GROUP 2

WEATHER FORECASTING

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OUR GOALS

ROADMAP:

1

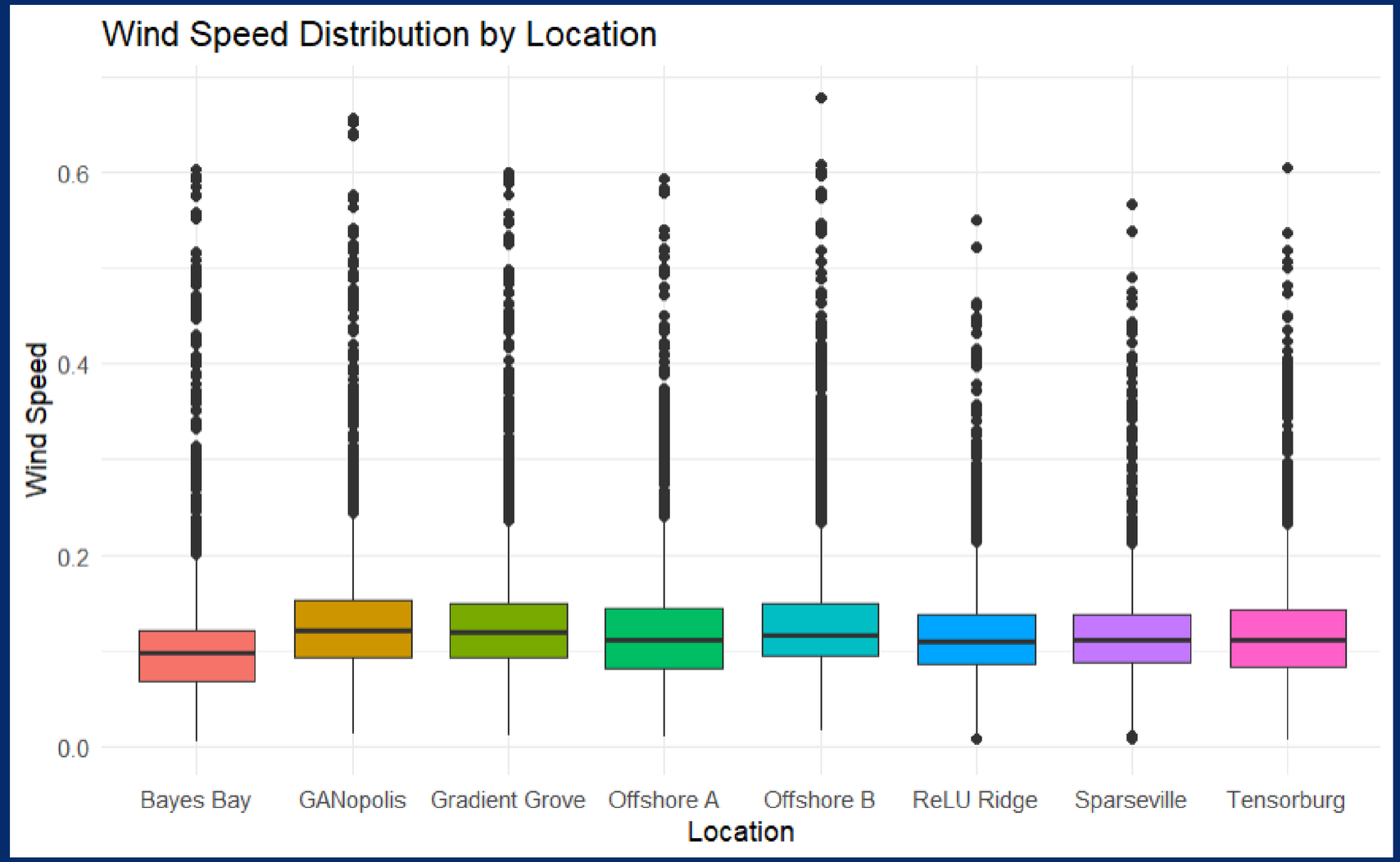
Predict wind speed accurately

2

Identify what constitutes high damage

3

Predict low-risk pricing while maximizing profits



FIRST WERE TAKING A LOOK AT OUTLIERS IN THE WINDSPEED DISTRIBUTION TO DECIDE HOW TO PREPROCESS DATA

