



# Wind Power Predictive Modeling

Final Project for **Ironhack** Bootcamp

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Goal



Weather  
conditions



Wind Farm



Power  
Production



Improve the **planning** and **management** of the integration of renewable energy into the grid.

Predict the **excess** energy production and then **optimize** the energy storage system to store that excess energy for future use, and vice versa.



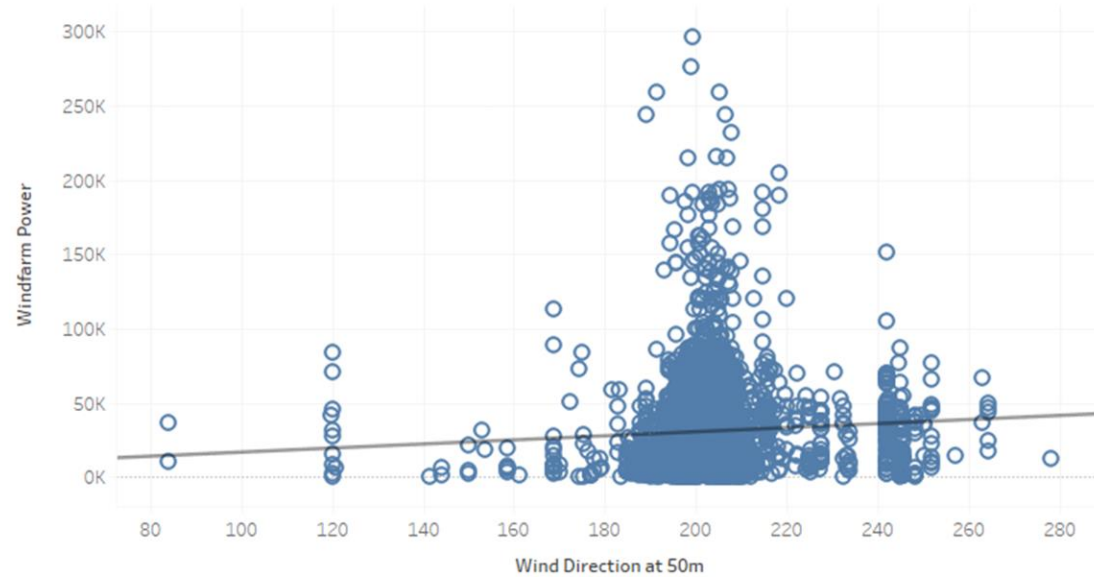
A landscape photograph featuring five white wind turbines positioned across a series of rolling green hills. The hills are covered in lush grass and show signs of erosion with visible ridges and valleys. In the background, there are more distant hills and a sky filled with soft, white clouds. The overall scene conveys a sense of clean, renewable energy in a natural setting.

