Global Climate Analysis

Chris Hollman
November, 2022

Overview

- Analysis of historical climate data.
- Identify trends/create forecast
- Identify contributors, develop interventions

Project Objective:

- Time Series Decomposition
  - Prophet Model
  - LSTM Model
  - Forecast

- Regression Analysis
  - Correlations
  - Predictors
  - Action Steps

Examining Data

Time Series

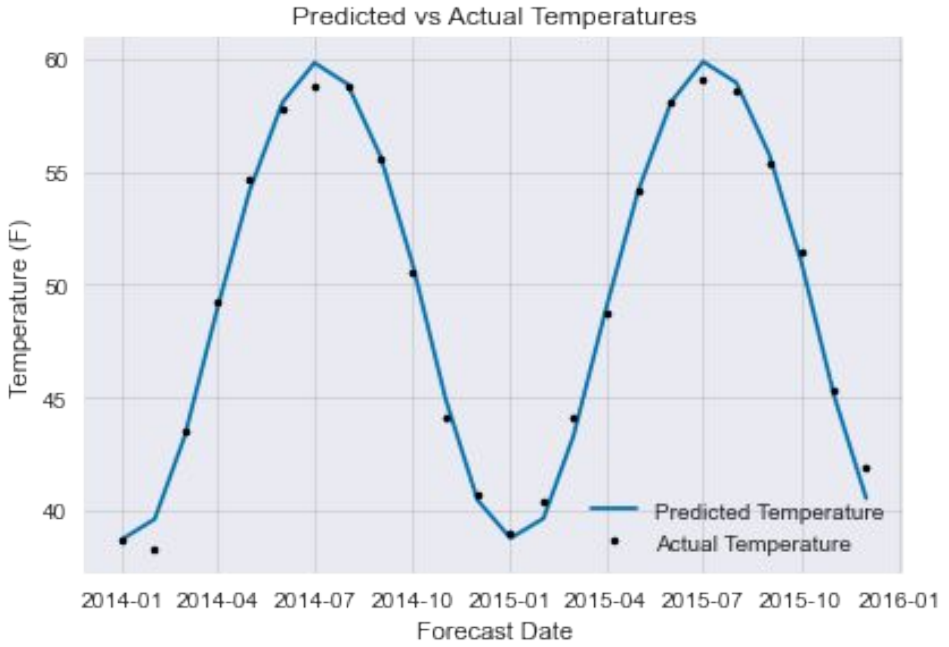
- Historical monthly averages 1750-2015
- Not all data used

Regression

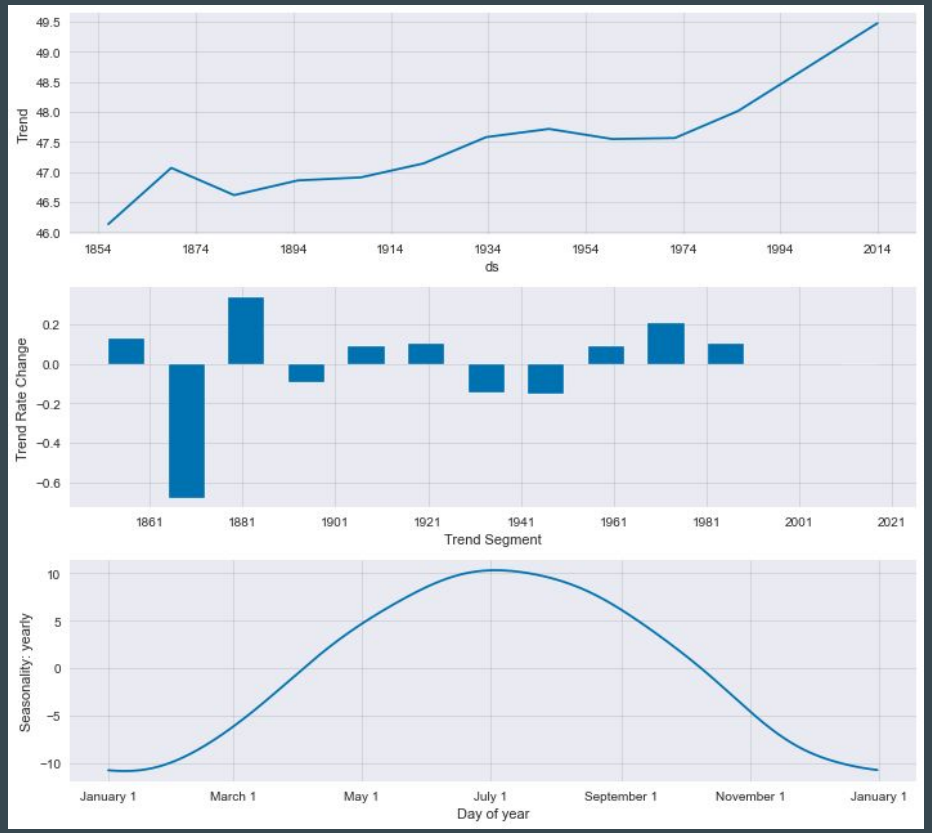
- Forest area
- Oil consumption
- CO2 emissions
- Population
- GDP growth

