

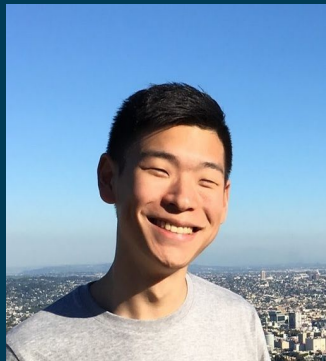
A landscape photograph of a snow-capped mountain range in Alaska, with a body of water in the foreground. The water is filled with numerous small ice floes, suggesting a melting glacier or sea ice. The sky is blue with some light clouds. On the right side of the image, there is a decorative graphic consisting of a grid of squares in various shades of blue and green, arranged in a pattern that resembles a stylized wave or a digital data visualization.

ALASKAN SEA LEVEL RISE

SEA LEVEL PREDICTION TEAM



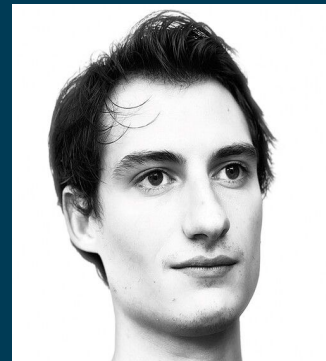
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1. Problem Statement
2. Brief Summary
3. Target Audience
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1. PROBLEM STATEMENT

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

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



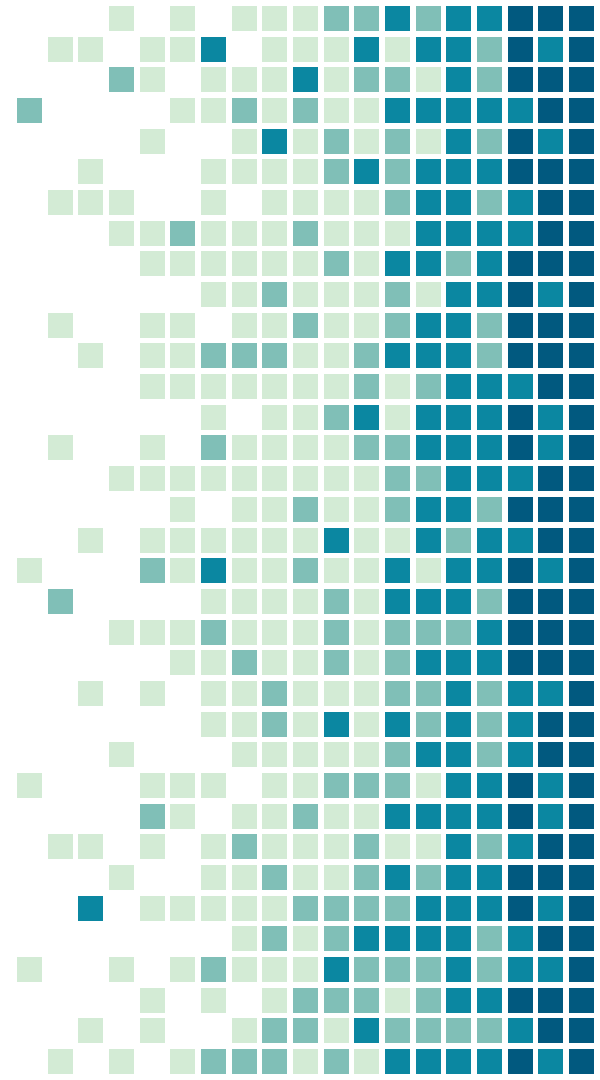
National Oceanic and
Atmospheric Administration
U.S. Department of Commerce