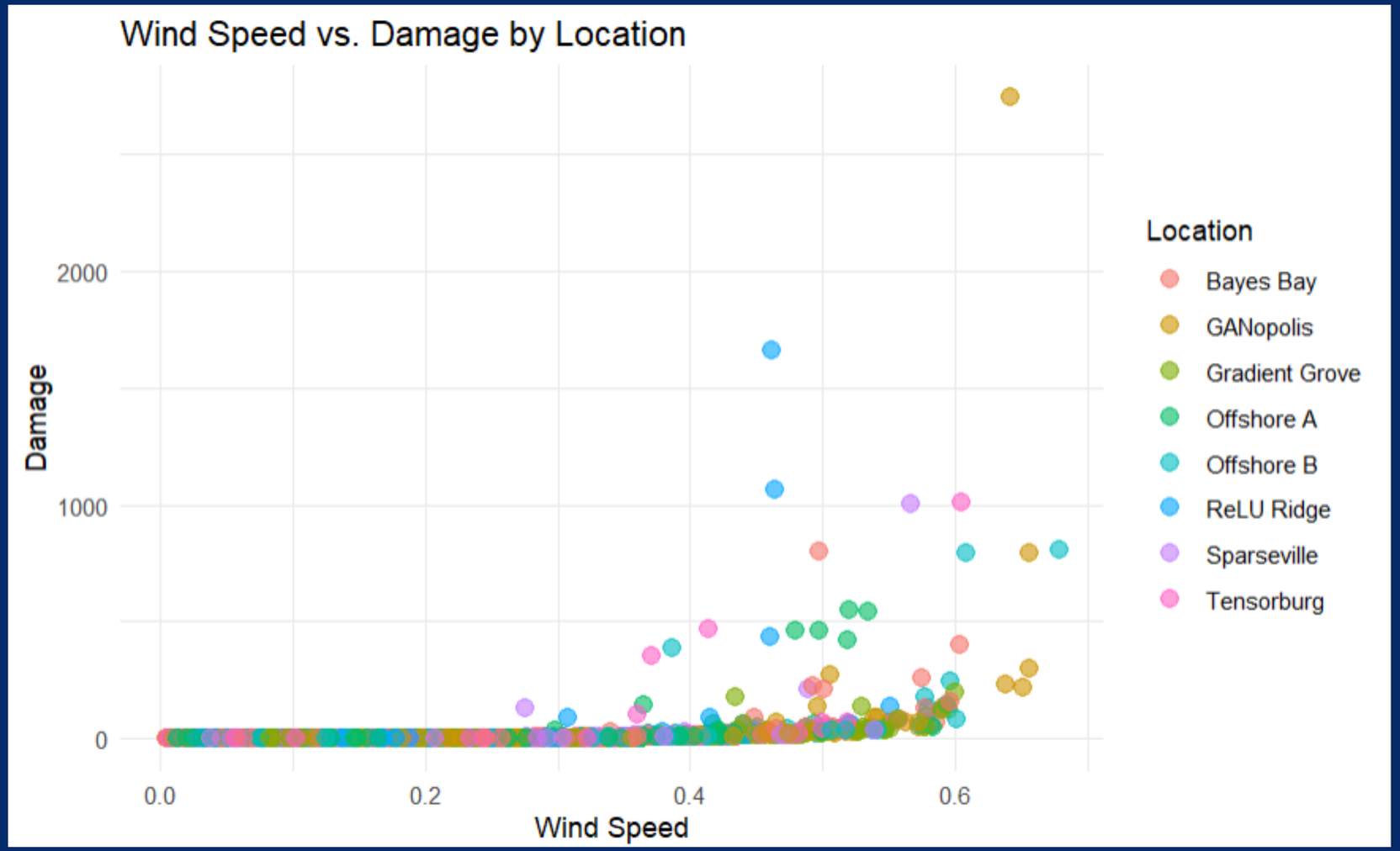
XGBOOST

XGBoost was a simple method to acheive accurate wind speed results with an R^2 of over .99. The only problem with this is that the model is better suited for estimating using time-adjacent data rather then predicting future values.