Prophet Results

- .45 MAE
- Outperformed LSTM



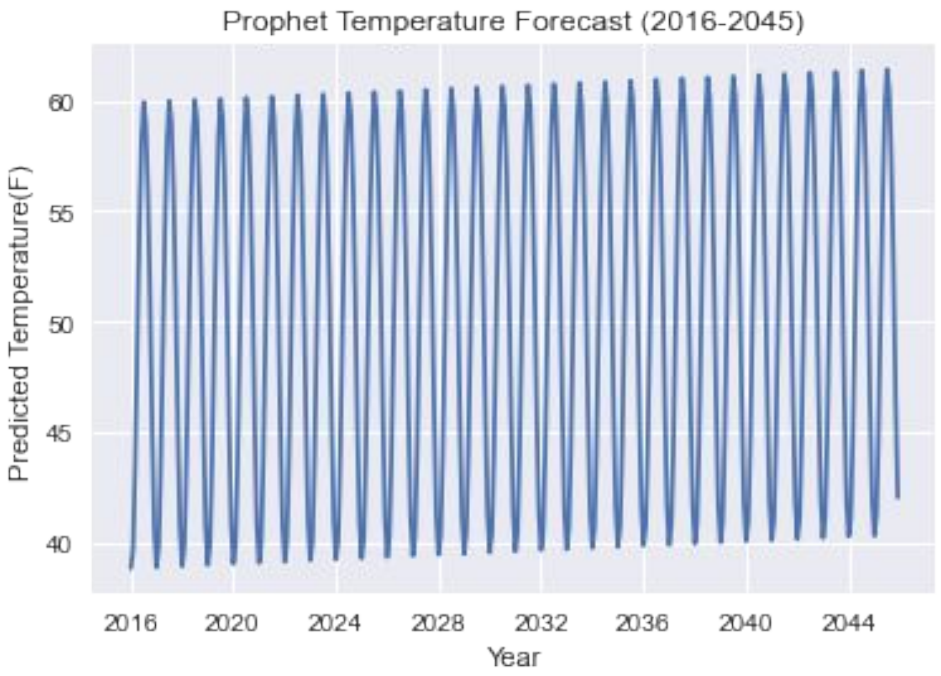
Prophet Model Components



- Significant upward trend beginning in 1970's
- Data significantly more accurate with time
- Uses recent trend for forecasts

