INTRODUCTION

WIND TURBINES:
Time Series Analysis & Predictions

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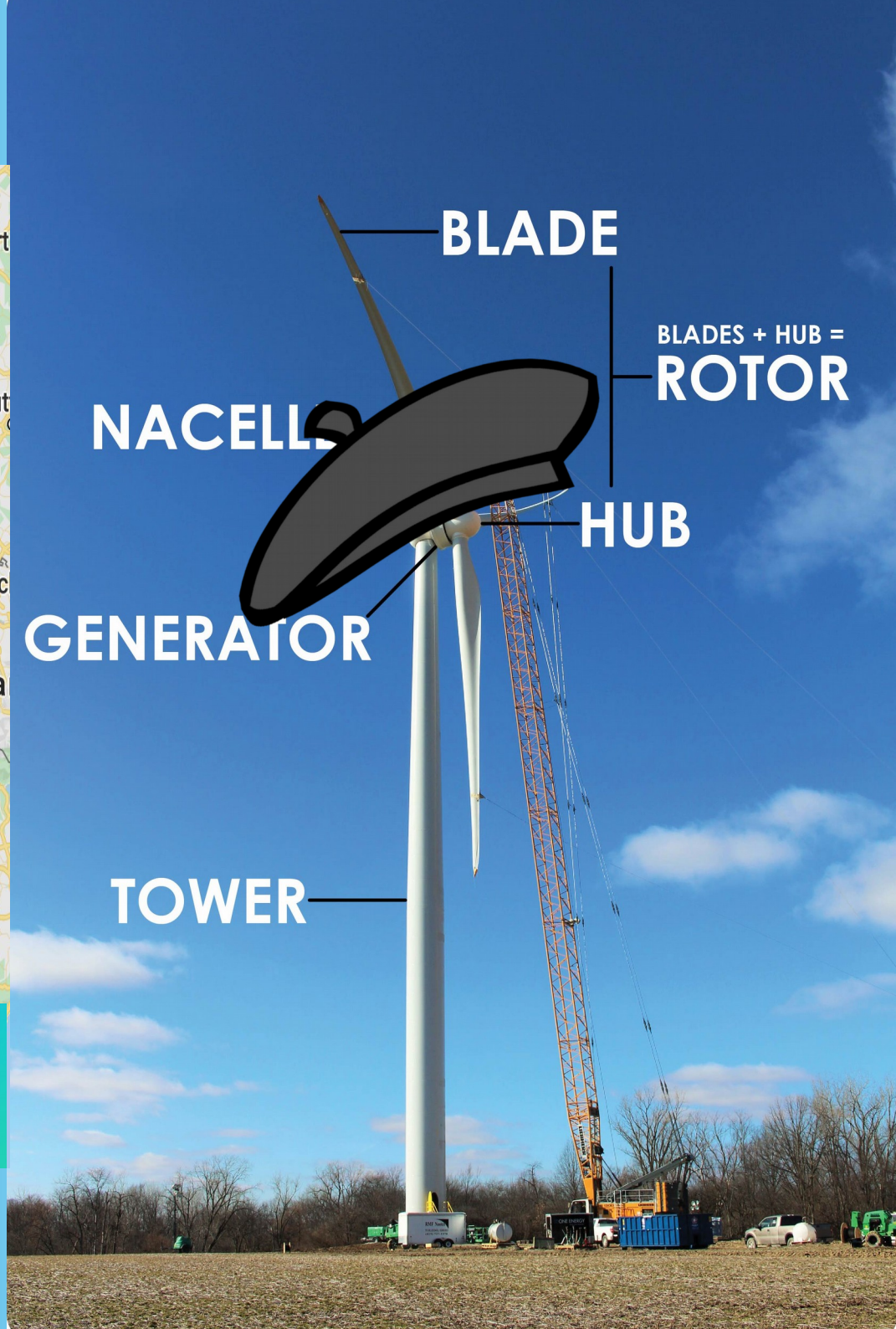
OBJECTIVES

- **Optimize Power Production Estimation:**
  - Biggest contributing factors for overall performance
  - Wind turbine time series performance

DATA

Brussels
Brighton
Southampton
Plymouth
Lille
Belgium
Frankfurt
English Channel
Luxembourg
Mannheim
Guernsey
Jersey
Paris
Strasbourg
Brest
Rennes
Zürich
Tours
Nantes
Switzerla
France
Geneva
La Rochelle
Lyon
Limoges
Clermont-Ferrand
Grenoble
Turin
Bay of Biscay
Bordeaux
Toulouse
Montpe

