AIR QUALITY INDEX PREDICTION - ML Model

team a

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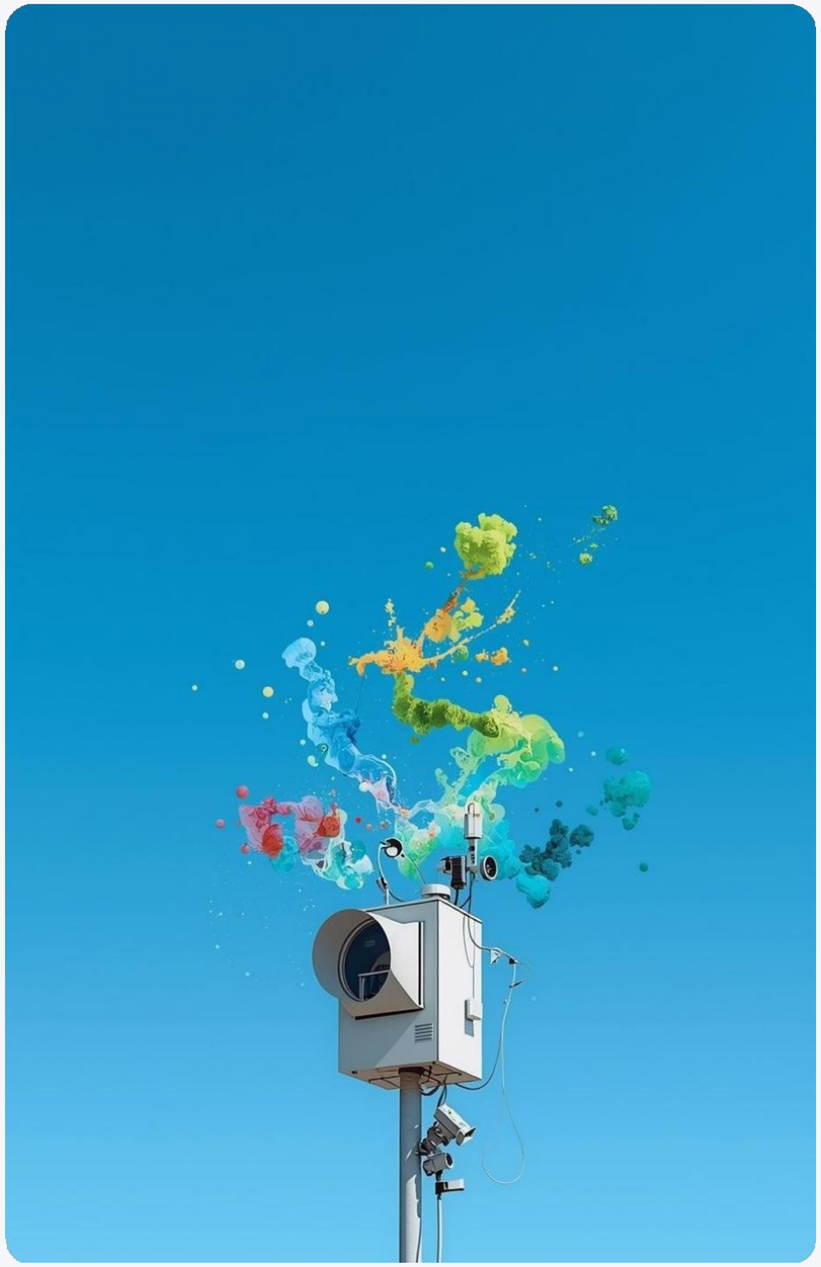
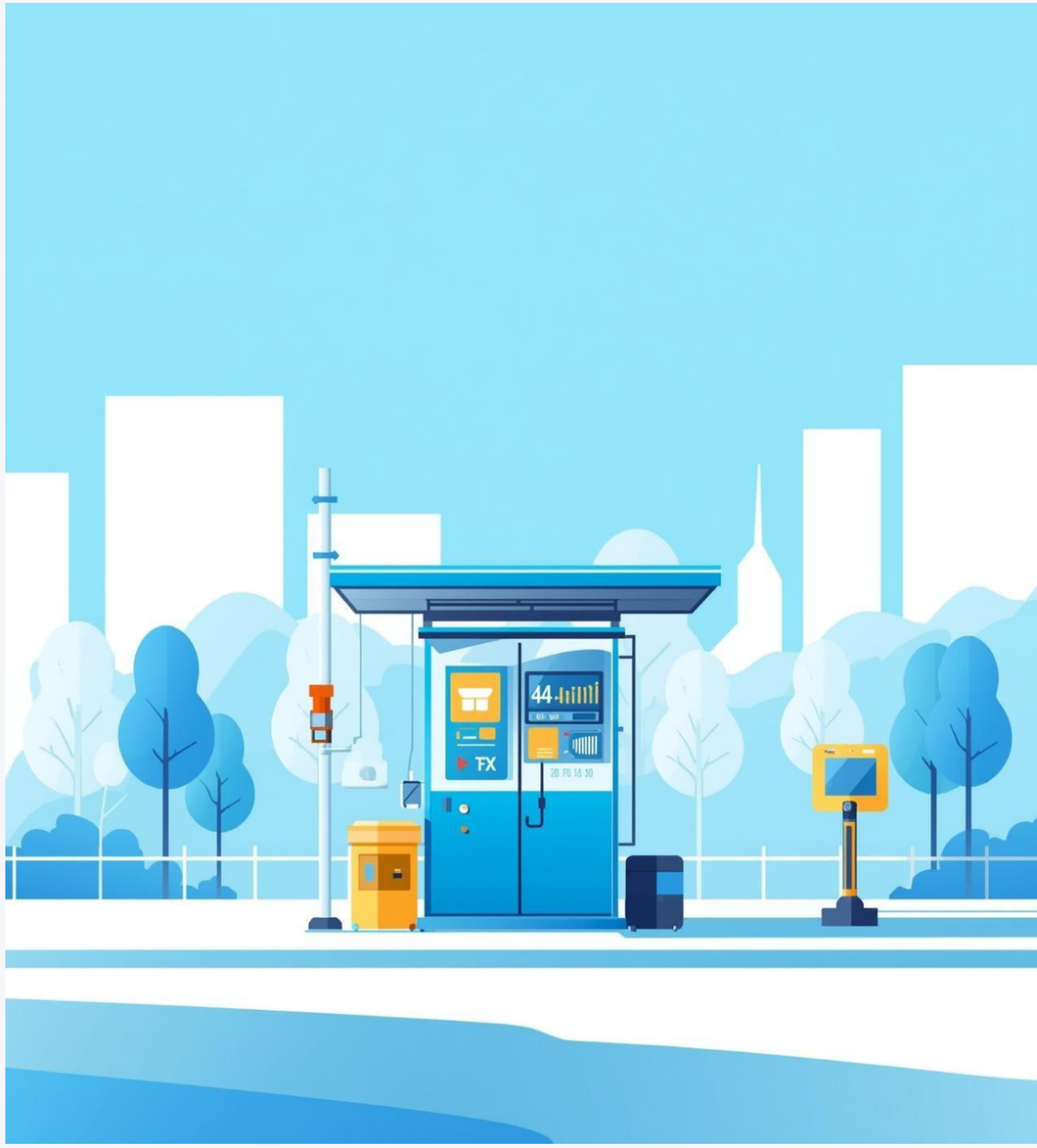
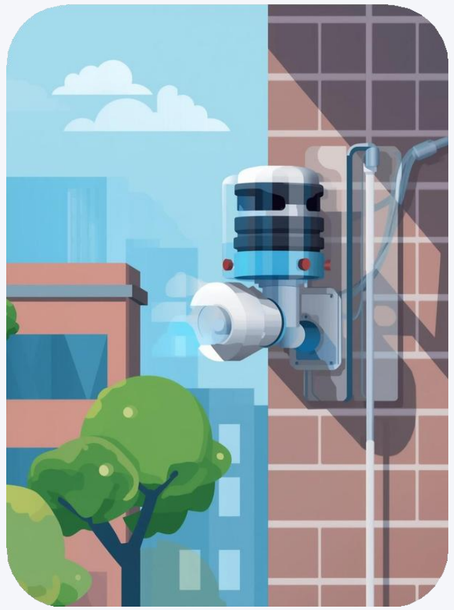


