"AI for Climate Action: Predicting and Mitigating Urban Air Pollution in India"

Introduction

Title: Air Quality Prediction and Policy Simulation

- **Background:**
- Air pollution is a significant concern in urban areas, adversely affecting health and the environment. Addressing pollution through innovative measures, like tree plantation and vehicle reduction, can provide sustainable solutions.
- **Objective:**
- To develop a tool that predicts air quality and simulates the impact of policy measures (e.g., tree plantation and vehicle reduction) on AQI in real time.

Problem Statement

- **Key Issues:**
  - Rising levels of PM2.5, PM10, and other pollutants in urban areas.
  - Limited tools for evaluating the effectiveness of policies like tree plantation and vehicle reduction.
  - Need for data-driven, interactive platforms to guide urban planning and decision-making.
- Core Question:
- How can we predict air quality and provide actionable insights on the impact of environmental policies?

Solution

- **Key Features:**
  a. Policy Simulation
     i. Simulates the potential impact of environmental policies on AQI:
     ii. Tree Plantation: Calculates AQI improvement based on the number of trees planted.
     iii. Vehicle Reduction: Models the effect of reducing vehicle emissions on AQI.
  b. AI-Driven Dynamic Green Zoning
     - Using AI to create green belts dynamically in cities where pollution is highest (e.g., along traffic corridors or industrial zones).
     - Zones adjust dynamically based on real-time pollutant data, ensuring optimal pollution mitigation.
  - https://colab.research.google.com/drive/1VhIIRL5EzNpdZRFuUNURto6WzpkDkjSg?usp=sharing

