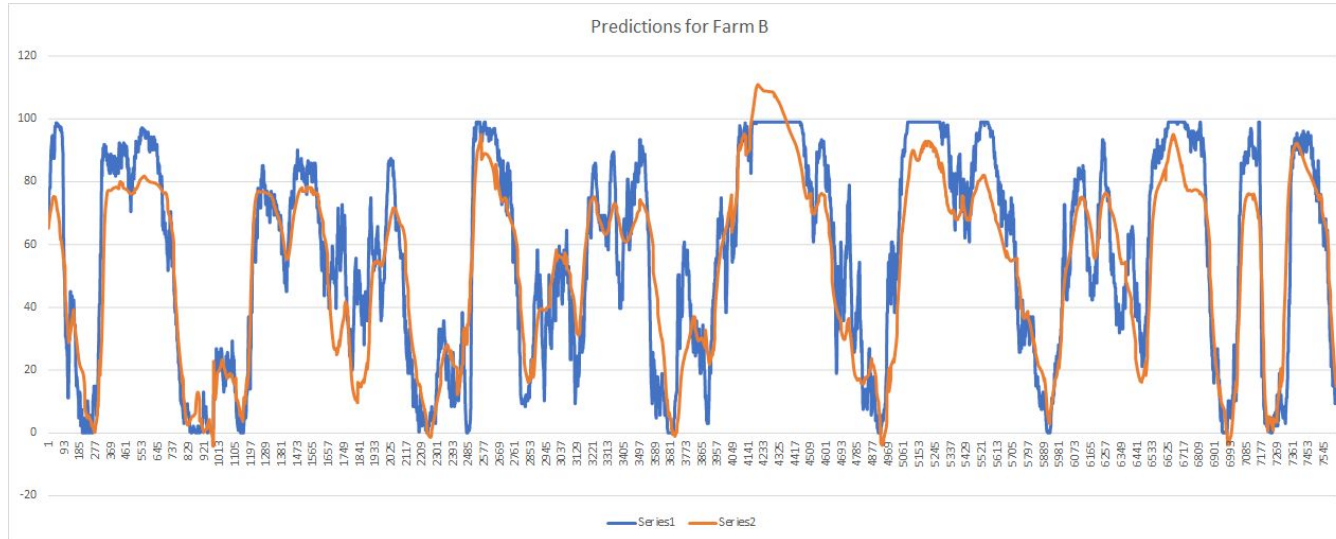
Results with the AI applied

- Artificial neural network with two layers
- 11 Feature
- MSE: 11.99
- Benefits:
 - Transfer learning to include new farms
 - Quick training
 - Only weather forecast information needed

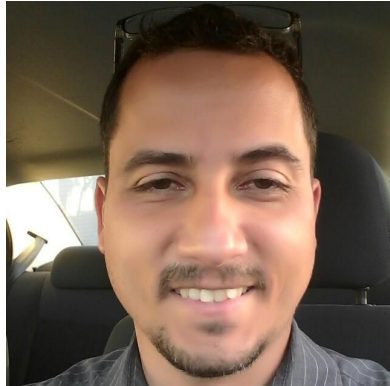
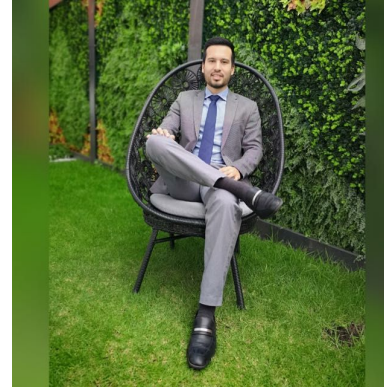
Applications

The forecast technique is beneficial for farms in several ways:

1. It will reduce maintenance costs as farm owners will know whether it is good time for maintenance
2. Everybody could use the model to determine if a location is good for building a new farm
3. A new farm owner could receive high quality forecasts with little data.



Group members





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