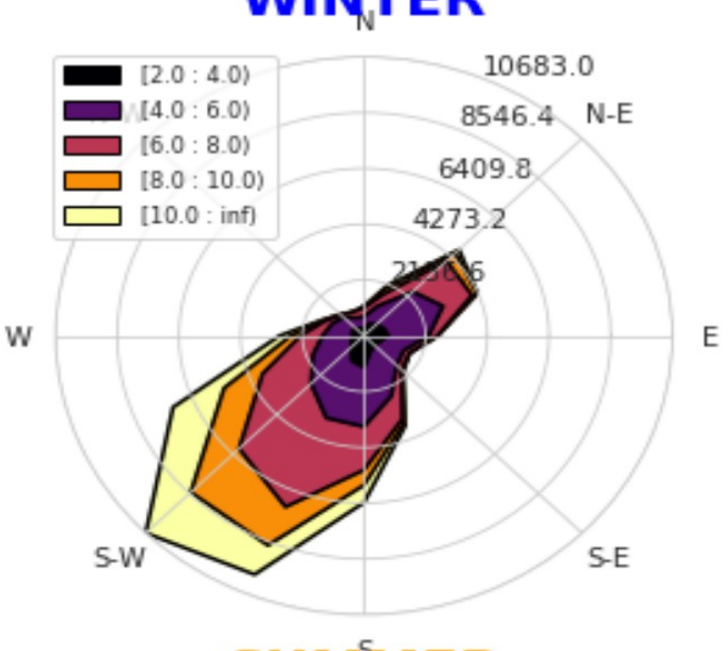
ENGIE


BLADE
BLADES + HUB =
ROTOR
NACELLE
HUB
GENERATOR
TOWER

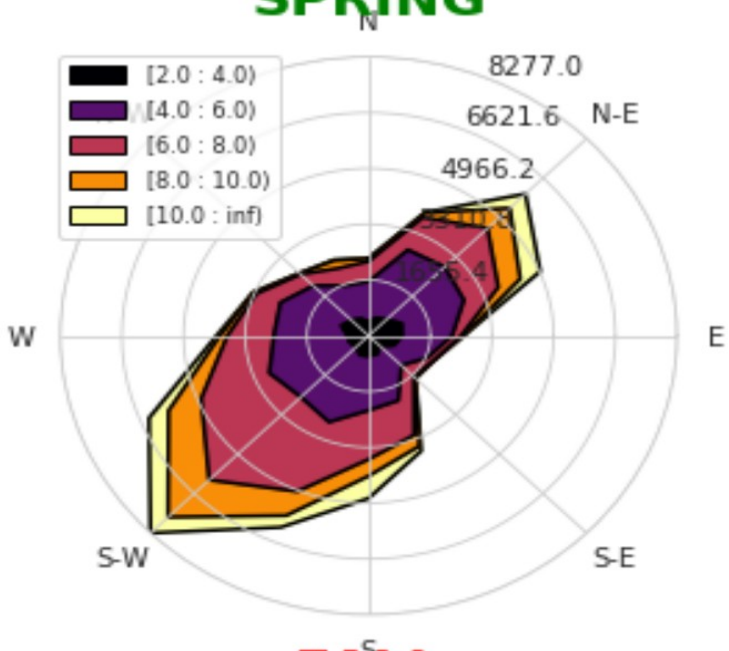
