

Wind Energy Forecasting Project

Data Analysis Report

Executive Summary

This report presents a comprehensive analysis of the wind energy dataset, including correlation analysis, distribution patterns, seasonal trends, and feature engineering insights. The analysis reveals important patterns and relationships that inform model development and feature selection.

Correlation Analysis

Variable	wind_generation_actual	wind_capacity	temperature
wind_generation_actual	1.000	0.128	-0.326
wind_capacity	0.128	1.000	0.112
temperature	-0.326	0.112	1.000

Correlation Insights

- Wind Generation vs Wind Capacity: 0.128 - Weak positive correlation
- Wind Generation vs Temperature: -0.326 - Weak negative correlation

Distribution Analysis

Variable	Mean	Median	Std Dev	Skewness	Kurtosis
Wind Generation Actual	305,819.77	254,332.50	205,728.86	0.997	0.386
Wind Capacity	45,066.02	46,073.00	4,315.84	-0.371	-1.319
Temperature	10.05	10.05	7.74	-0.017	-0.951

Seasonal Patterns

Month	Average Wind Generation (MW)	Std Dev (MW)
Jan	397,343	261,623
Feb	340,860	202,680
Mar	389,181	249,229
Apr	289,312	157,162
May	225,959	107,458
Jun	216,395	134,557
Jul	176,985	99,816
Aug	187,393	113,761
Sep	259,777	187,175
Oct	374,635	198,987
Nov	336,288	191,686
Dec	477,021	227,359

Feature Engineering Summary

Lag Features: 10 features

Examples: wind_generation_actual_lag_1, wind_generation_actual_lag_2, wind_generation_actual_lag_3, wind_generation_actual_lag_7, wind_generation_actual_lag_14 ... and 5 more

Rolling Features: 16 features

Examples: wind_generation_actual_rolling_mean_7, wind_generation_actual_rolling_std_7, wind_generation_actual_rolling_min_7, wind_generation_actual_rolling_max_7, wind_generation_actual_rolling_mean_14 ... and 11 more

Seasonal Features: 11 features

Examples: month, day_of_year, week_of_year, day_of_week, quarter ... and 6 more

Temperature Features: 9 features

Examples: temperature, temperature_lag_1, temperature_lag_2, temperature_lag_3, temperature_lag_7 ... and 4 more

Capacity Features: 4 features

Examples: wind_capacity, capacity_utilization, capacity_change, capacity_change_pct

Total Features Created: 42

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