Overview of AQI Prediction System

This project focuses on developing a Machine Learning-based system to predict the Air Quality Index (AQI) using key air pollutants such as PM2.5, PM10, NO_2, SO_2, CO, and O_3. The goal is to provide an accurate and easy-to-understand prediction of air quality levels to promote environmental awareness.





Data Collection Setup

The project begins with **data collection** from various sources, including governmental and environmental organizations, focusing on key pollutants like PM2.5, PM10, NO_2, SO_2, CO, and O_3 to ensure accurate AQI predictions.

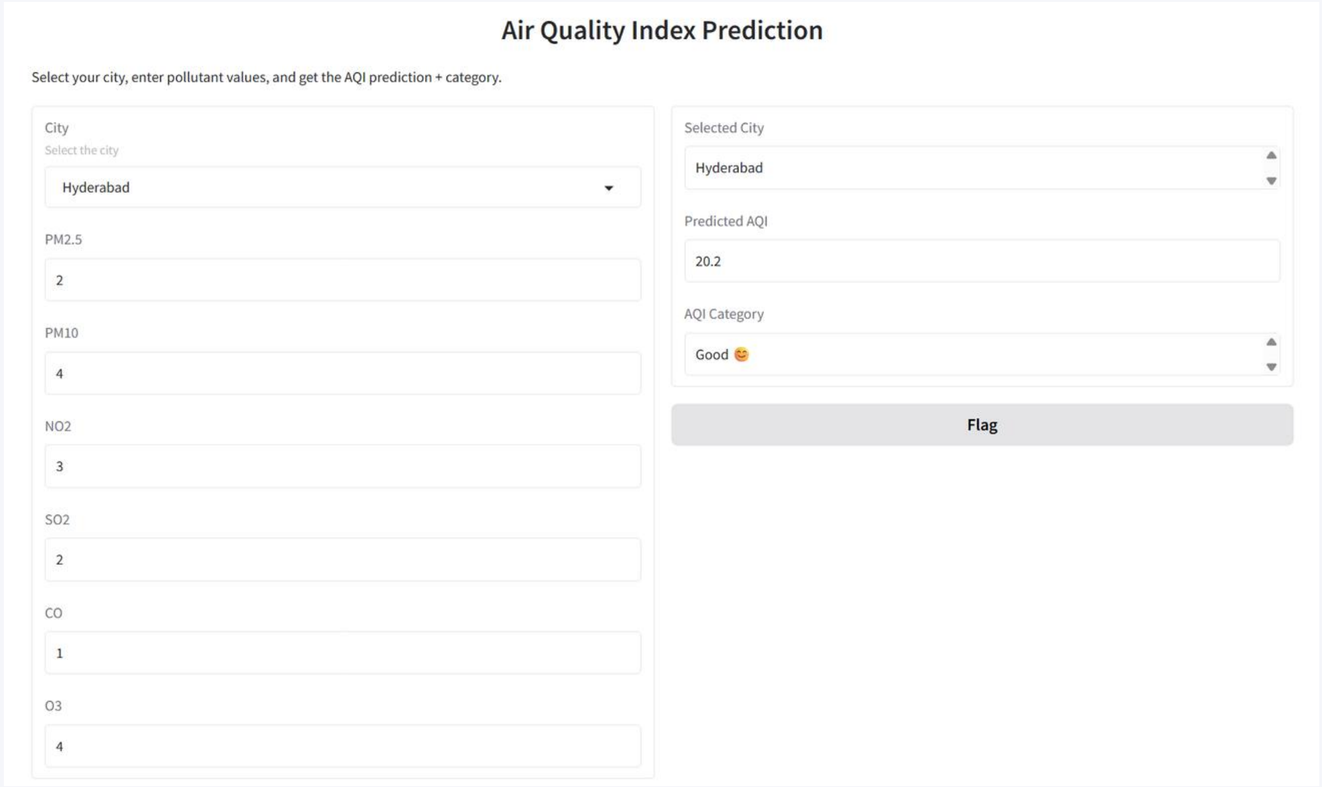
	AQI Value	CO AQI Value	Ozone AQI Value	NO2 AQI Value	PM2.5 AQI Value	lat
0	51	1	36	0	51	44.7444
1	41	1	5	1	41	-5.2900
2	41	1	5	1	41	-11.2958
3	66	1	39	2	66	37.1667
4	34	1	34	0	20	53.0167