# Data Insights

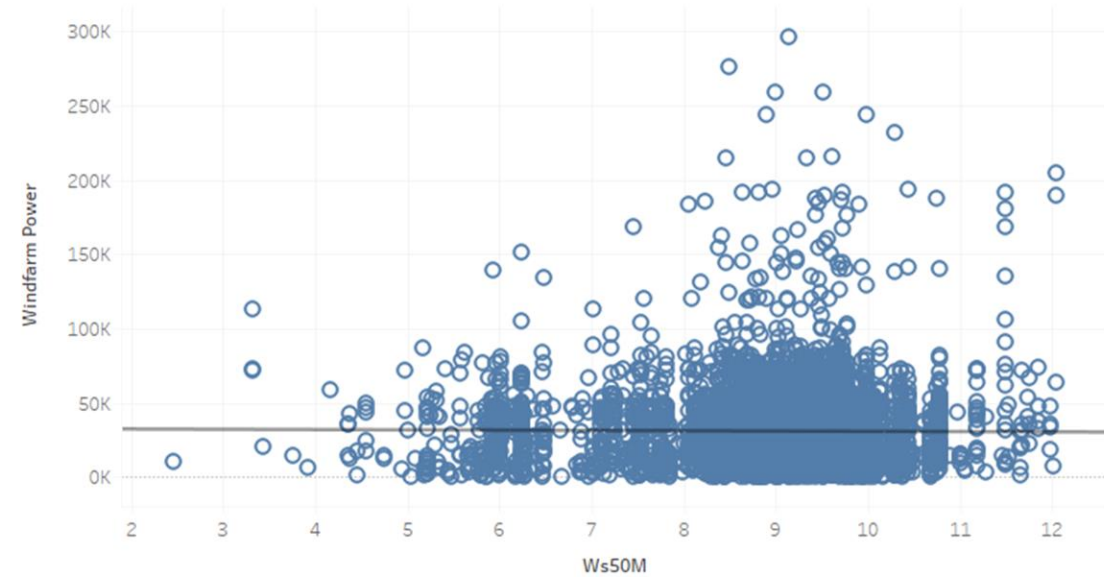


# Scraped Wind Farm Data Statistics

Scatterplot of Wind Direction (50m) and Windpower



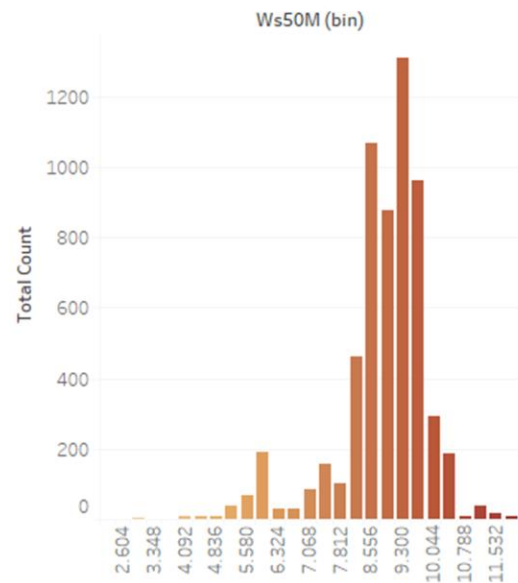
Scatterplot of Wind Speed (50m) and Windpower



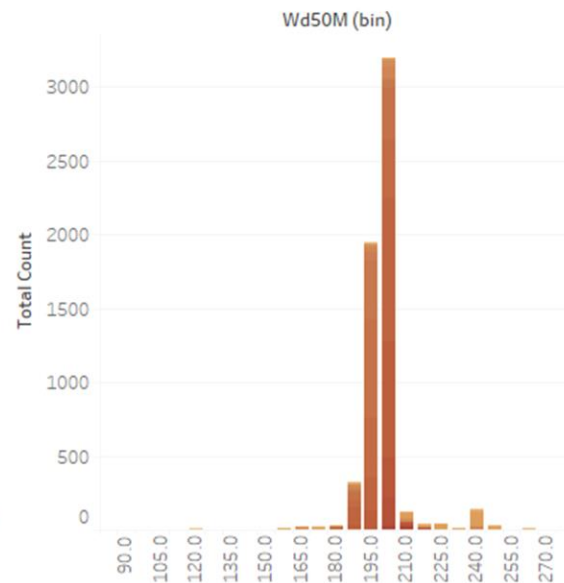
Ws50M (bin)



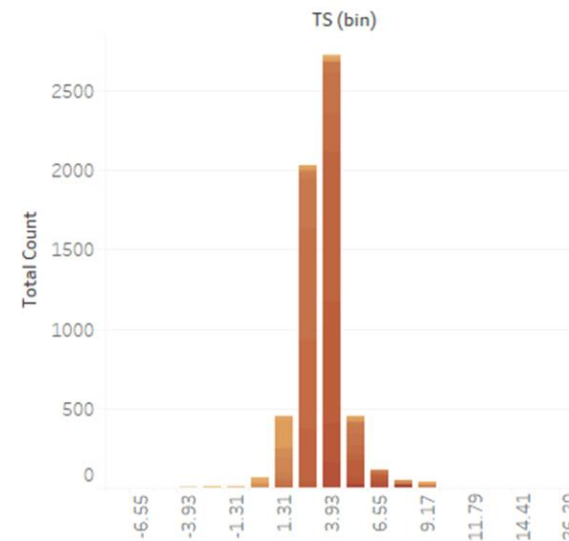
Histogram of Wind Speed (50m)



