Sea Level Rise Analysis and Prediction Project Overview

What This Project Does

This project analyzes over 130 years of global sea level data to understand how ocean levels have changed since 1880 and predicts what sea levels might look like by 2050. Using real environmental data from US government agencies, the project creates visualizations and statistical models to show both historical trends and future projections.

Why This Project Matters

- **Climate Change Impact**: Sea level rise is one of the most visible and measurable effects of climate change
- **Future Planning**: Predictions help coastal communities, governments, and organizations prepare for future changes
- **Data-Driven Insights**: Uses scientific data to make evidence-based projections rather than speculation
- **Historical Context**: Shows how the rate of sea level rise has changed over more than a century

What the Project Analyzes

Historical Data (1880-2014)

- **Time Span**: 134+ years of measurements
- **Data Source**: US Environmental Protection Agency, CSIRO, and NOAA
- **Measurement**: Global average absolute sea level change in inches
- **Baseline**: Changes measured relative to a historical reference point

Key Questions Answered

1. **How much has sea level risen since 1880?**
2. **What is the overall rate of sea level change?**
3. **Has the rate of change accelerated in recent decades?**
4. **What might sea levels look like in 2050?**

Technical Approach

Data Visualization

- **Scatter Plot**: Shows individual data points for each year to reveal the overall pattern

- **Trend Lines**: Two different linear regression lines to compare different time periods

- **Professional Formatting**: Clear labels, title, and axes for easy interpretation

Statistical Analysis

- **Linear Regression**: Uses mathematical models to find the "line of best fit" through the data

- **Two Time Periods Compared**:
    - **Full Dataset (1880-present)**: Shows the long-term historical trend
    - **Recent Data (2000-present)**: Shows if the rate has changed in the 21st century

Prediction Methodology

- **Extrapolation**: Extends trend lines to 2050 to make predictions

- **Comparative Analysis**: Shows two different scenarios based on different time periods

- **Scientific Approach**: Uses established statistical methods for forecasting

Tools and Technologies Used

- **Python Programming**: Core language for data analysis

- **Pandas**: Data import, cleaning, and manipulation

- **Matplotlib**: Creating professional-quality visualizations

- **SciPy**: Statistical analysis and linear regression calculations

Key Features of the Analysis

Visual Output

- **Scatter plot** showing all historical data points

- **Two trend lines** representing different prediction scenarios

- **Future projections** extending to year 2050

- **Professional formatting** with proper labels and title

Dual Prediction Approach

1. **Historical Trend**: Based on entire dataset (1880-present)
    - Shows long-term average rate of change
    - Provides conservative estimate based on historical patterns
2. **Recent Trend**: Based on data since 2000
    - Captures potential acceleration in recent decades

- May provide more relevant prediction for current conditions