AIR QUALITY INDEX (AQI) PREDICTOR

SPRINT 3 - MODELING

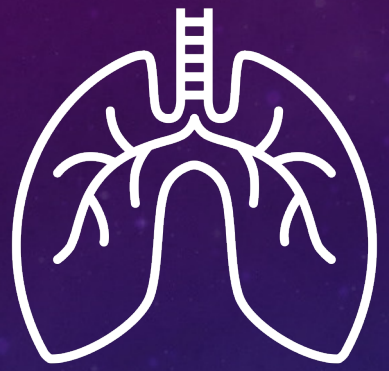
BROOKE HALL

APRIL 12, 2024

AIR QUALITY MONITORING

- 15-20 breaths per minute
- 20,000 breaths per day
- 8,000,000 breaths per year

AQI MONITORING



Problem

Respiratory Sensitivities are difficult to manage

Solution

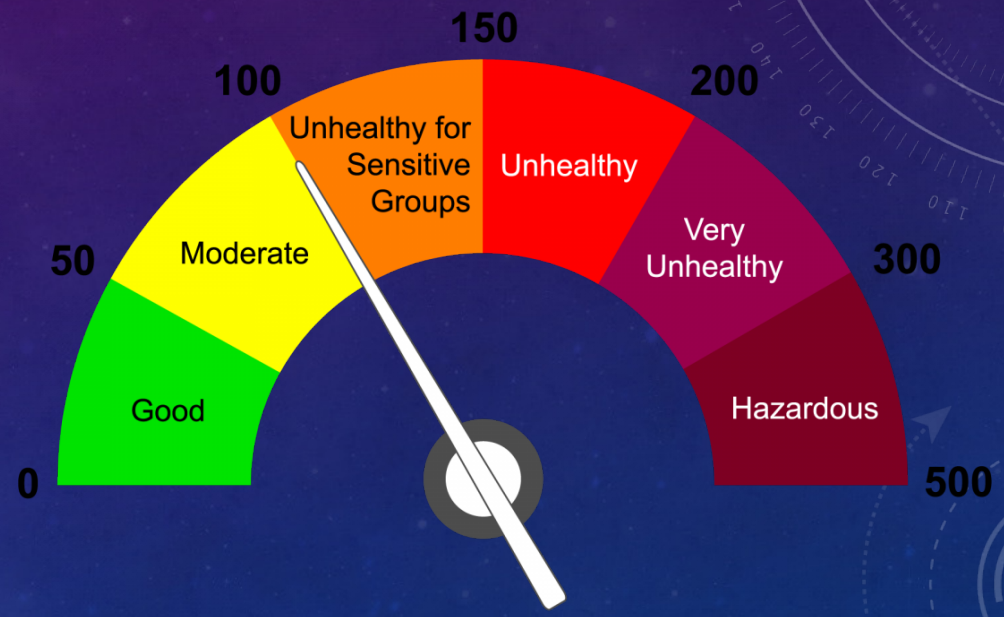
US State AQI Predictor

Impact

Freedom, control

WHAT IS AQI

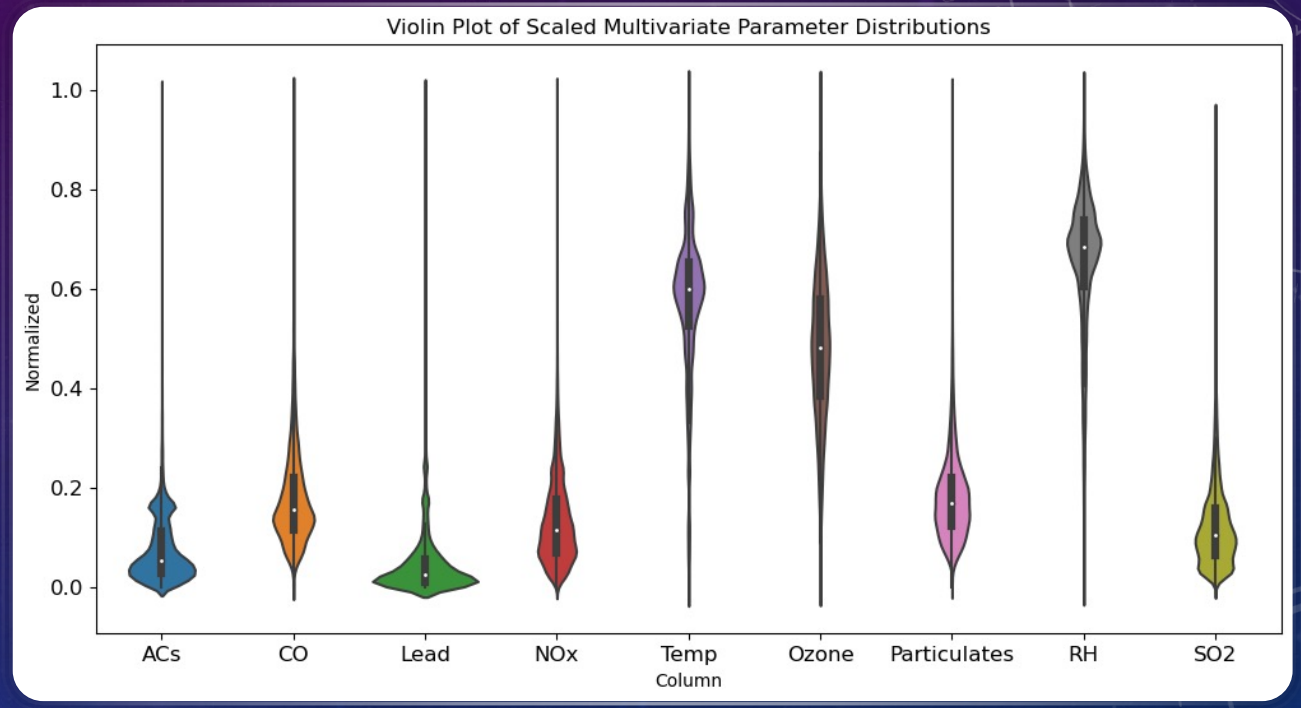
- Ground- level ozone
- Particle pollution (PM)
- Carbon monoxide (CO)
- Sulfur dioxide (SO2)