RESULTS

WIND: SEASONAL COMPARISON

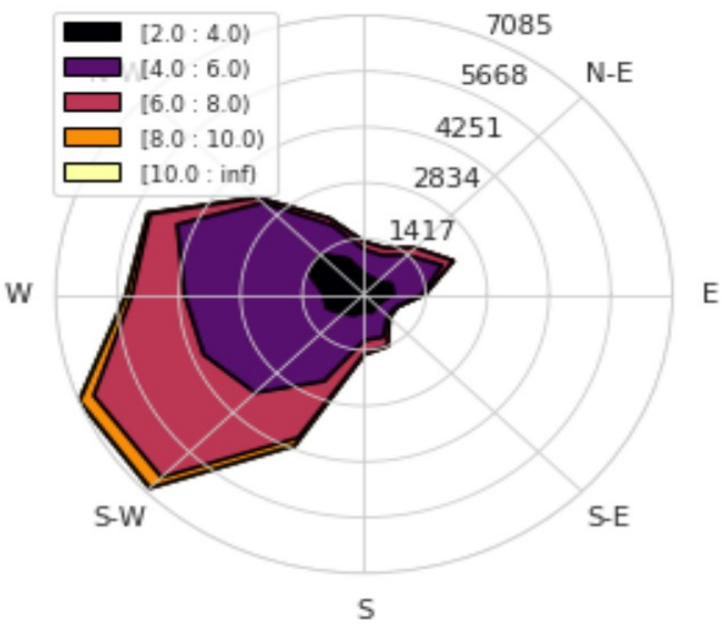
WINTER



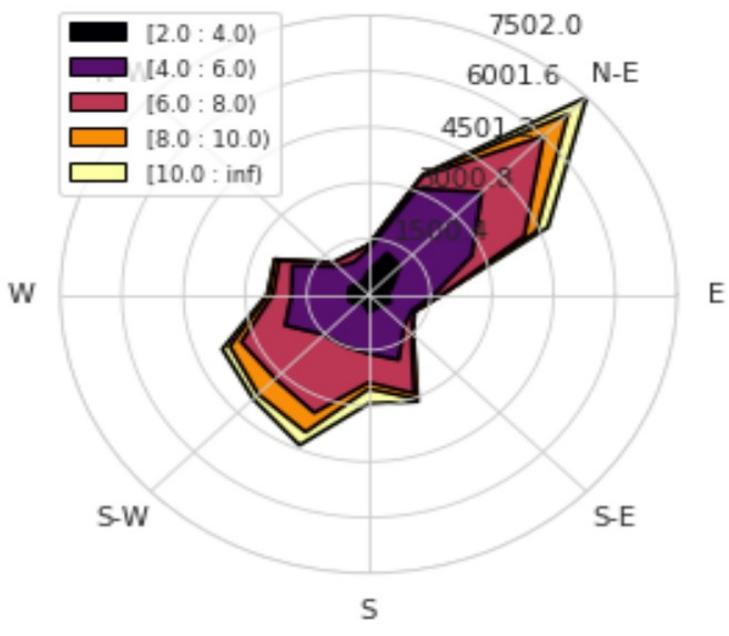
SPRING