Model Training and Accuracy Criteria

The model training phase focused on evaluating various regression algorithms. Selection criteria emphasized **accuracy and reliability**, ensuring optimal predictions for AQI based on collected pollutant data and environmental factors.

	MAE	MSE	RMSE	R2 Score	Accuracy (%)
Linear Regression	4.126361	41.797808	6.465122	0.974798	97.479807
Random Forest	0.090036	2.388645	1.545524	0.998560	99.855977
Gradient Boosting	0.827992	3.049675	1.746332	0.998161	99.816120
SVR	2.920637	278.538232	16.689465	0.832056	83.205574
KNN	1.316502	6.643031	2.577408	0.995995	99.599459

User Interface Development Overview



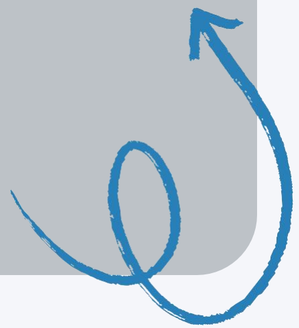

```
def predict_aqi(city, PM2_5, PM10, NO2, SO2, CO, O3):
    input_data = np.array([[PM2_5, PM10, NO2, SO2, CO, O3]])
    prediction = model.predict(input_data)[0]
    prediction = round(prediction, 2)

    # AQI Category
    if prediction <= 50:
        category = "Good 😊
        "
    elif prediction <= 100:
        category = "Satisfactory 😐
        "
    elif prediction <= 200:
        category = "Moderate 😐
        "
    elif prediction <= 300:
        category = "Poor 😟
        "
    elif prediction <= 400:
        category = "Very Poor 😣
        "
```

Progress Milestones

Achieving steady and timely completion

Throughout the 8-week project, we maintained a **consistent pace**, successfully meeting all key milestones while adapting to challenges, ensuring the AQI prediction system was developed efficiently and on schedule.



Challenges Faced

Encountering obstacles in AQI project

Data Inconsistencies

Inconsistent and incomplete air quality data presented significant challenges, requiring **extensive data cleaning** and validation processes to ensure reliability and accuracy in model training and predictions.

