
ALASKAN SEA
LEVEL RISE

SEA LEVEL PREDICTION F.E.A.M (TEAM)

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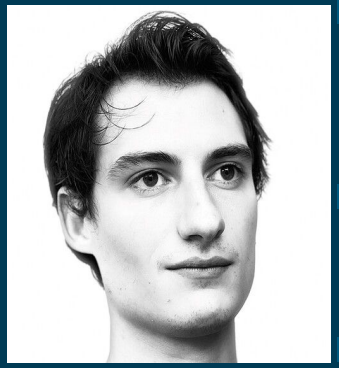

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CONTENTS:

1. PROBLEM STATEMENT

We intend to create an optimal model to predict sea levels in various geographical areas of Alaska to pinpoint areas requiring attention from **environmental regulators.**

MAPS


Beaufort Sea
Chukchi Sea
Latitude: 71.32
Longitude: -156.61
City: Barrow
Latitude: 64.51
Longitude: -165.44
City: Nome
Alaska
Anchorage
Bering
Latitude: 53.90
Longitude: -166.54
City: Dutch
Latitude: 57.75
Longitude: -152.49
City: Kodiak
Latitude: 60.13
Longitude: -149.42
City: Seward
Latitude: 59.51
Longitude: -139.67
City: Yakutat
Latitude: 55.36
Longitude: -131.72
City: Ketch
Latitude: 57.05
Longitude: -135.36
City: Sitka
Northwest Territories
British Columbia

2. BRIEF SUMMARY

- **Sea level rise poses huge threat to coastal habitats**
  - Leads to erosion, flooding, as well as wind-driven storm surges
- **Factors contributing to sea level rise**
  - Ice Melt, Thermal Expansion, Land Sinkage, Gulf Stream
- **Local meteorological conditions reasonably tie to sea level tendency**

3. TARGET AUDIENCE

- **Alaska Department of Environmental Conservation**
- **Environmental Protection Agency (EPA)**

- **Background:** The state and national environmental regulators are not always aligned in their priorities

- **Goal:** Aligning both regulators' understanding of the sea level situation in Alaska, and create awareness consistent between both parties

4. DATA COLLECTION

National Oceanic and Atmospheric Administration
U.S. Department of Commerce

- **Sea Level** Data for Various Weather Stations in Alaska
- **Carbon Dioxide** Data