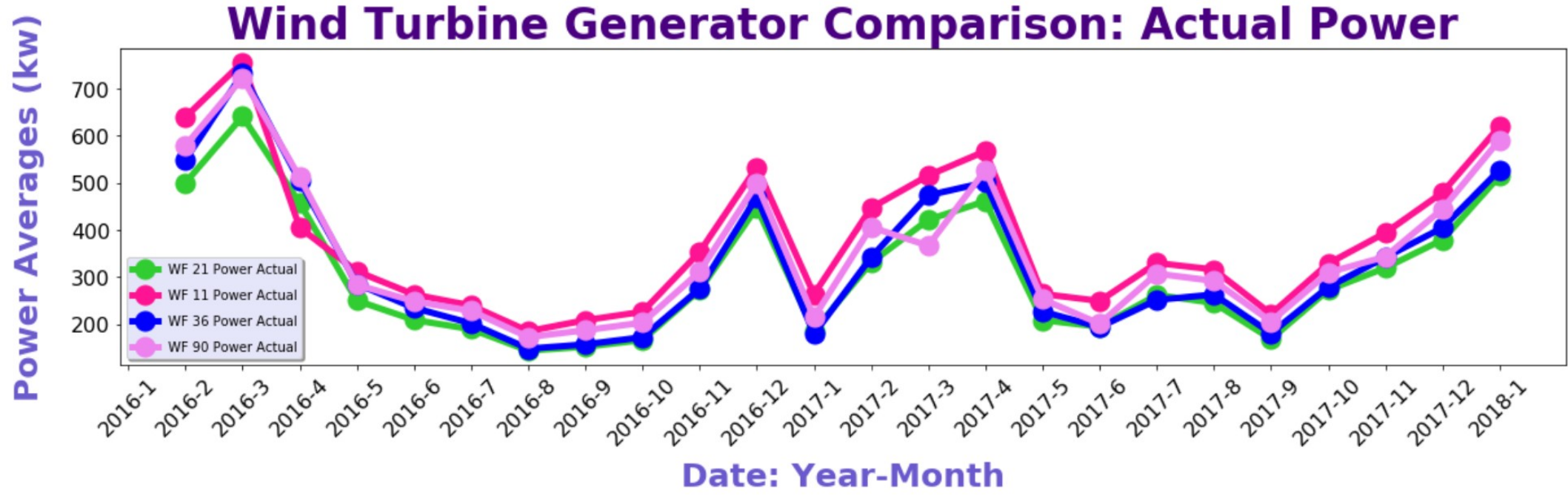
SUMMER

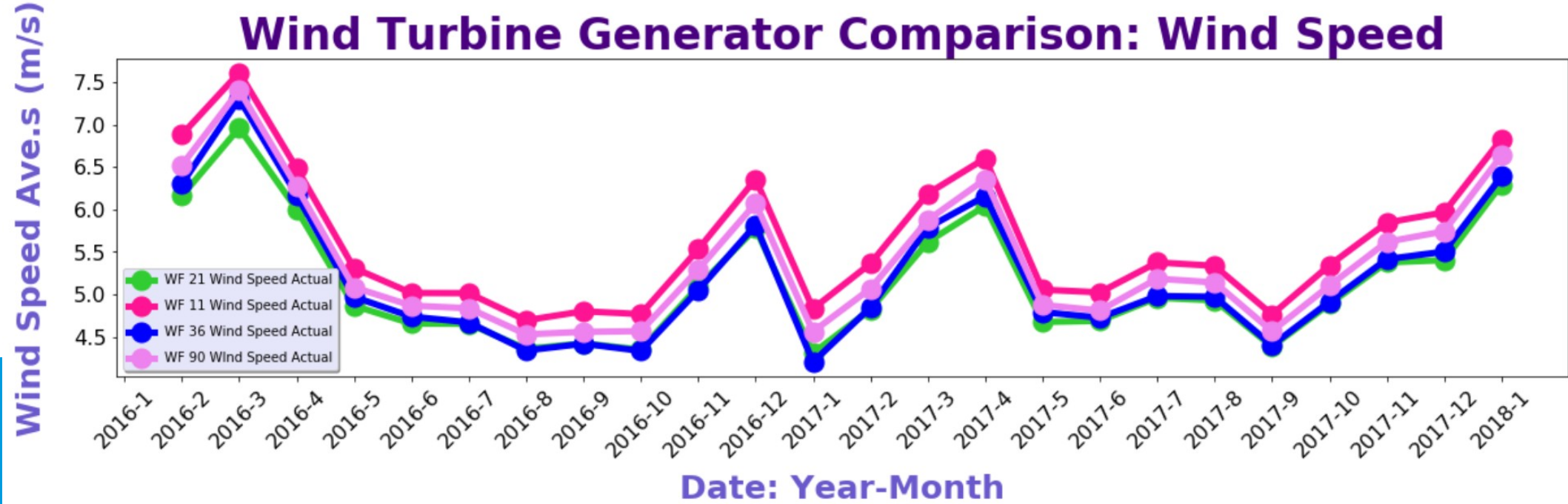


FALL

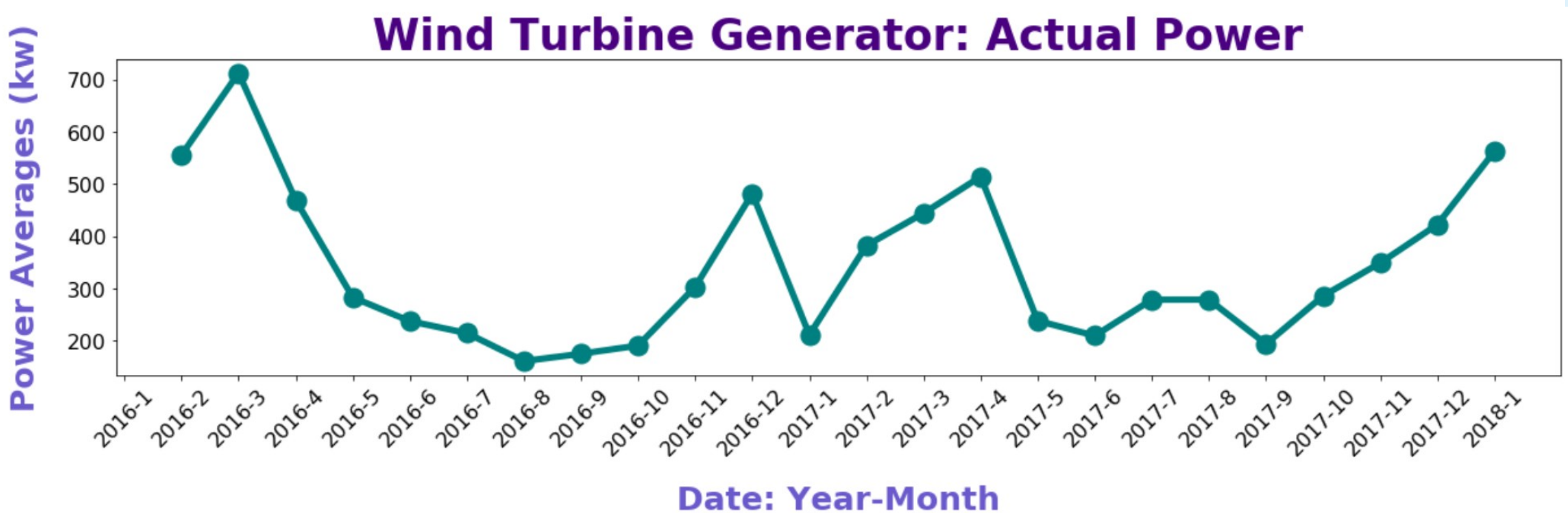