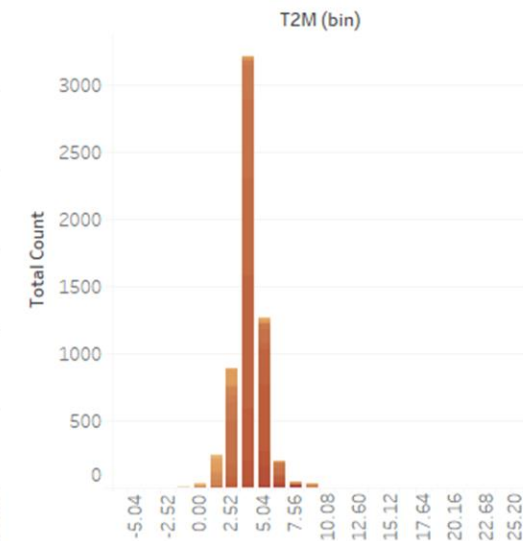
Histogram of Wind Direction (50m)



Histogram of Earth Skin Temperature (TS)

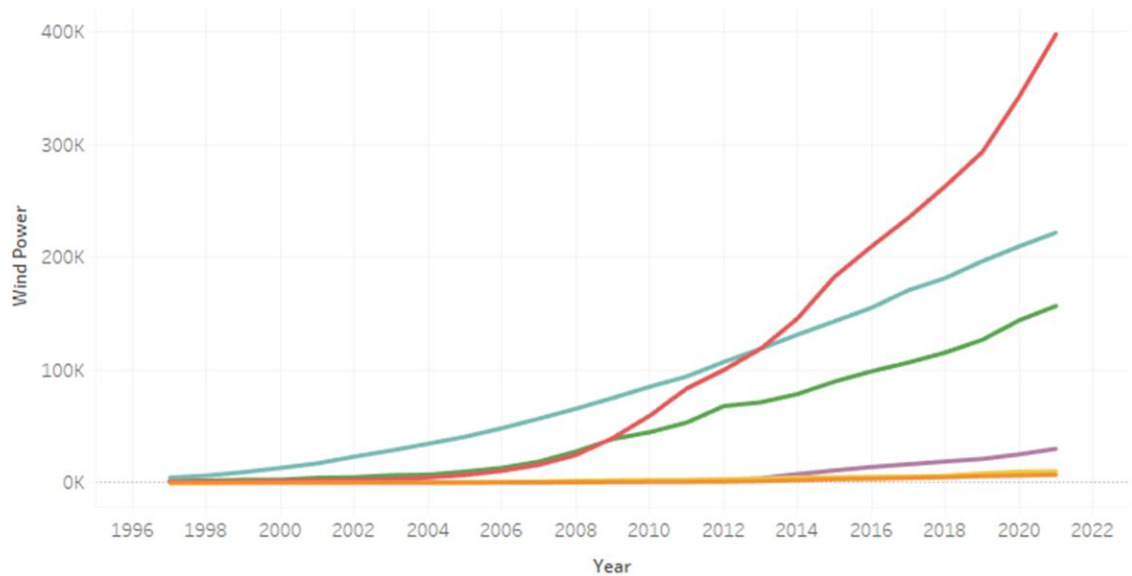


Histogram of Temperature at 2m (T2M)