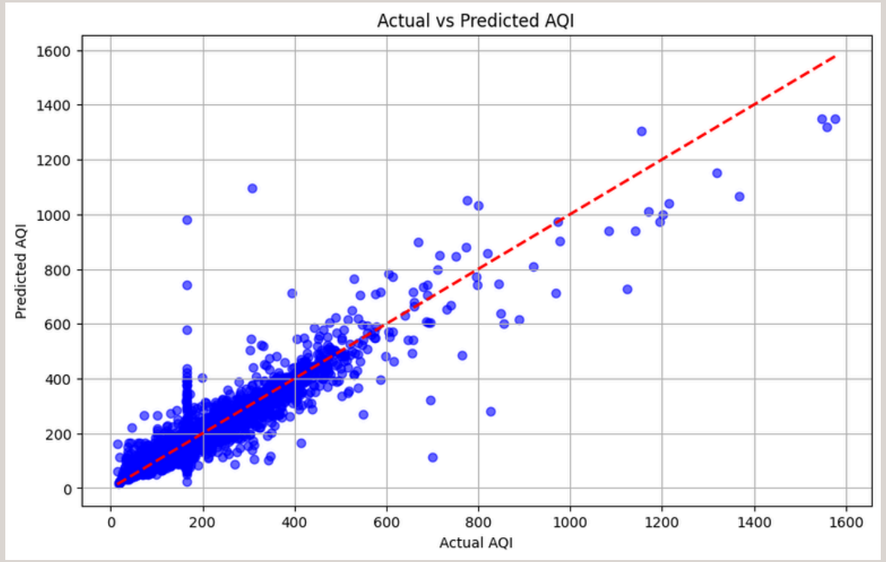
Solution

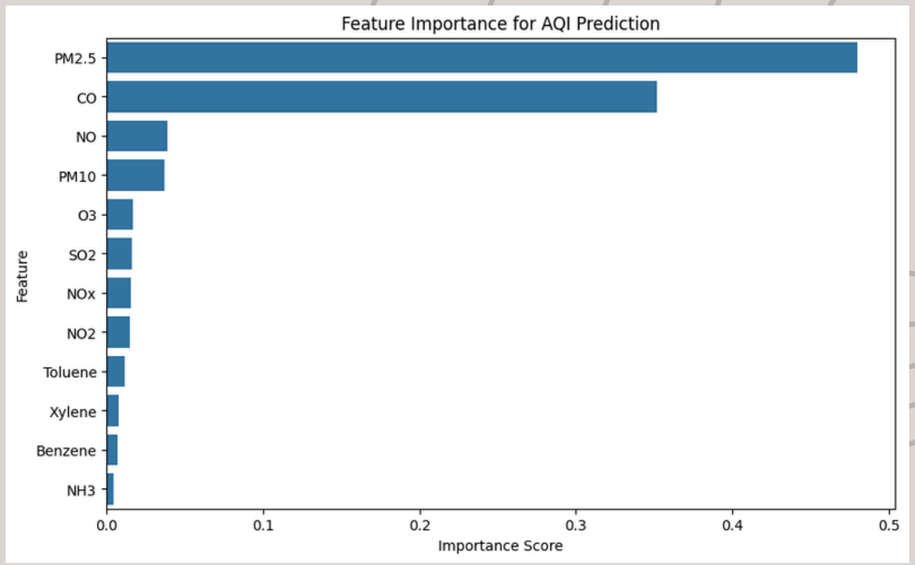
- Generative AI in Action:
- Simulates the impact of various pollution reduction strategies.
- Provides dynamic insights for different scenarios, like tree plantations, emission reductions, and industrial shifts.
- Solution Framework:

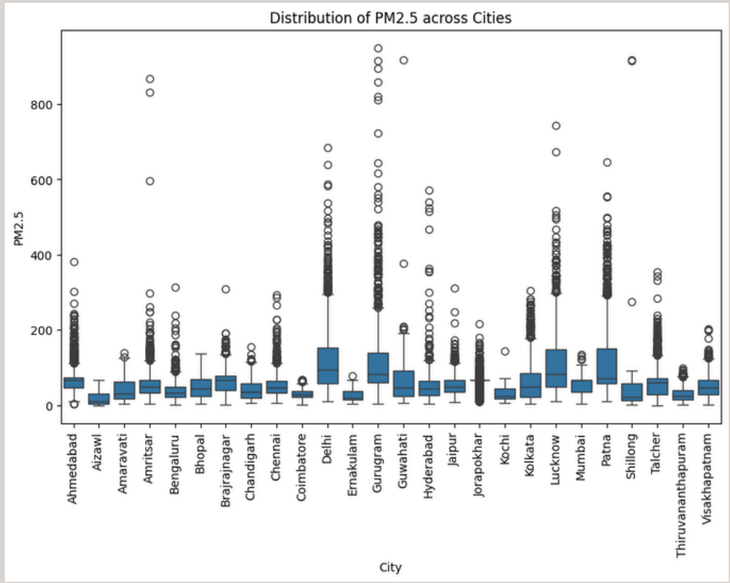
1. Input: Current pollutant levels and city-specific parameters.
2. Policy Adjustment: Simulate actions such as reducing vehicle emissions by 20% or planting 10,000 trees.
3. Generative AI Output: Predict adjusted AQI and pollutant levels.

- Use Case Example:
- Tree Plantation Drive:
  - Scenario: Plant 10,000 trees in Delhi.
  - Result: Predicts a 15% reduction in AQI over 12 months.