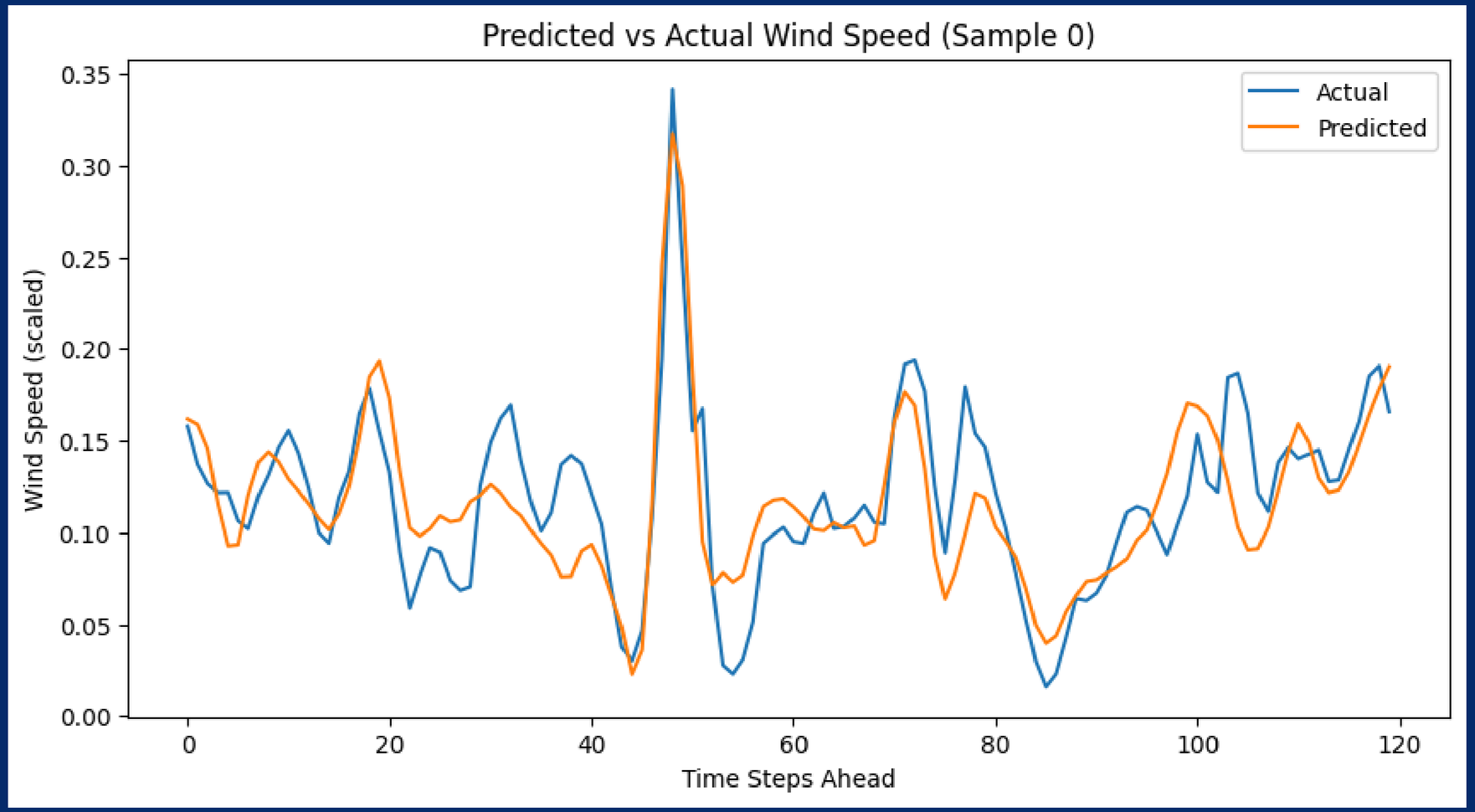
WHAT ARE BETTER SEQUENCE BASED ALTERNATIVES?

LSTM

LSTM is an advanced version of a recurrent neural network with more advanced tuning features that allowed us to better predict windspeed for the next 5 days based on the previous 5 days.



NOW, WE ARE PLOTTING WINDSPEED VS DAMAGE TO FIND A CORRELATION THAT WE CAN USE FOR OUR PRICING.