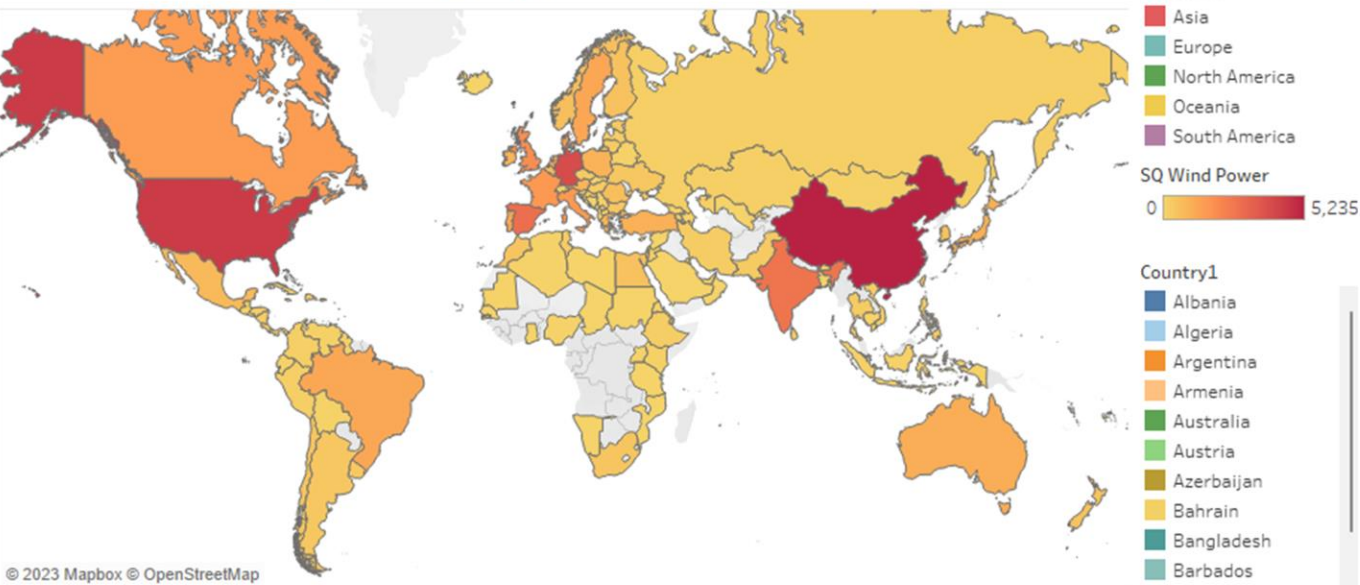


# Wind Farm by Country Statistics

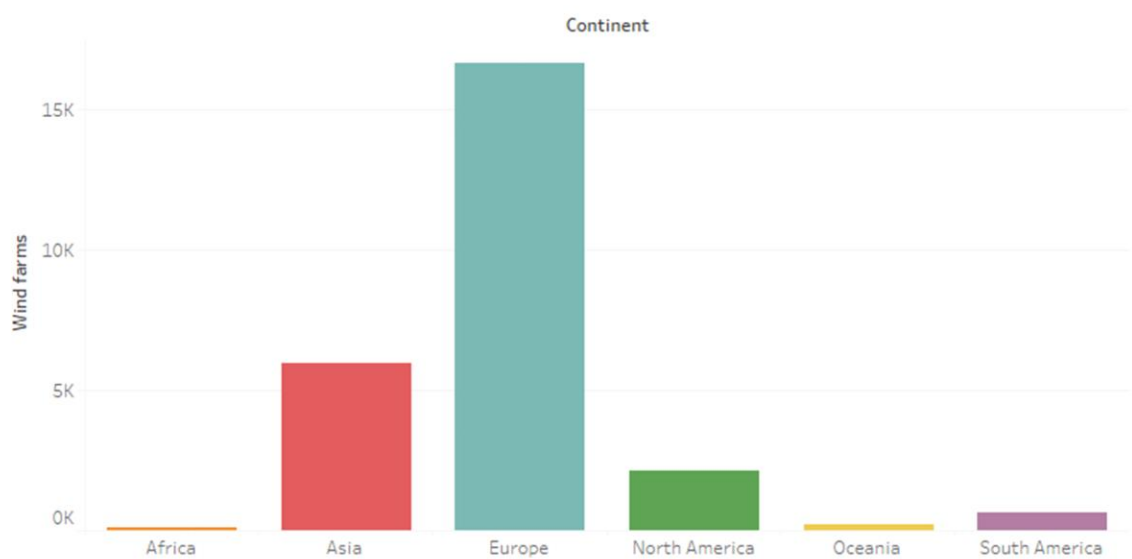
Production Growth of Wind Power per Continent