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



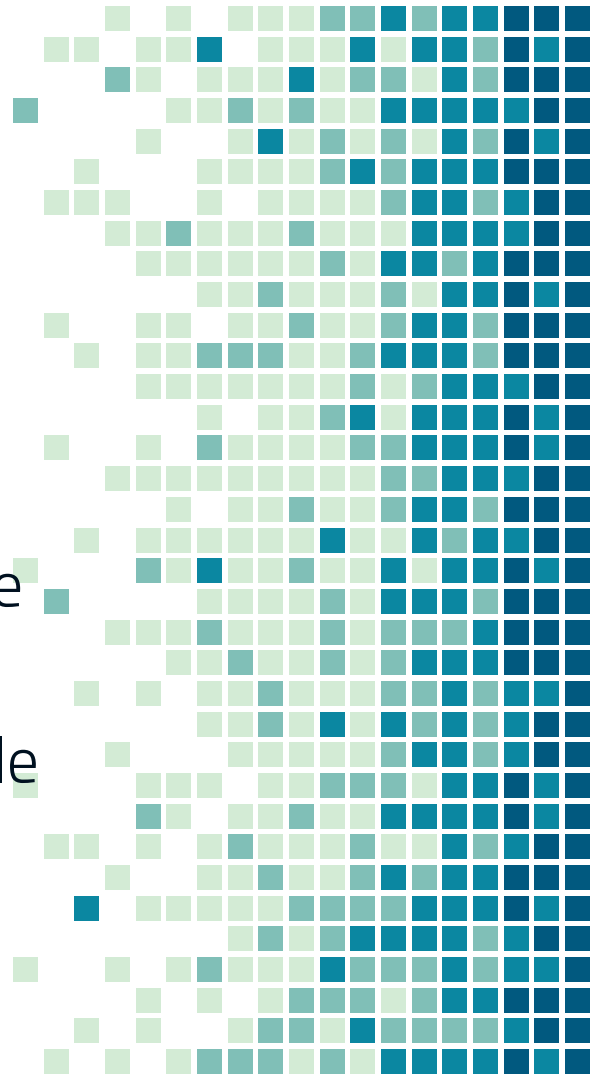
UNIVERSITY OF HAWAII
SEA LEVEL CENTER

- Sea Level Data