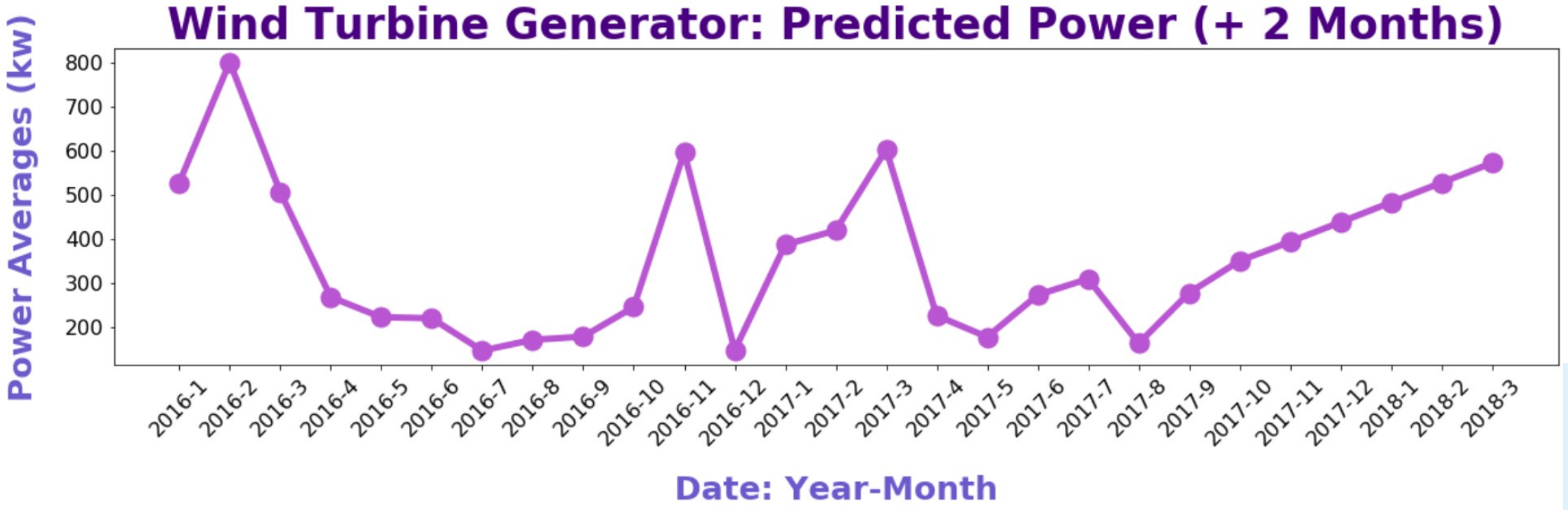
TIME SERIES: TURBINE COMPARISON



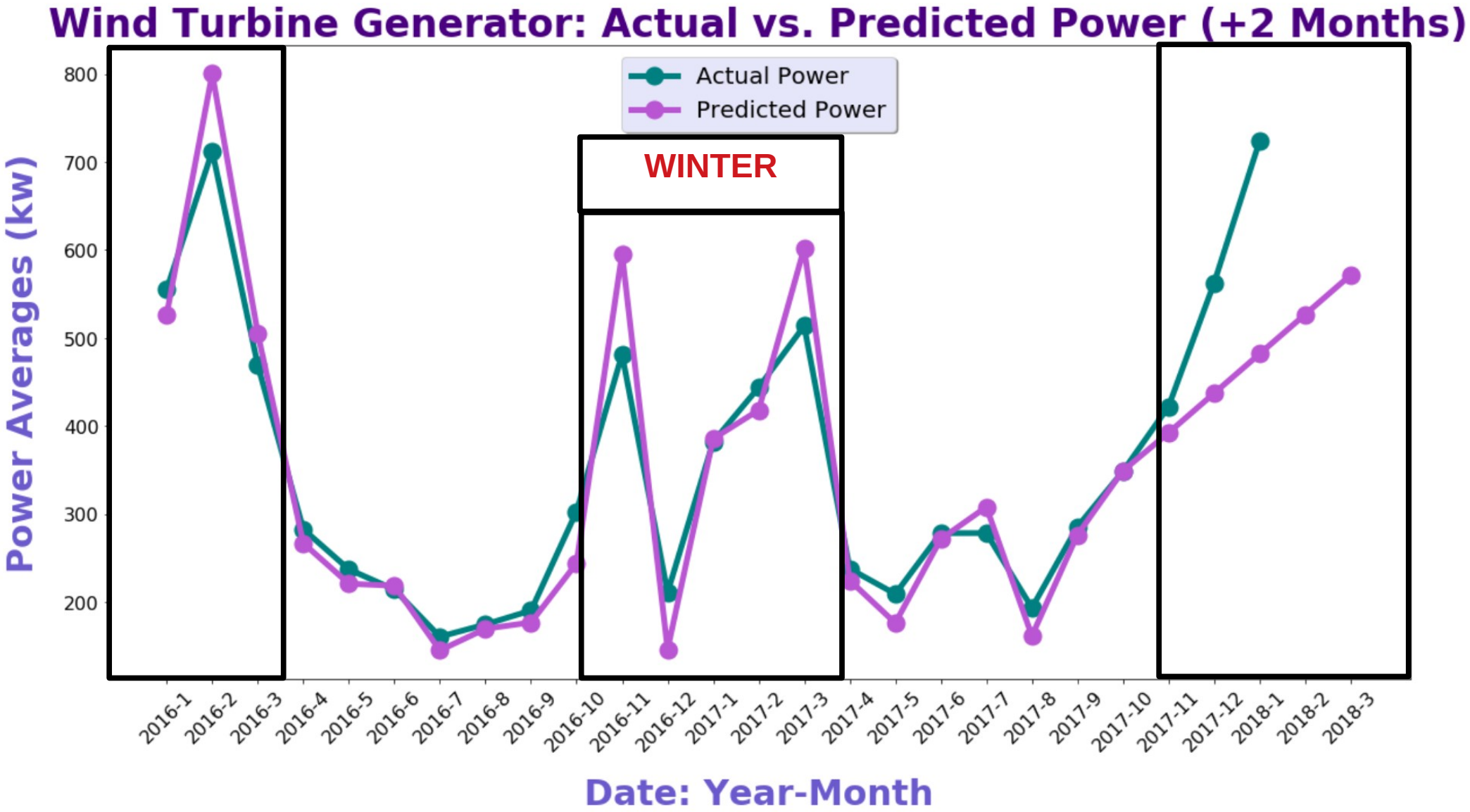


TIME SERIES: MONTHLY POWER SEPARATED