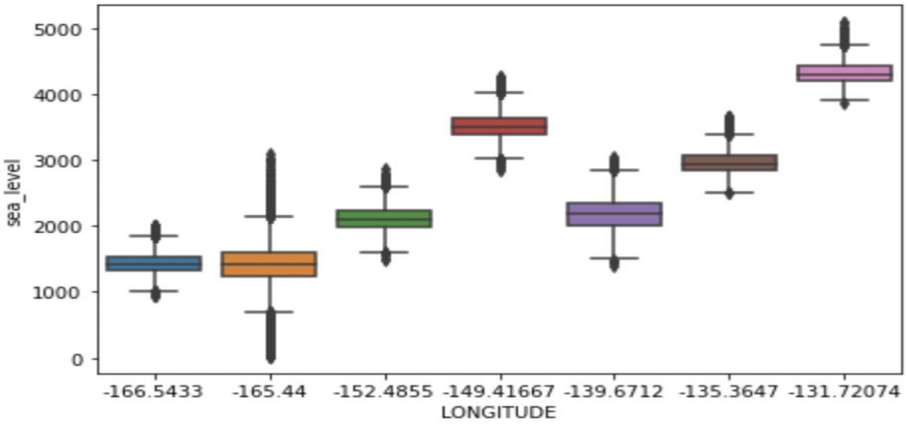
UNIVERSITY OF HAWAII SEA LEVEL CENTER

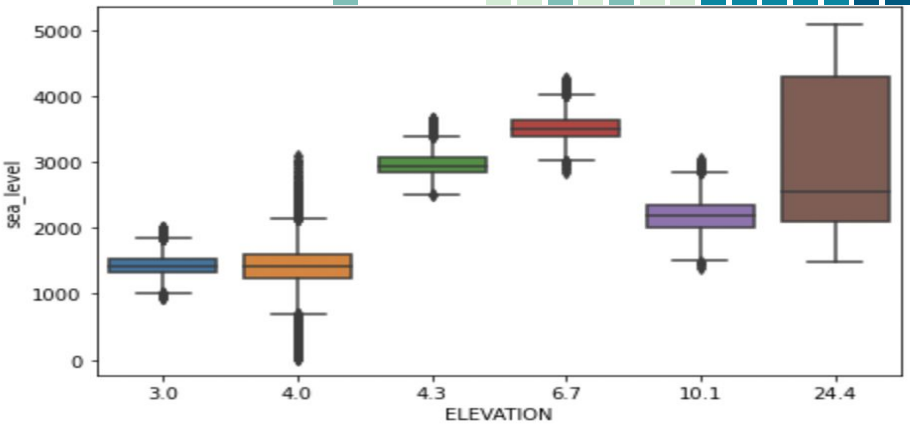
- **Sea Level** Data

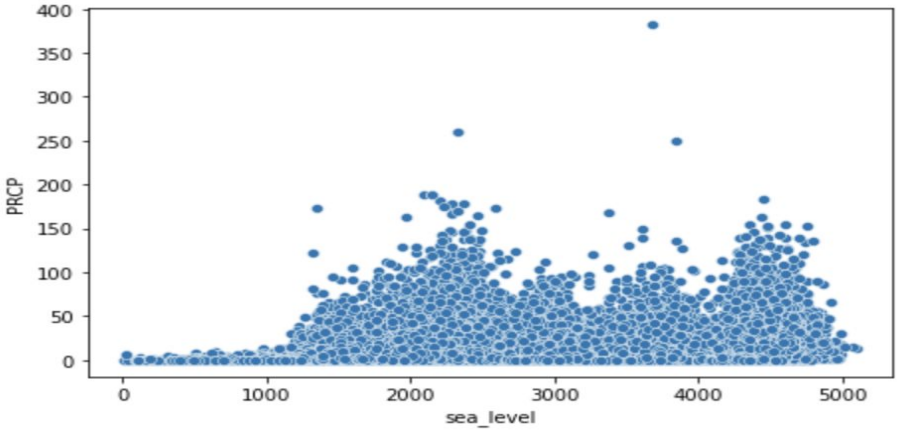
5. DATA CLEANING

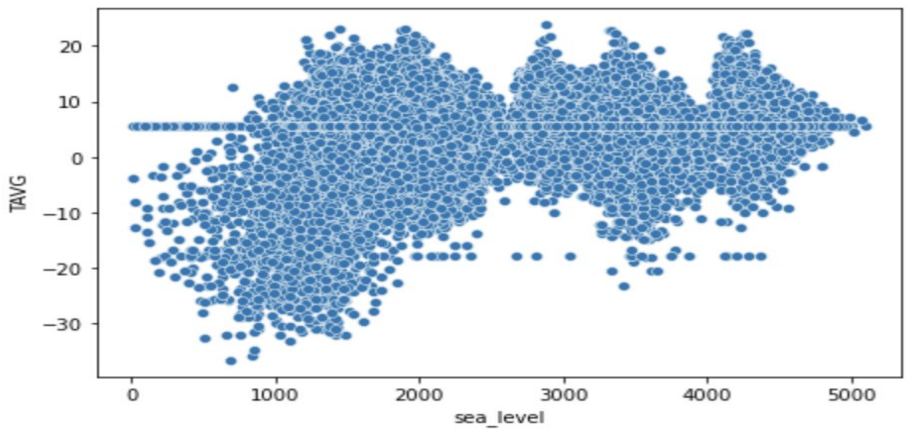
- Filled empty values with adequate values.
- Dropped less valuable features.
- Renamed many features.
- Created year_month_day feature to organise the dataset.
- Dropped all the observations where Y-variable (sea_level) was null.