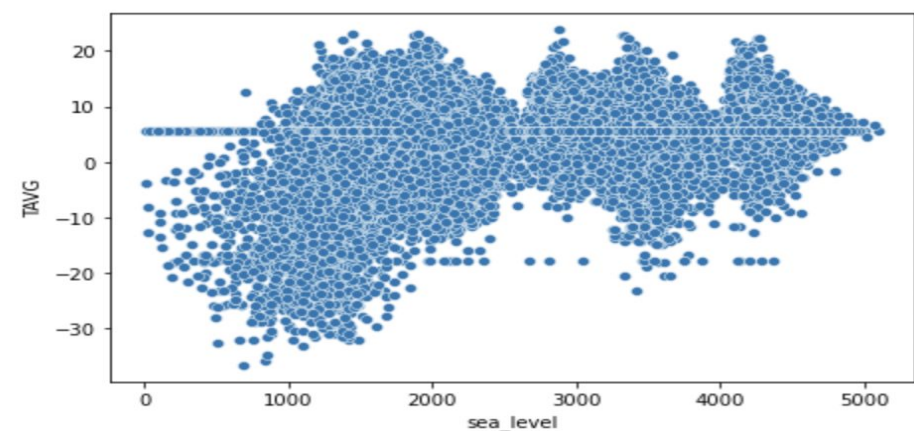
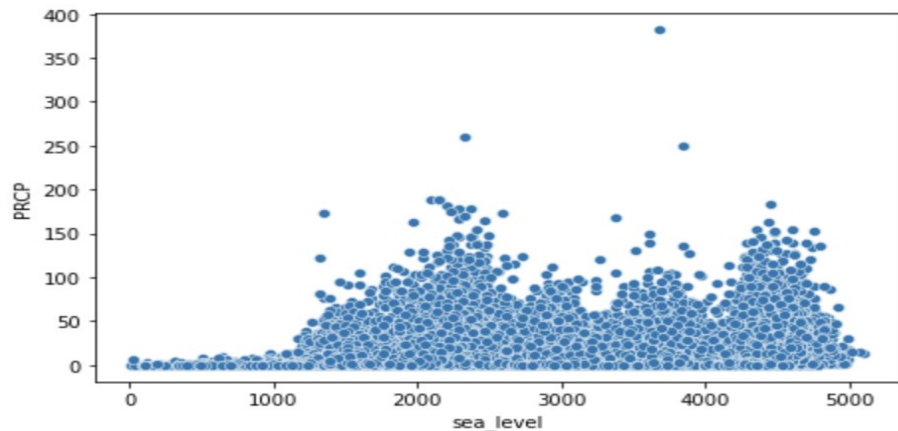
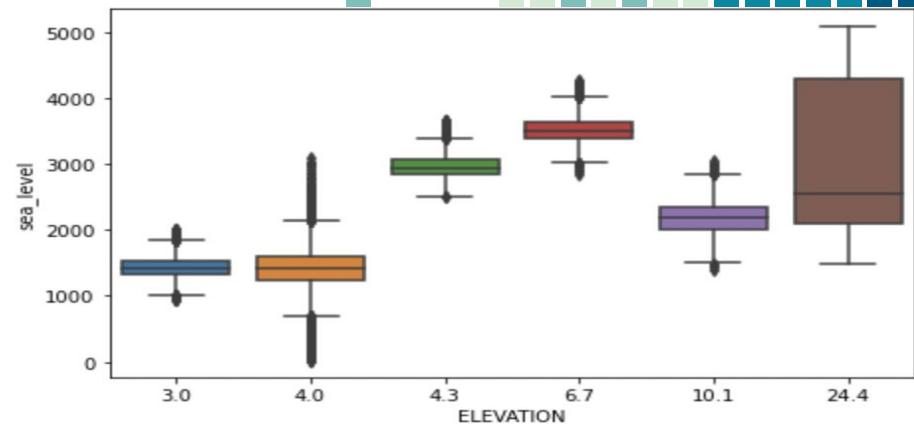
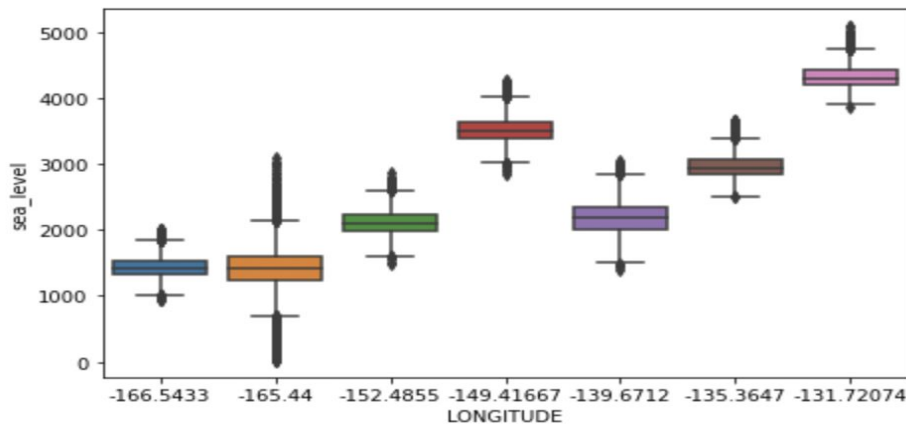