Model Selection

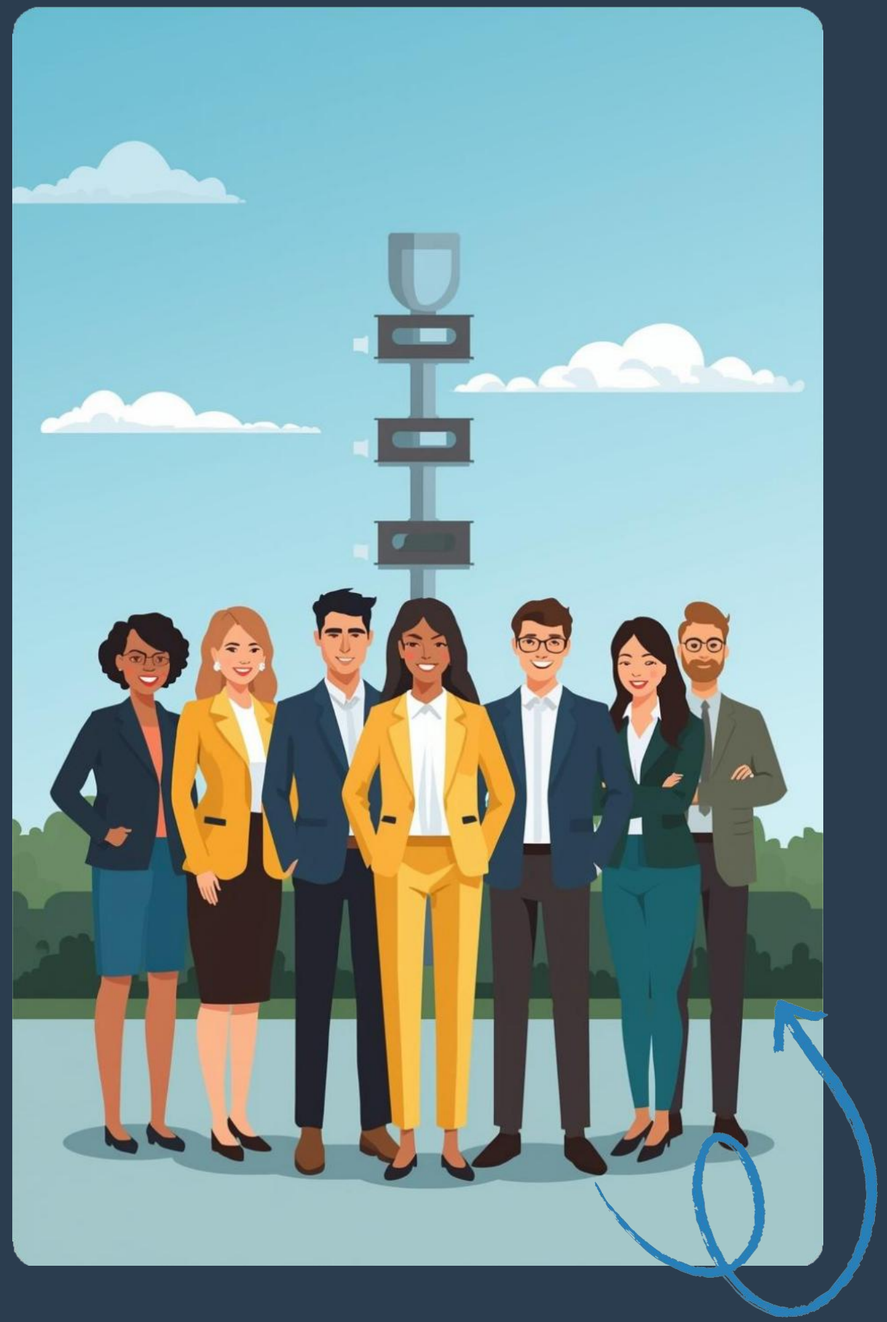
Selecting the best regression model involved evaluating multiple algorithms, requiring **careful analysis of performance metrics** and adjustments to ensure optimal accuracy in AQI predictions.

AQI Mapping

Correctly mapping predicted AQI values to standard categories posed a challenge, necessitating a **robust classification approach** to align predictions with established environmental standards effectively.

Key Learnings from the Project

Throughout the project, I gained insights into effective **data cleaning techniques**, learned the importance of model evaluation metrics, and developed a deeper understanding of how pollutants affect air quality.



Thank You

We appreciate your attention and questions!