CALIFORNIA STATE UNIVERSITY BAKERSFIELD

BOREALIS : TRACKING POLLUTION IN KERN COUNTY USING WEATHER PATTERNS
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Project Introduction

This project aims to create an accessible and intuitive air pollution tracking application focused on highly affected regions such as Kern County, California. By integrating real-time air quality data, wind patterns, and an AI model, the app provides detailed pollution source tracking and movement forecasts.

What Is The Problem ?

Air pollution is a major issue worldwide, especially in areas like Kern County, one of the most polluted regions in the U.S. Existing weather apps often show current air quality but lack details on pollution sources or movement. While advanced tools exist, they are often complex and not user-friendly. There's a clear need for an accessible app that offers reliable pollution tracking and forecasts.
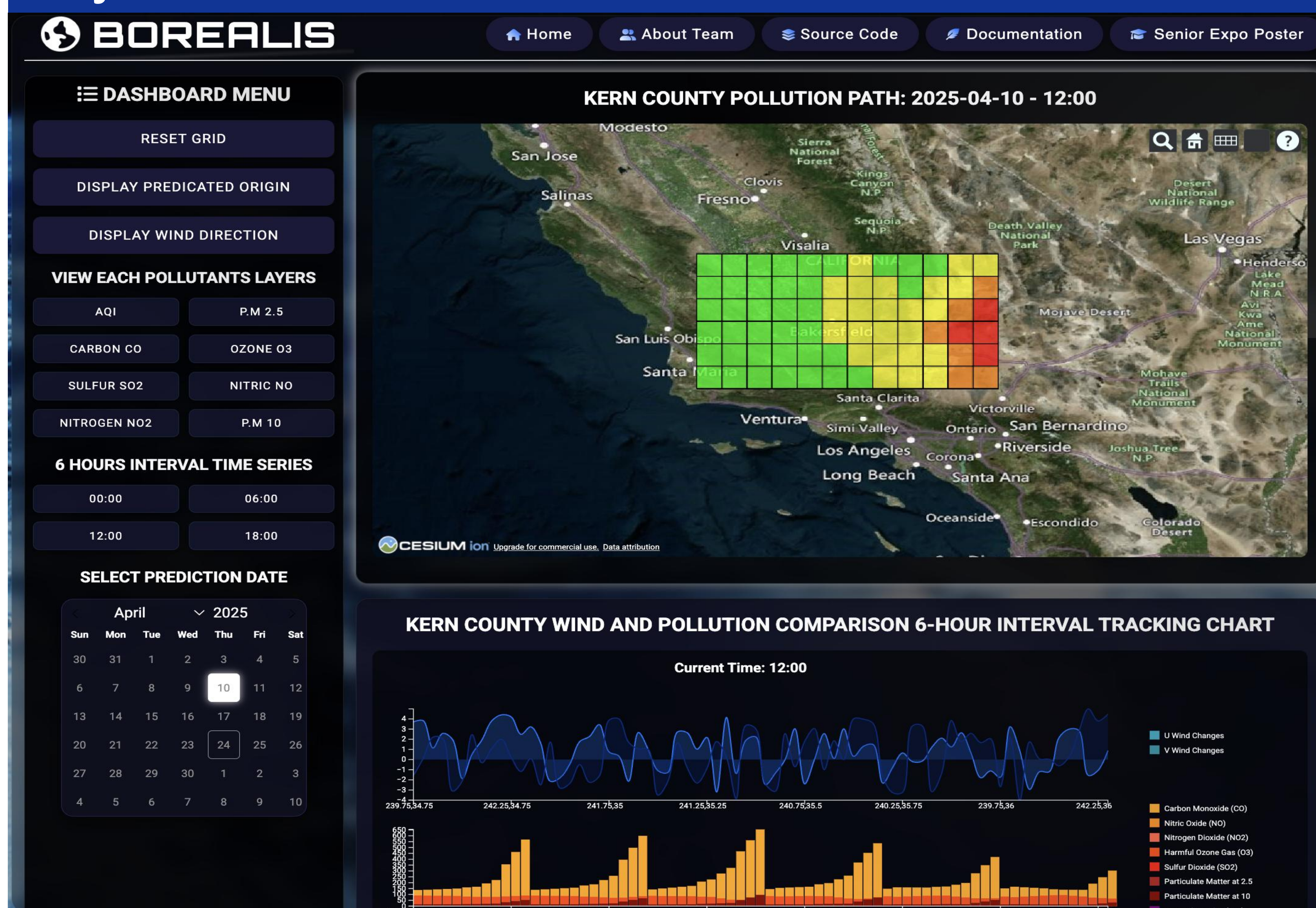
How This Problem Can Be Solved