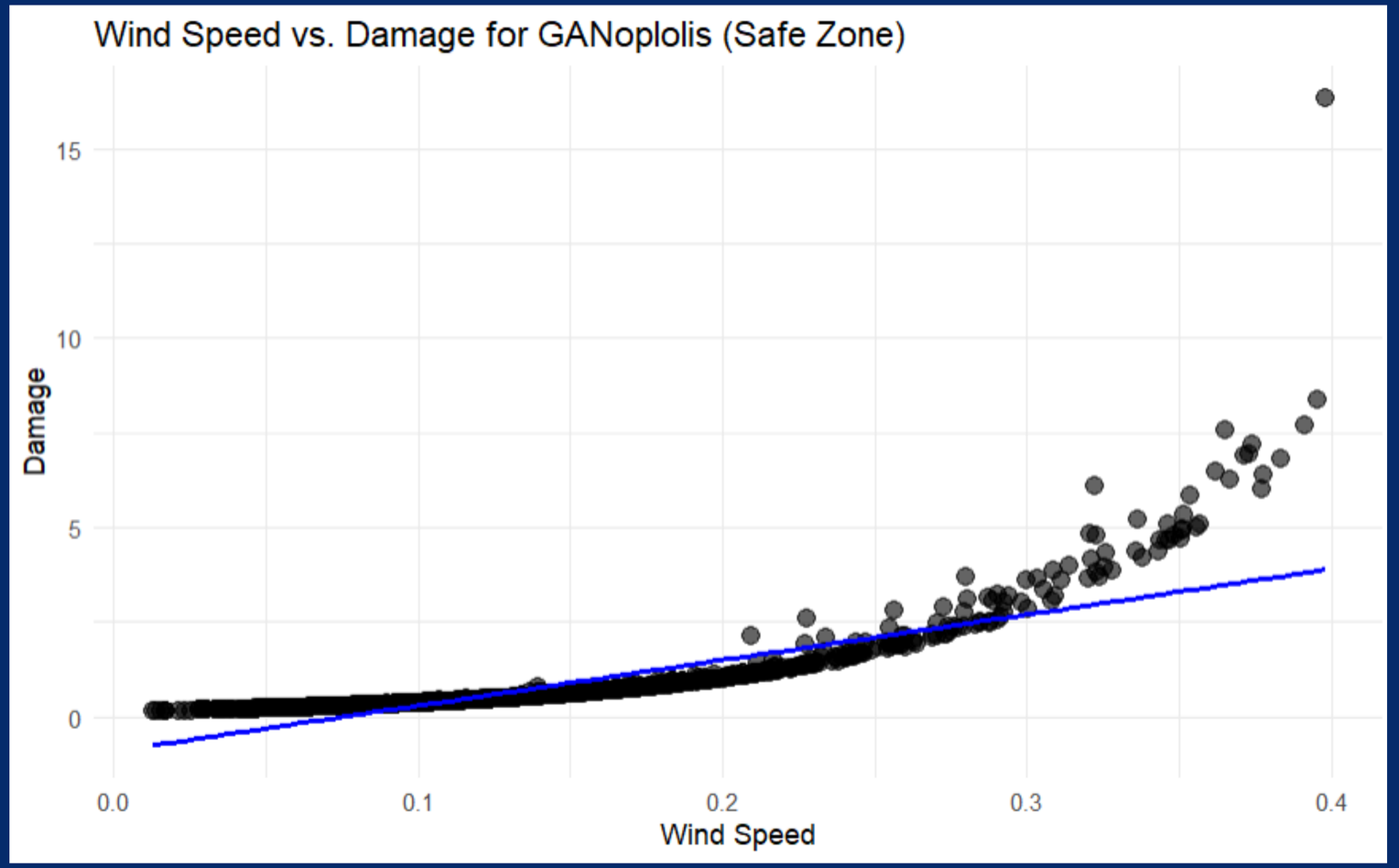


TESTING ACCURACY COMPARISON GRAPH

OUR PRICING MODEL

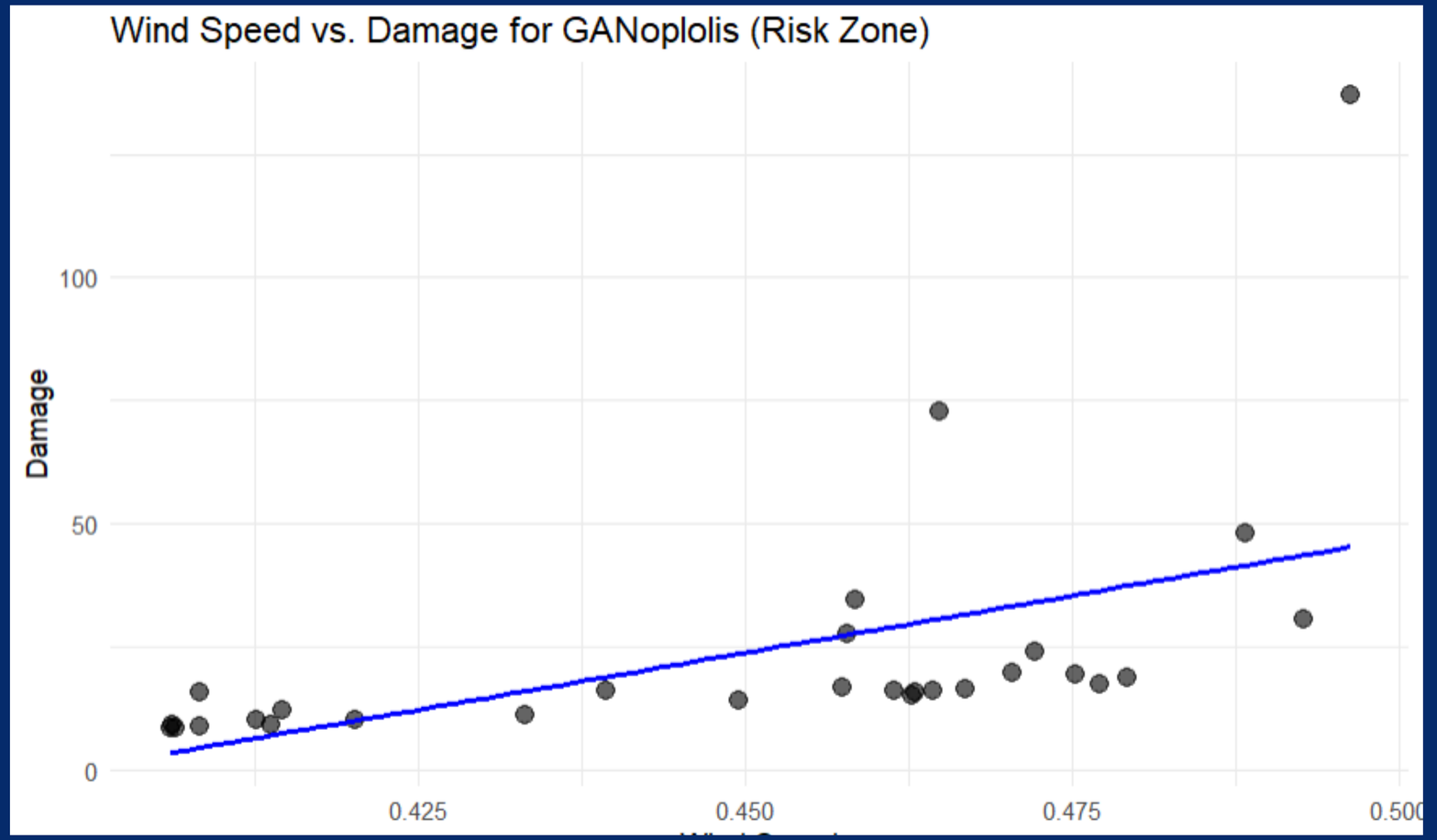
SUNNY

We consider sunny hour to be any hour where the wind speed is below .4.


Wind Speed vs. Damage for GANoplolis (Safe Zone)
Damage
15
10
5
0
0.0
0.1
0.2
0.3
0.4
Wind Speed

