

Air Quality Index Estimation

Team Information

- **Team Members:** Pavan Sai Porapu

Problem Statement

- **Problem:** Air pollution is a major environmental and health concern, affecting millions of people worldwide. Accurately estimating the AQI can help individuals, policymakers, and healthcare providers take necessary precautions.
- **Importance:** Poor air quality contributes to respiratory diseases, cardiovascular issues, and other health complications. Real-time AQI estimation can improve public awareness and response.
- **Target Users:**
 - General public
 - environmental agencies
 - urban planners
 - healthcare professionals.

Selected API

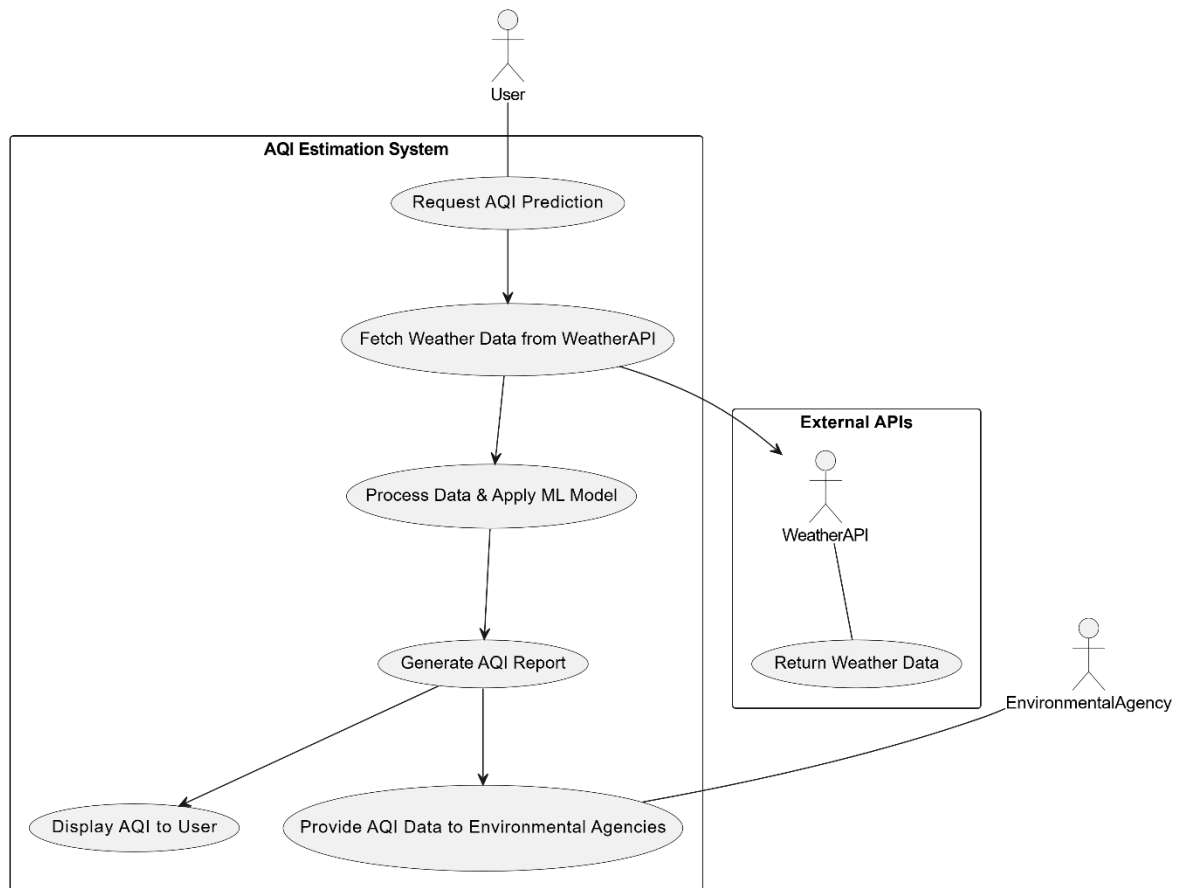
- **API Name:** Weather & Environmental APIs
- **API Documentation:** <https://rapidapi.com/weatherapi/api/weatherapi-com>
- **Role in the Solution:** This API provides real-time weather parameters like temperature, humidity, wind speed, and pressure, which are crucial for predicting AQI levels.

Proposed Solution

- The system will use WeatherAPI to fetch real-time weather data.
- The AQI estimation model will be trained using historical weather data and AQI records.
- The model will predict AQI based on temperature, humidity, wind speed, and pressure.

- The results will be displayed in a user-friendly web app or mobile application.

Use Case Diagram



Key Features & Innovation

- **Real-time AQI Estimation:** Uses live weather data for near-instant AQI predictions.
- **Machine Learning-Based Prediction:** More accurate than traditional interpolation methods.

Expected Impact & Benefits

- Provides valuable insights for city planners and environmental agencies.
- Increases awareness of pollution trends and their effects.

Technical Approach

- **Machine Learning Models:** Traditional machine learning models
- **Frameworks & Tools:** Python, Scikit-learn, Pandas, Matplotlib, Streamlit (for deployment).
- **Data Sources:** WeatherAPI

Feasibility & Implementation Plan

- **Data Collection & Preprocessing:** Merge historical AQI data with weather data.
- **Model Training & Evaluation:** Train ML models and fine-tune hyperparameters.
- **Deployment:** Develop a web interface for real-time AQI predictions.

UI/UX Considerations

- **Simple Interface:** Users can input location, and weather data to get AQI predictions.
- **Color-Coded AQI Levels:** Easy interpretation of air quality (Green, Yellow, Red).
- **Accessibility:** user friendly web interface is used to get AQI information.

Expected Outcome & Evaluation Metrics

- **Expected Results:** A functional ML model providing AQI predictions with reasonable accuracy.
- **Metrics for Success:** Mean Absolute Error (MAE), Root Mean Square Error (RMSE)

References

- WeatherAPI: <https://rapidapi.com/weatherapi/api/weatherapi-com>
- Scikit learn : https://scikit-learn.org/stable/user_guide.html
- Pandas: <https://pandas.pydata.org/>