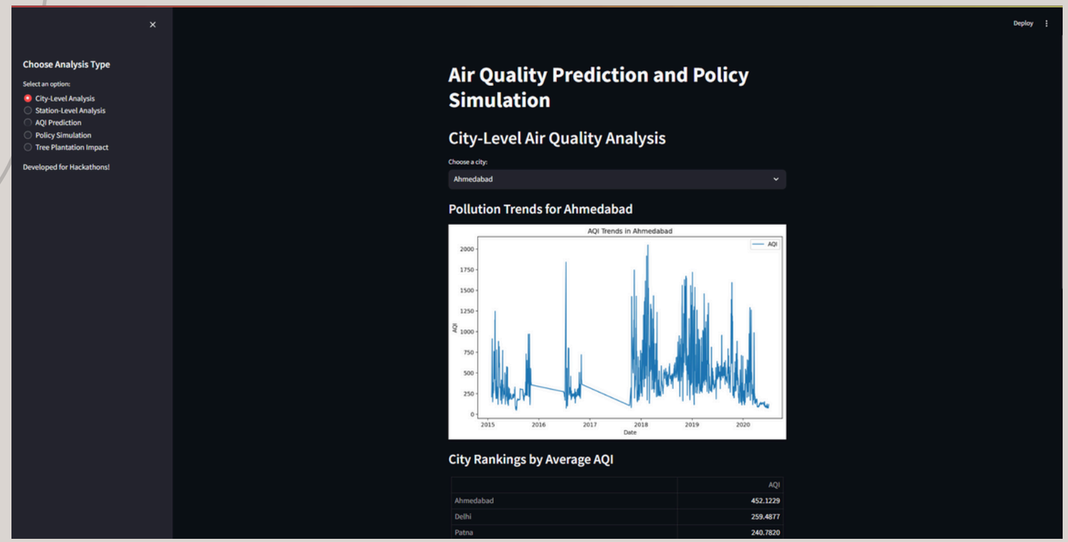
EDA

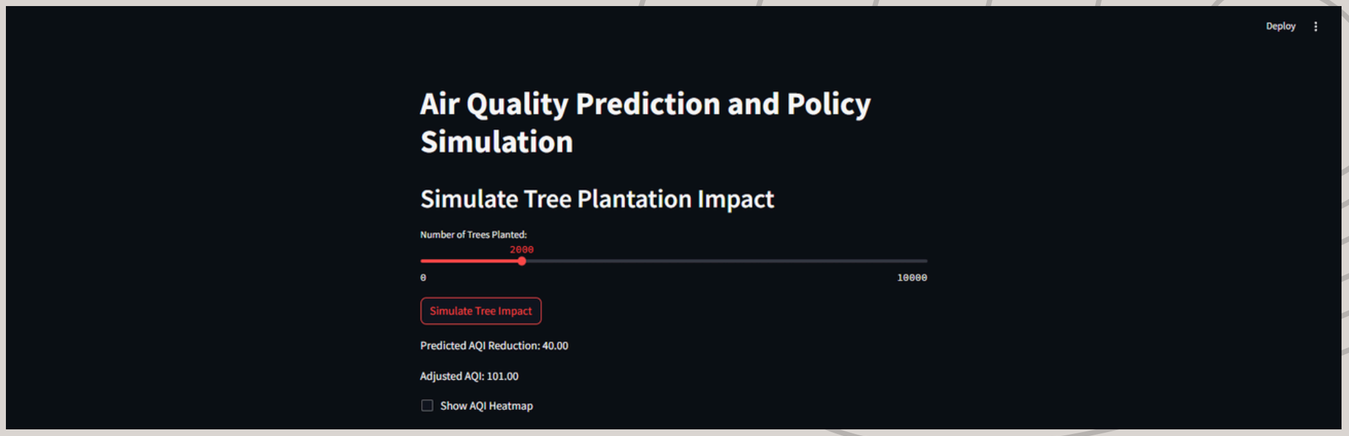

Actual vs Predicted AQI
Predicted AQI
Actual AQI
0
200
400
600
800
1000
1200
1400
1600