5. DATA CLEANING

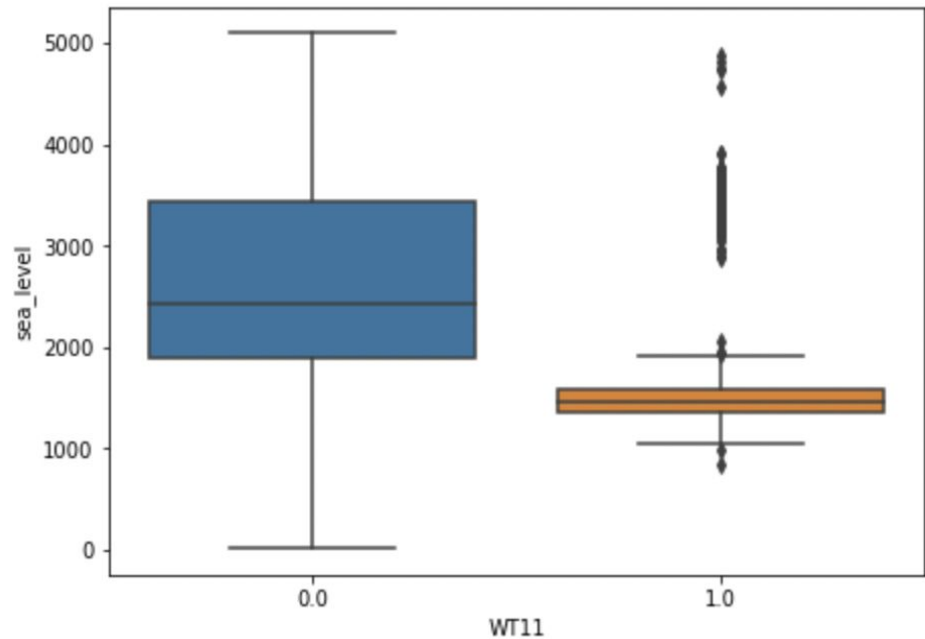
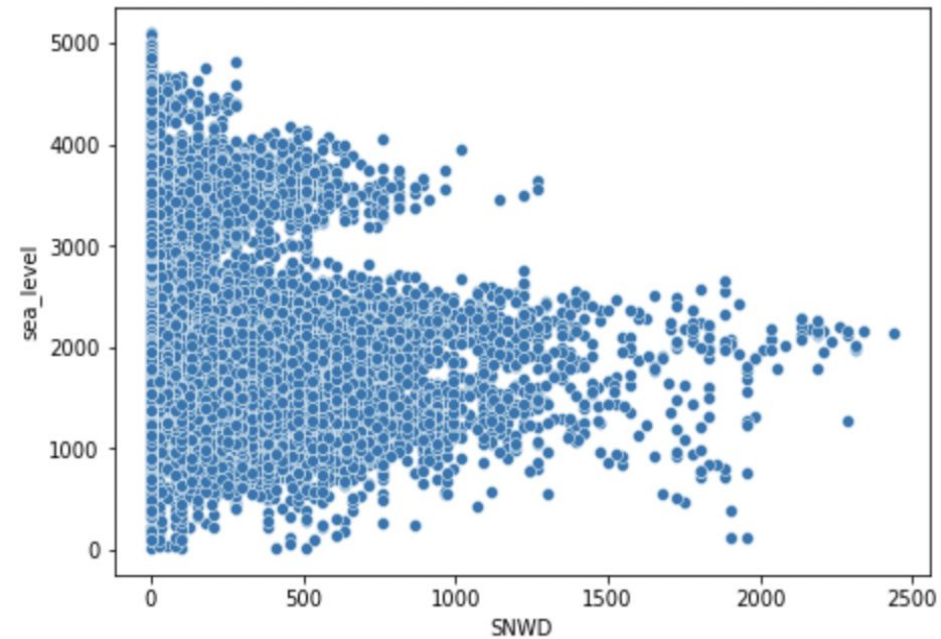
- Filled empty values with adequate values.
- Dropped less valuable features.
- Renamed many features.
- Created year_month_day feature to organise the dataset.
- Dropped all the observations where Y-variable (sea_level) was null.