Prophet Forecast

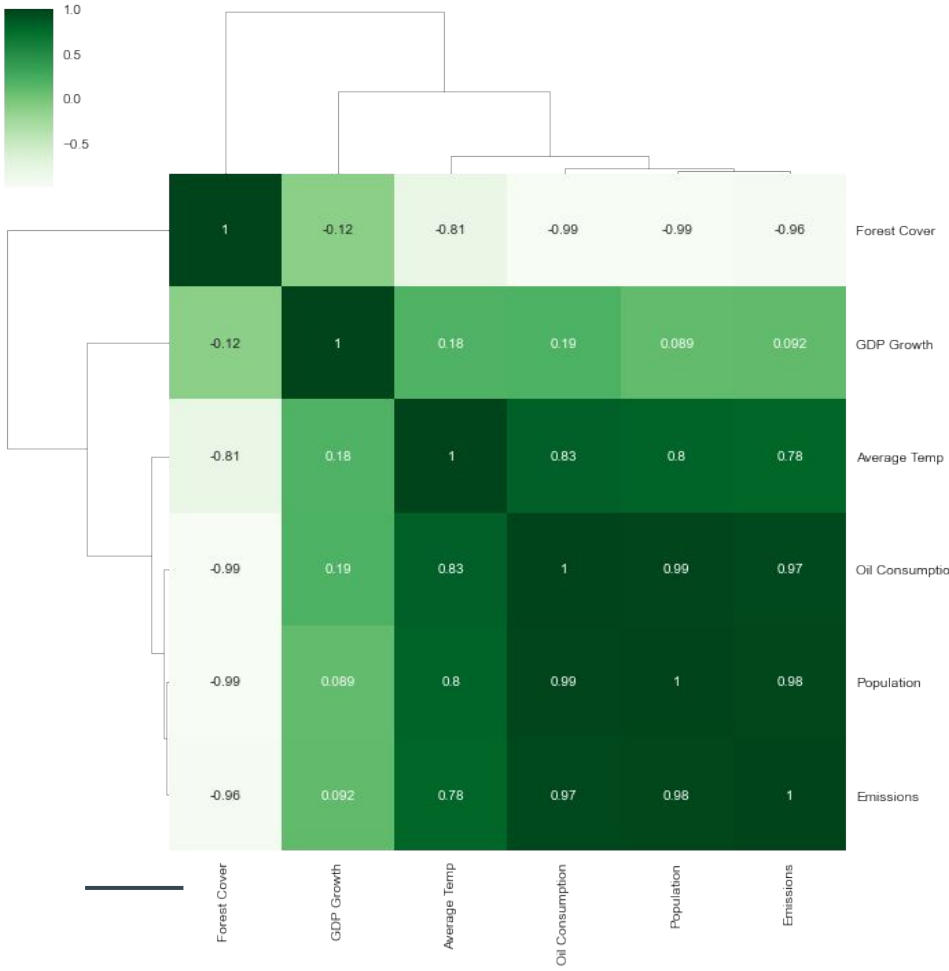
- Predicted to increase
- 1.5 degrees by 2044
- Comparable to other studies