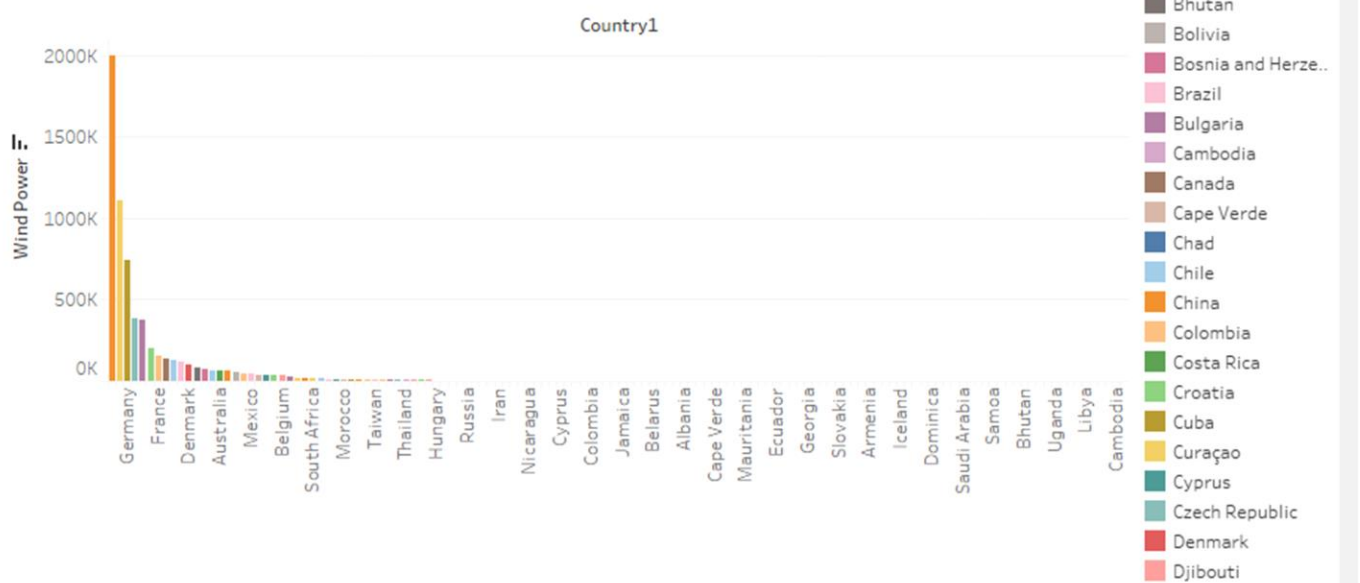
Wind Power Capacity by Country (Map)



Number of Wind Farms per Continent



Wind Power by Country





Where does the **model** fits in?

**Historical Weather  
Data**



**Predictive  
Modelling**



**Power Output  
Forecast**





What can we **achieve**?

**Fluctuations in**  
Weather Data (wind  
forecast data)

**Predictive**  
Model

Power Output  
**Forecast**



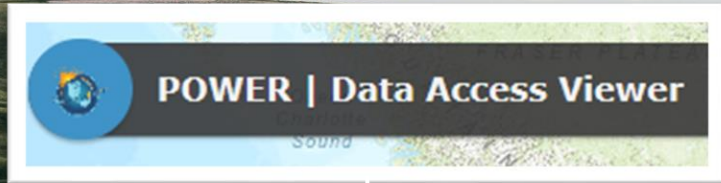


The image shows a vast landscape of rolling green hills. Five wind turbines are positioned along the ridges of the hills, stretching from the left towards the right. The sky is filled with soft, white clouds, and the overall scene conveys a sense of clean, renewable energy. The text 'The Approach (Taken)' is overlaid in the center of the image, with the word 'Approach' in white and '(Taken)' in green.

# The Approach (Taken)



# Web API Web Scraping



# Selenium Web Scraping



x	y





Historical Monthly Data  
for each wind farm lacking

Exhaustive weather features  
lacking

- As, **only** last month's power generation data was available for each windfarm.
- This was used to build the model with input features as monthly averaged **weather** data.
- The data set was compiled as one row for each windfarm with corresponding **power** output.
- **Random Forest Regressor** was used to build the model.





# The Approach (Ideal)

How to scale and improve the model

**WARNING:** Seeing multiple icons on next slide might make you overwhelmed.



Historical Weather Data for each  
Windfarm



Predictive  
Modelling for each windfarm



Bagging  
And creating a  
Random Forest  
Regressor





धन्यवाद!

¡Gracias!

Thank you!

*\*A pinwheel in my backyard*