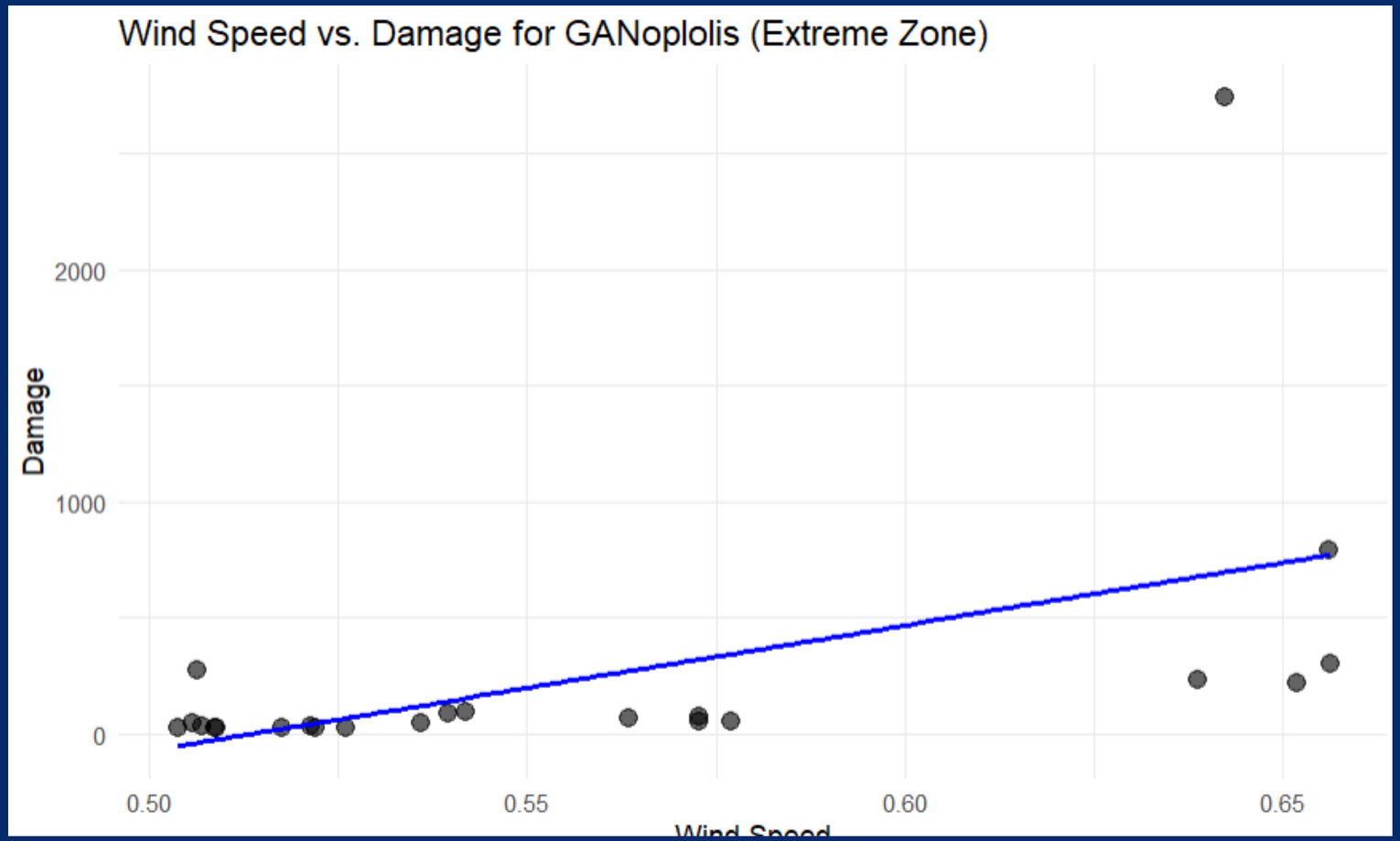
WINDY

A windy hour is any hour where the wind speed is below .4.


Wind Speed vs. Damage for GANoplolis (Risk Zone)
Damage
100
50
0
0.425
0.450
0.475
0.500

STORMY

A stormy hour is any hour where the wind speed is above .5.


Wind Speed vs. Damage for GANoplolis (Extreme Zone)
Damage
2000
1000
0
0.50
0.55
0.60
0.65

$$margin = x - damage_{total}$$

$$demand = 10000 - 20x$$

$$profit = demand \times margin = (10000 - 20x)\,(x - damage)$$

$$\frac{dP}{dt} = 10000 - 40x + 20damage = 0$$

$$x = 250 + \frac{1}{2}damage = 250 + \frac{1}{2}\mu_{damage}$$

FUTURE IMPROUMENTS

- **Geospatial Location -** Using the modeling of wind speeds at certain coordinates (cities) in order to better model weather in GANopolis.
- **Exponential regression functions -** Using an exponential regression function that better matches the damage rather than using "blocks".
- **Predicting damage with ML Model -** Rather than using regression all together, we train an ML model to predict damage based on values other than wind speed.

INSACORP'S INTERESTS

- How well do Machine Learning (ML) models perform at surrogate modeling of climate models?
- What is the role of insurance pricing models - should they be integrated in the same model as the surrogate model or a separate model in the pipeline?
- What price will be robust to catastrophic events
- Over what time horizons do ML model representations of surrogate models break down?

THANK YOU FOR LISTENING!