Our solution for this is to build a user-friendly tool that predicts the origin and movement of air pollution. It collects AQI data from APIs, wind patterns from a simplified version of Microsoft's Aurora, and archives additional data from algorithm. The model then forecasts air pollution trajectories, which are displayed on an interactive 3D map hosted on Athena, making complex data easy to access and understand.
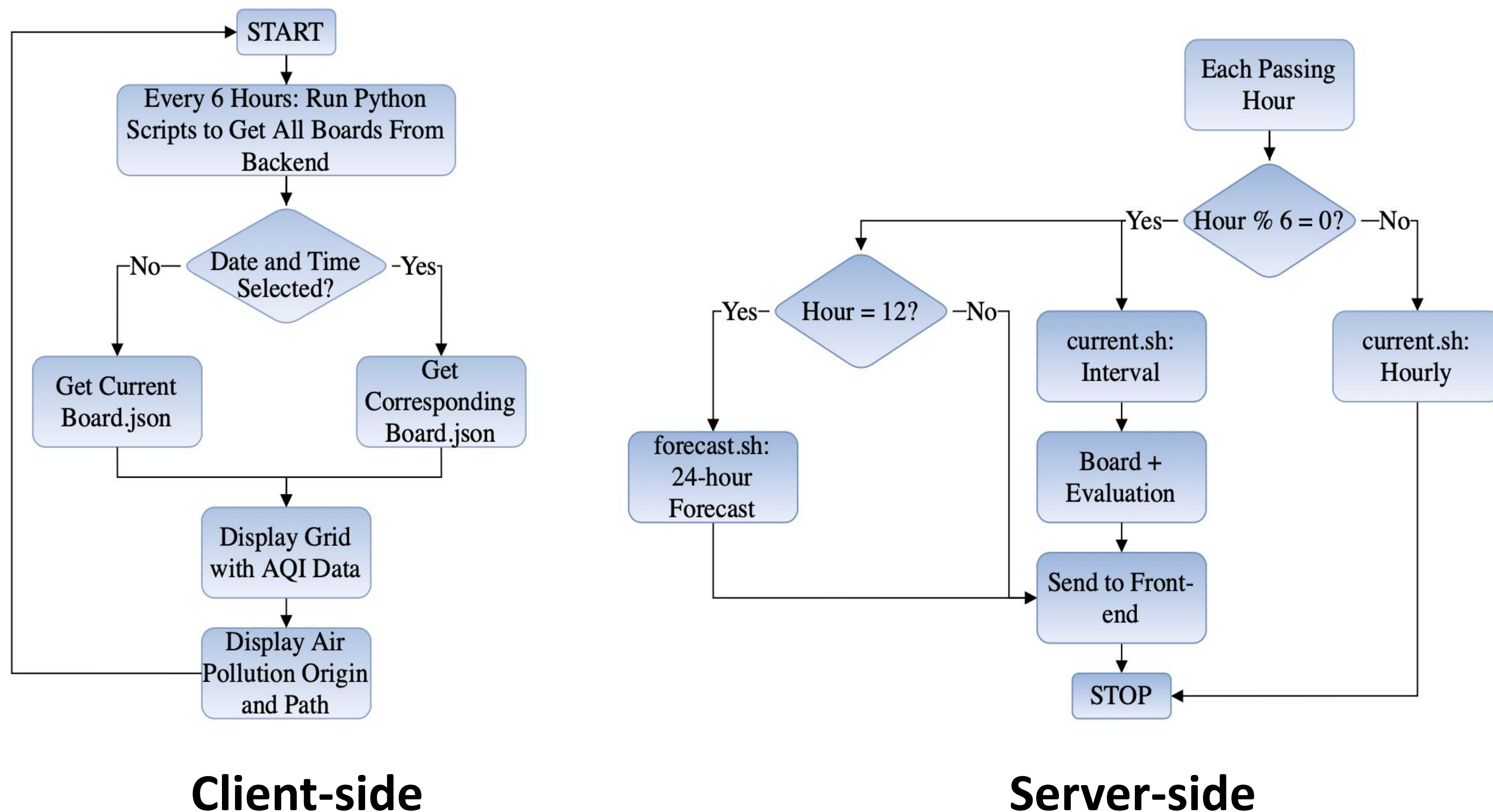
Development Sources

Cesium, HTML5, CSS3, Microsoft Aurora, python, JS, D3.js

Project Results Overview

Project Final Architecture Flow Chart

Client-side   **Server-side**

How Does This Work ?

> **Back-end server:** Using Python libraries to get the data from Aurora into JSON files . Ensure the forecast data accuracy.

> **Front-end server:** Using Javascript HTML CSS and D3 libraries to visualization the dataset from backend (on map grid and charts) and design a responsive website on Athena.

> **Database server:** Organized CSV/JSON format, clean data from back-end and save to archive.

Project Challenges

Our backend can face delays due to outdated data and limited GPU VRAM on Athena, forcing slow batch predictions. Accurate results require uninterrupted runs, and hourly forecasting is too time-consuming. Lower-resolution models could help, but current hardware can't support them without further optimization.

Project Features

- Display predicated pollution pathway
- Display wind direction based on picked time
- 2D Locked Grid Mapping for Kern County
- Enhanced GUI and Data Visualization
- Multi-Format Environmental Data Display
- 6-Hour Real Time Series -AQI and Pollutants
- Calendar Picker for Date-Based Analysis

Acknowledgements