6. EDA

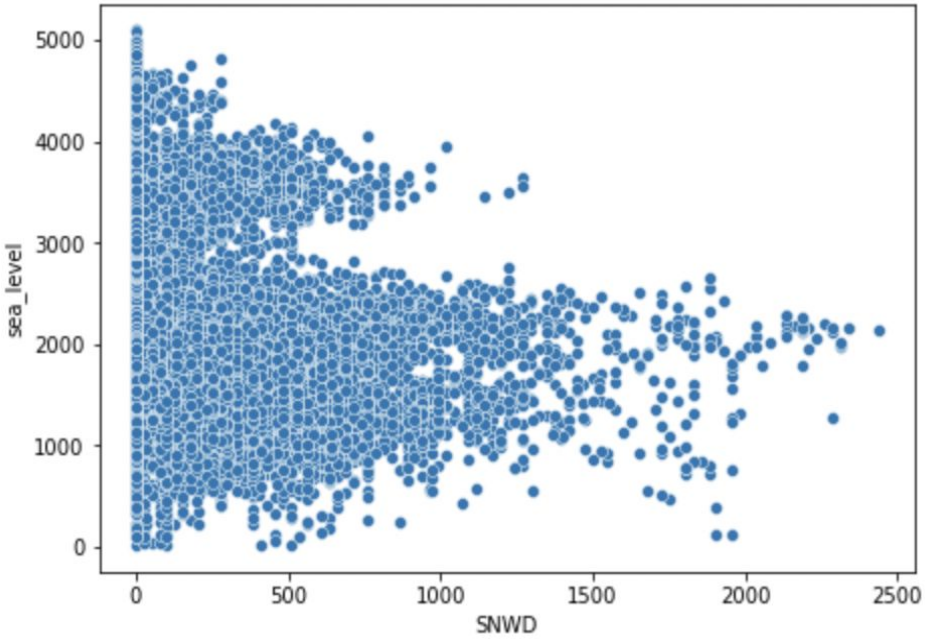


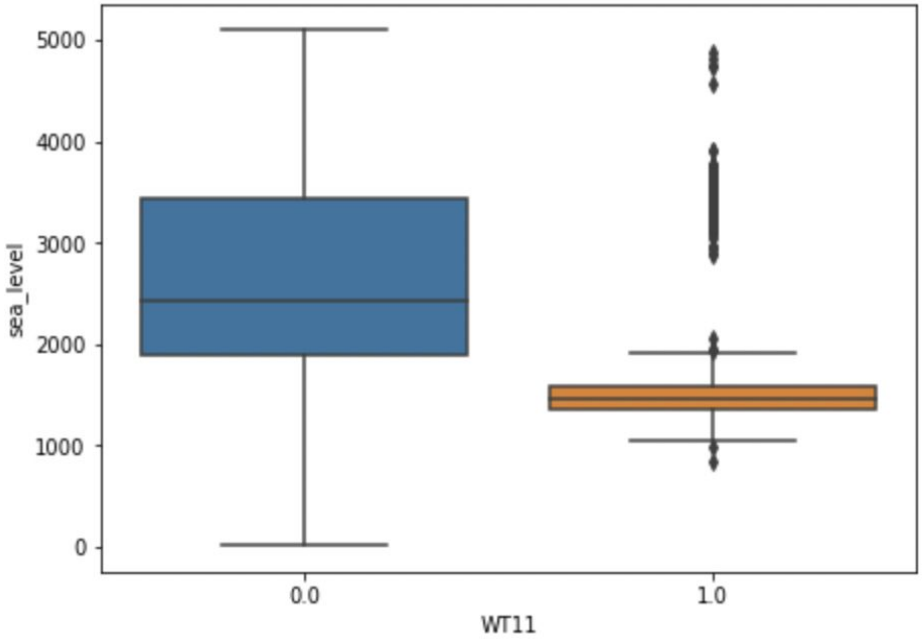






Positive correlated features with the **sea-level**





Negative correlated features with the **sea-level**

7. MODEL BUILDING

- **Regression Problem**
  - **Machine Learning:**
    - Linear Regression
    - Polynomial Features
    - **Random Forest**
    - Extra Trees
    - ADA Boost

7. MODEL BUILDING

- **Regression Problem (continued)**
  - **Deep Learning:**
    - Neural Networks
    - Recurrent Neural Networks

7. MODEL BUILDING

- **Parameters Considered**
  - Correlation coefficients (R-squared scores)
  - Root Mean Square Error Values
- **Best Predictors**
  - Longitude
  - Elevation
  - Temperature (Min, Max, Avg)
  - Precipitation

7. MODEL BUILDING

Model	Features	R-squared score (Training)	R-squared score (Testing)	RMSE	Description
Machine Learning	---	---	---	---	---
Simple Linear Regression (baseline)	---	---	0.7671	443.97	---
Linear Regression	Best 6 Features	0.5807	0.5840	655.15	---
Linear Regression with Polynomial Features	---	---	0.9519	---	---
Random Forest	Best 6 Features	0.9899	0.9639	192.95	---
Extra Trees	Best 6 Features	0.9932	0.9603	202.41	---
ADA Boosting	Best 6 Features	0.9602	0.9600	203.11	---
Deep Learning	---	---	---	---	---
Neural Net Model	Best 6 Features	---	0.3306	830.62	---
Neural Net Model (GridSearch)	Best 6 Features	---	0.9632	194.65	Best Parameters dropout: 0.1 epochs: 50, hidden_layers: 5, hidden_neurons: 64
Recurrent Neural Net Model	Best 6 Features	---	---	274.59	---
Recurrent Neural Net Model	Best 6 Features	---	---	1053.94	---

8. CONCLUSIONS & RECOMMENDATIONS

- ‘Random Forest’ Machine Learning Model to predict sea levels
  - Interpretability over other models
- Latitude and elevation key features to consider
  - Atmospheric CO2 not significant

8. CONCLUSIONS & RECOMMENDATIONS

- Further Data Collection
- Entirely different region for study
- Setting up new weather stations
- Further features to consider
  - e.g. Sea surface temperature, sea level pressure, surface salinity

MODEL DEPLOYMENT

THANKS!

Any questions?