Oklahoma Department of Environmental Quality

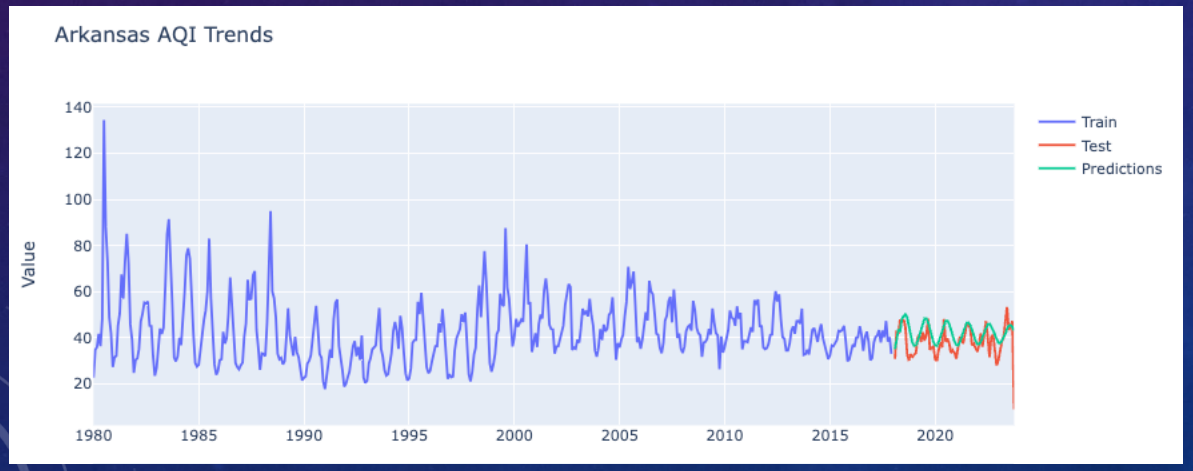
FEATURE ENGINEERING

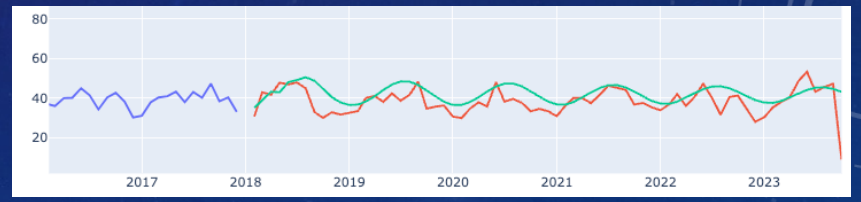
- Scaled/Normalized and grouped
- Variance threshold review
- Granger causality
- Cointegration test
  - Drop windspeed and direction
- ADF
  - All datasets stationary



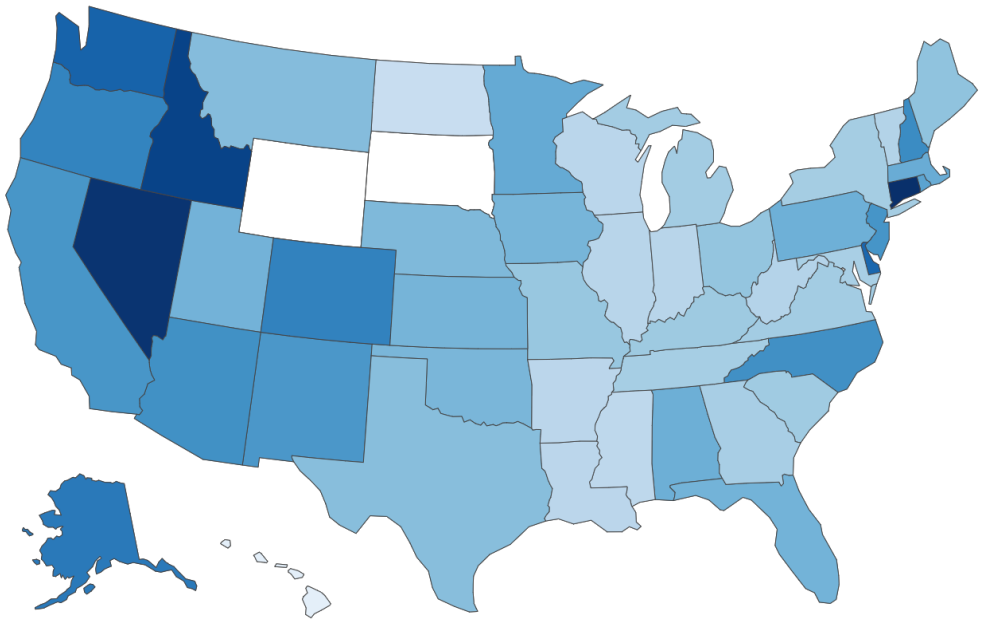
MODELING - ARKANSAS

Model	R^2	Mean Absolute Error	Mean Squared Error
Prophet	-0.343	6.13	59.4
Optimized Prophet	-0.241	6.11	54.8
Multivariate (lags = 6)	-0.150	5.10	50.8
Multivariate Differenced	-0.060	6.47	68.5





STREAMLIT – ALL MODELS



MODEL LIMITATIONS & NEXT STEPS

- Optimize Lags
- Data is scaled
- A reading for every parameter does not exist for every state
- Monthly rather than daily
- Does not include:
  - Extreme Events
  - Population growth
  - Industrialization
  - Cleanup strategies

$$x_{t,1} = \alpha_1 + \phi_{12} x_{t-1,1} + \phi_{12} x_{t-1,2} + \omega_{t,1}$$

$$x_{t,2} = \alpha_1 + \phi_{12} x_{t-1,1} + \phi_{22} x_{t-1,2} + \omega_{t,2}$$

$$x_{t,3} = \alpha_1 + \phi_{12} x_{t-1,1} + \phi_{32} x_{t-1,2} + \omega_{t,3}$$

THANK YOU