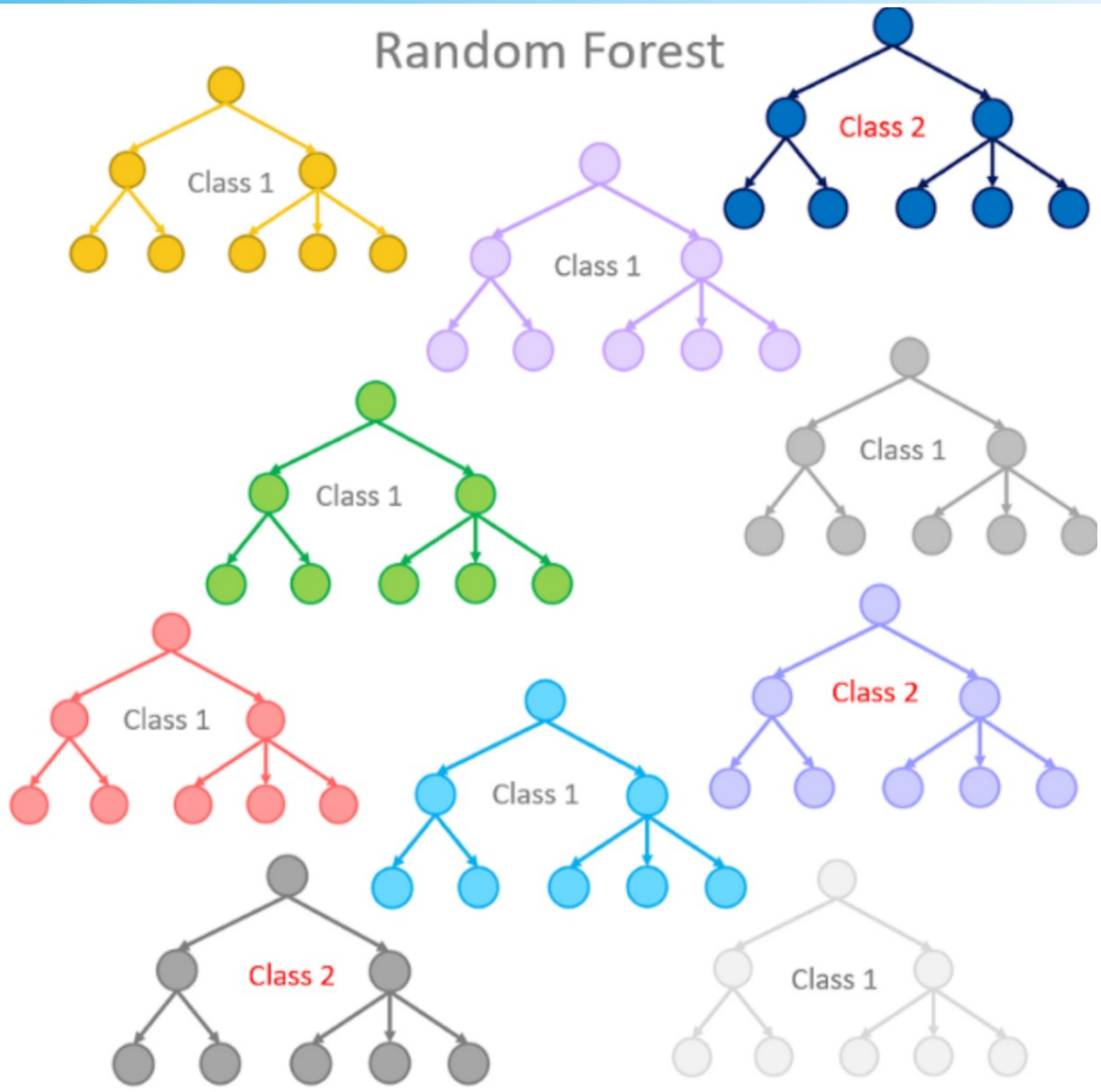


TIME SERIES: MONTHLY POWER COMBINED



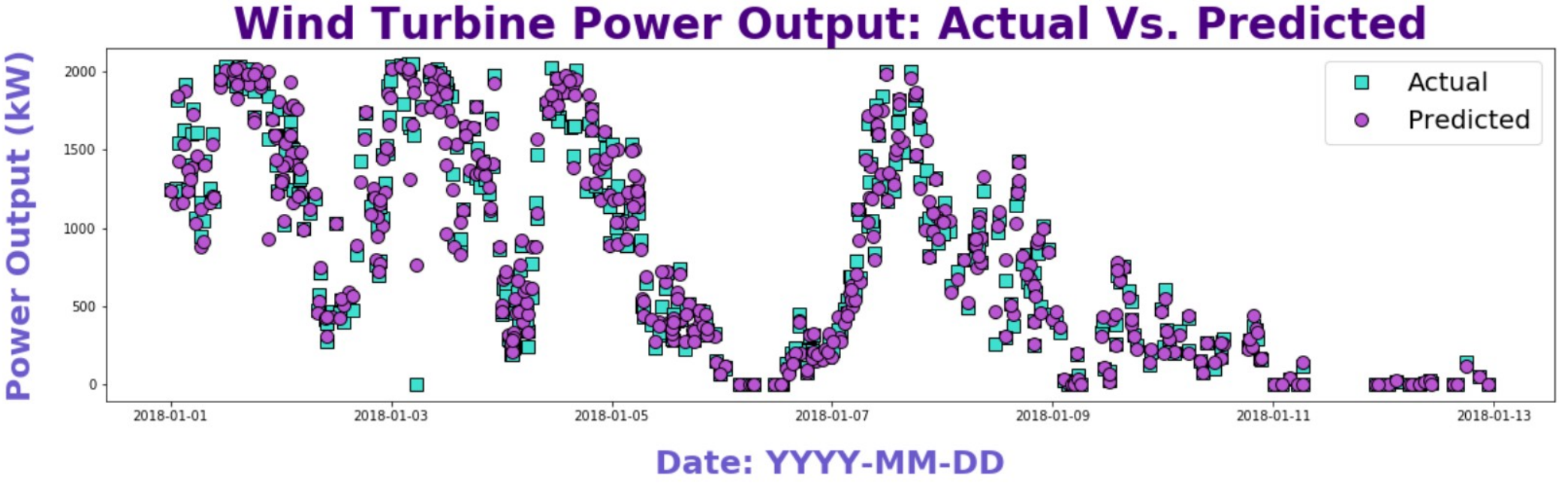
RF: PERFORMANCE PREDICTIVE MODEL