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



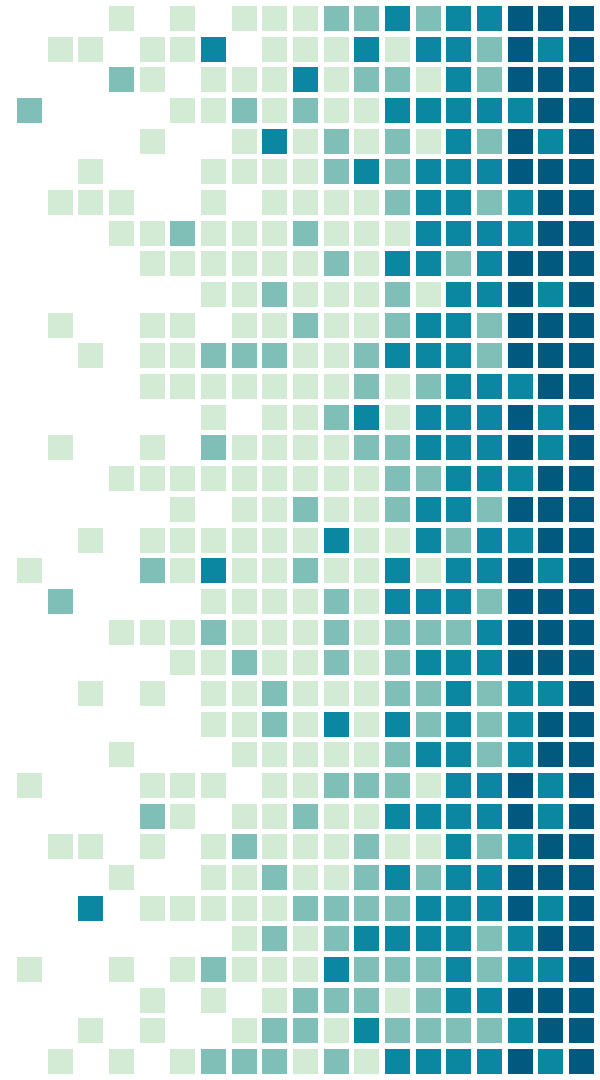
7. MODEL BUILDING

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

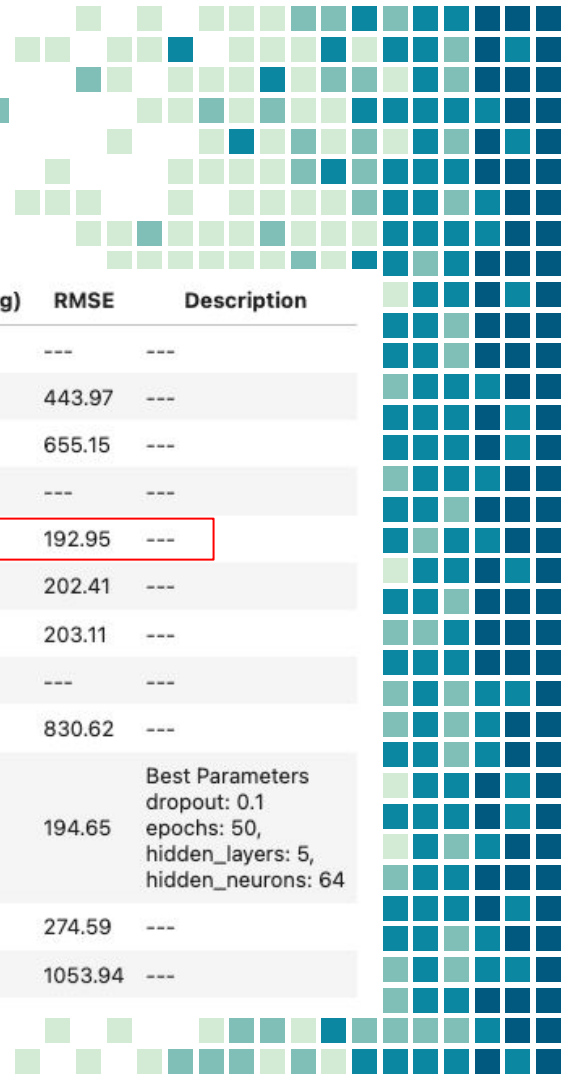


7. MODEL BUILDING

- **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



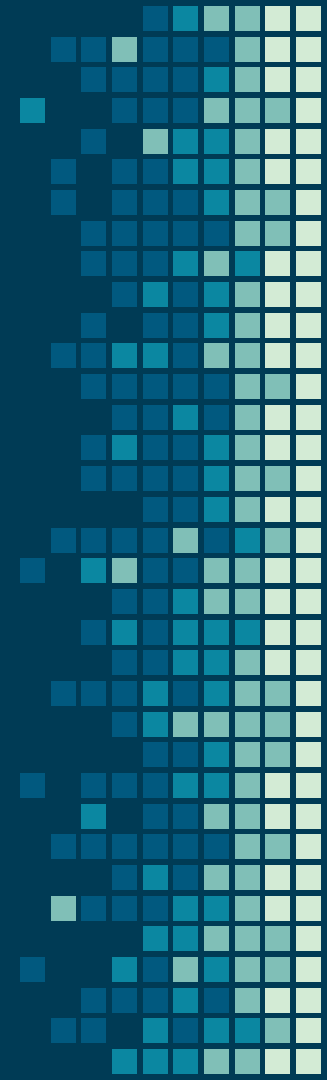
8. CONCLUSIONS & RECOMMENDATIONS

- 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?