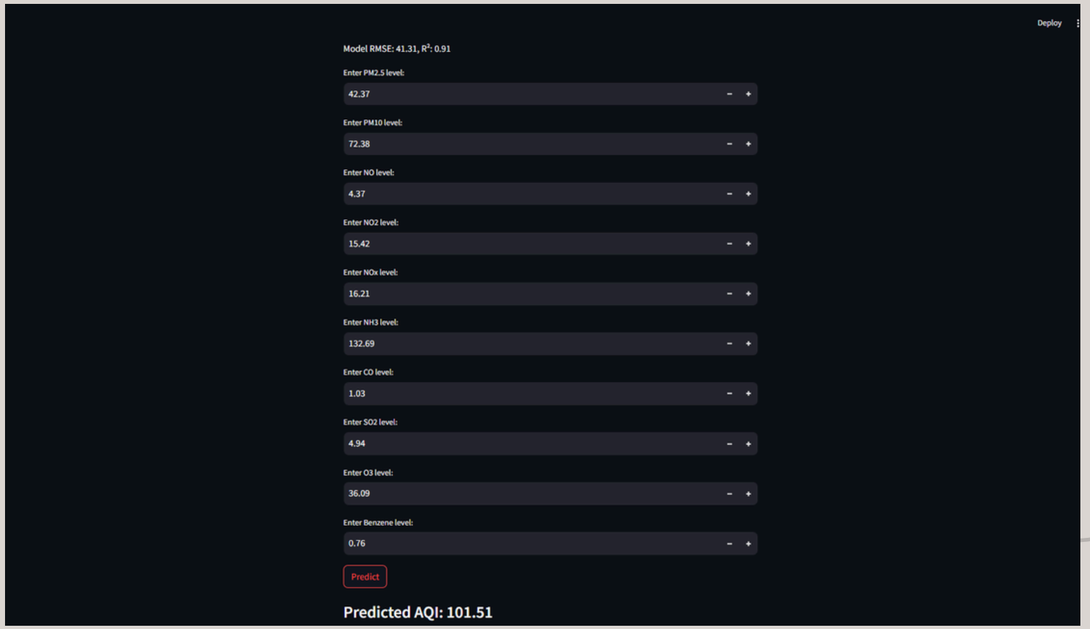

Feature Importance for AQI Prediction
Feature
Importance Score
PM2.5
CO
NO
PM10
O3
SO2
NOx
NO2
Toluene
Xylene
Benzene
NH3
0.0
0.1
0.2
0.3
0.4
0.5


Distribution of PM2.5 across Cities
PM2.5
City
0
200
400
600
800
Ahmedabad
Aizawl
Amaravati
Amritsar
Bengaluru
Bhopal
Brajrajnagar
Chandigarh
Chennai
Coimbatore
Delhi
Ernakulam
Gurugram
Guwahati
Hyderabad
Jaipur
Jorapokhar
Kochi
Kolkata
Lucknow
Mumbai
Patna
Shillong
Talcher
Thiruvananthapuram
Visakhapatnam

Results


Deploy
Choose Analysis Type
Select an option:
City-Level Analysis
Station-Level Analysis
AQI Prediction
Policy Simulation
Tree Plantation Impact
Developed for Hackathons!
Air Quality Prediction and Policy Simulation
City-Level Air Quality Analysis
Choose a city:
Ahmedabad
Pollution Trends for Ahmedabad
AQI Trends in Ahmedabad
AQI
Date
City Rankings by Average AQI
AQI
Ahmedabad 452.1229
Delhi 259.4877
Patna 240.7820


Deploy
Air Quality Prediction and Policy Simulation
Simulate Tree Plantation Impact
Number of Trees Planted:
2000
0
10000
Simulate Tree Impact
Predicted AQI Reduction: 40.00
Adjusted AQI: 101.00
Show AQI Heatmap


Deploy
Model RMSE: 41.31, R²: 0.91
Enter PM2.5 level:
42.37
Enter PM10 level:
72.38
Enter NO level:
4.37
Enter NO2 level:
15.42
Enter NOx level:
16.21
Enter NH3 level:
132.69
Enter CO level:
1.03
Enter SO2 level:
4.94
Enter O3 level:
36.09
Enter Benzene level:
0.76
Predict
Predicted AQI: 101.51

Thank You