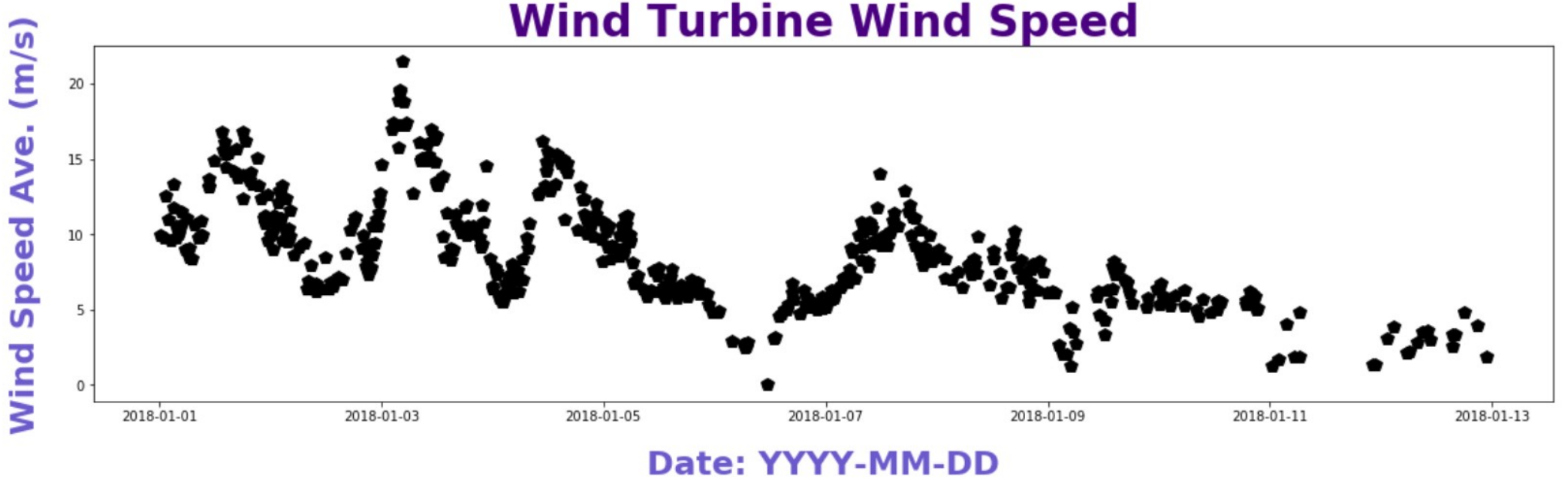
- Feature Selection & Categorical Data:
  - Wind Speed
  - Wind Direction
  - Outdoor Temperature