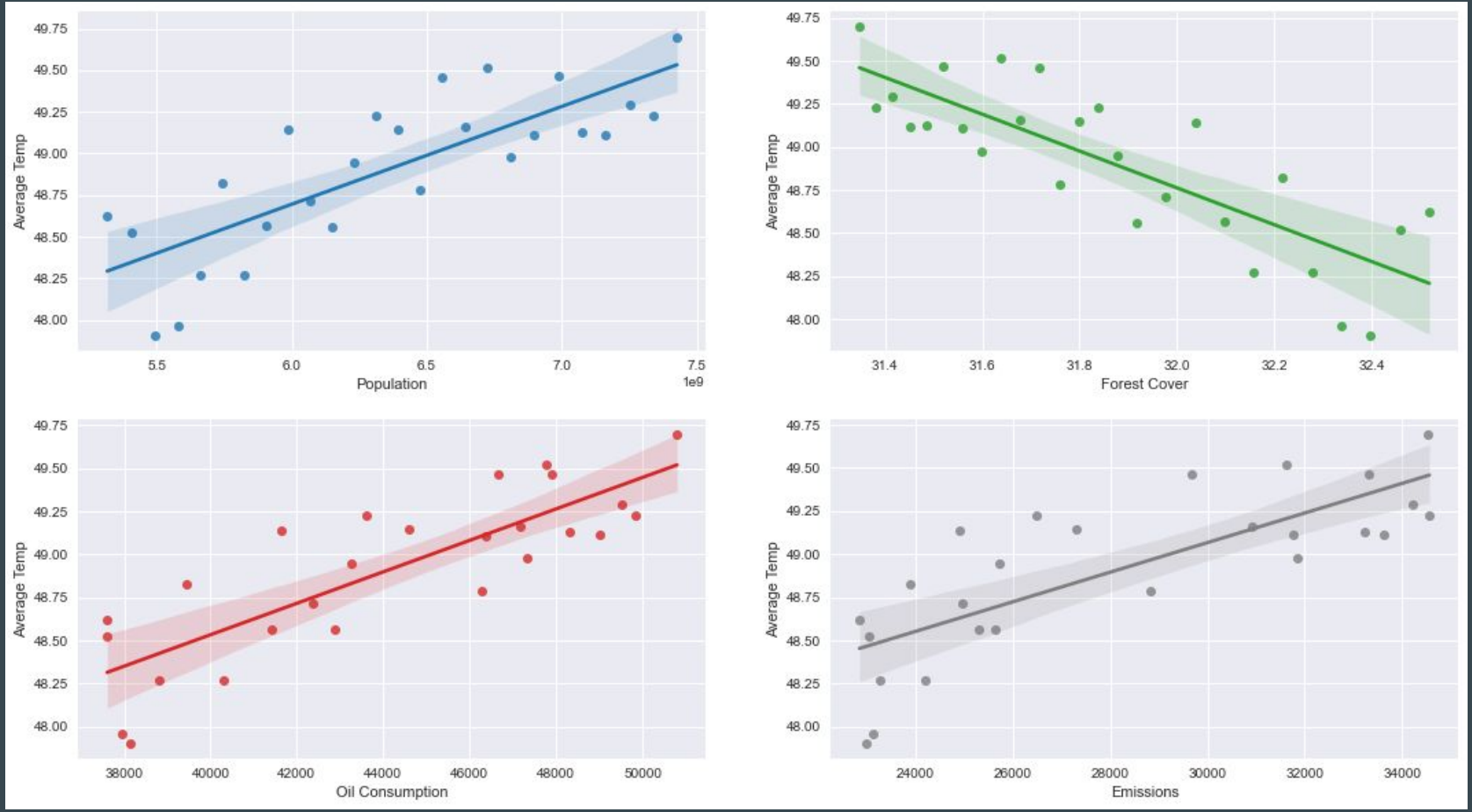
Regression Data

- Strong Correlations:
  - Population
  - Oil Consumption
  - Emissions
  - Forest Cover

- Weak/No Correlations
  - GDP Growth

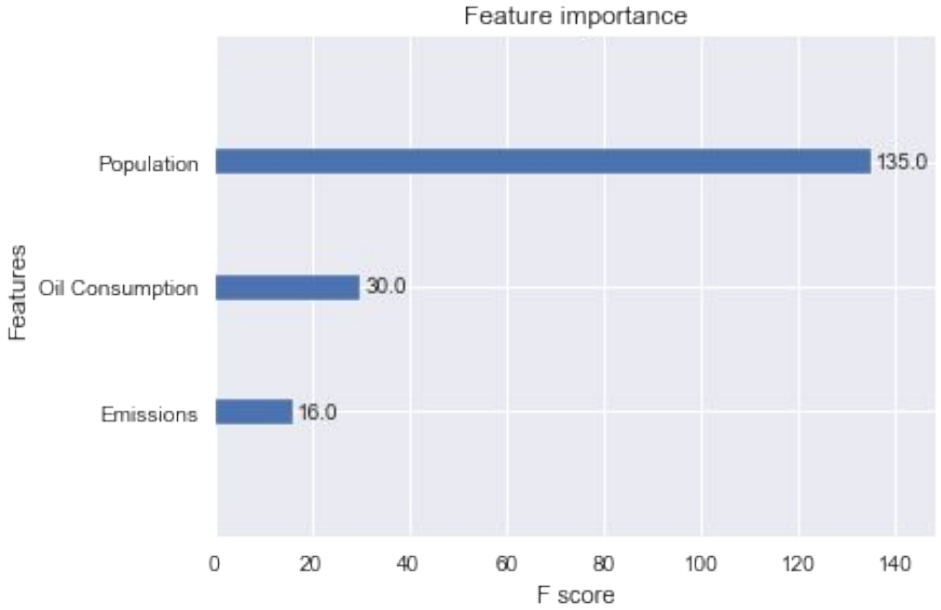


Regression Relationships



Results

- Model Scores:
  - .43 MAE
- Strong Predictors
  - Population(135)
  - Oil Consumption(30)
  - Emissions(16)



Conlusions

Upward Trends

- Beginning in 1970
- Accelerating
- +1.5 degrees by 2045

Correlations

- Deforestation
- Emissions
- Oil Consumption
- Temperature

Predictors

- Population
- Oil Consumption
- Emissions

Next Steps

Emissions

- Smaller areas
- Smaller intervals
- Lags
- Cumulative Effects

Population (By Country)

- Growth
- Consumption
- Emissions
- Examples

Seasonal Studies

- High/Low Extremes
- Smaller periods
- Smaller areas
- Weather Events

Thank You!

Please feel free to ask any questions.

You may also reach me via email:

Chris Hollman
chollman91@gmail.com