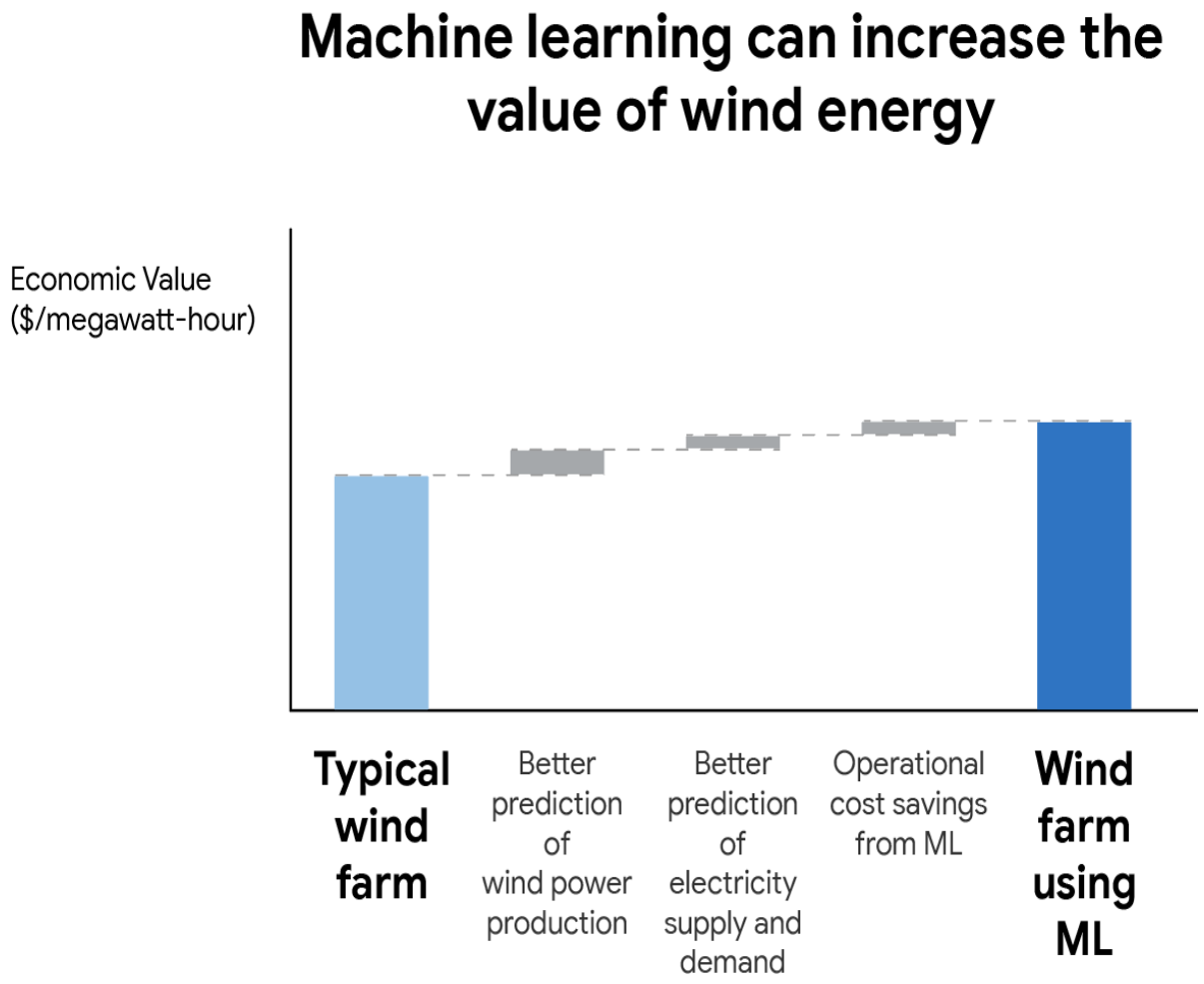
DAILY: ACTUAL VS. PREDICTED

$$\frac{MAE}{P_{rated}} = \frac{47}{2050} = 2.3\%$$





CONCLUSIONS



Illustrative results from 2018 Google/DeepMind field study

THANK YOU!

REFERENCES

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