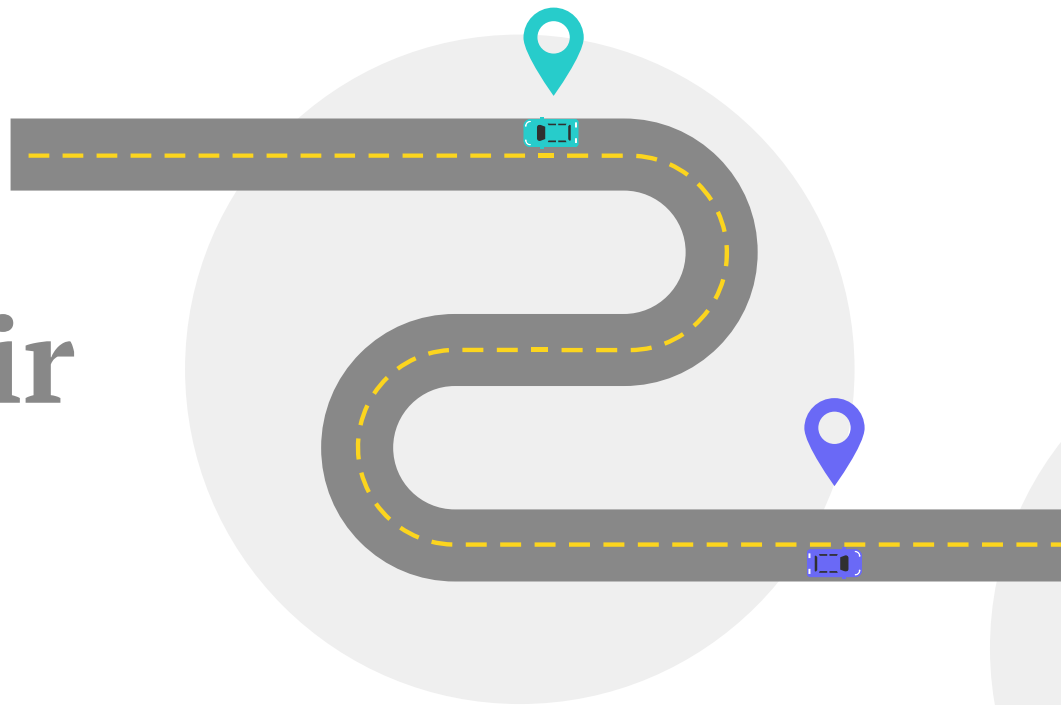# City of Boston:
Transit & Air Quality F

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Project Motivation

Air quality is a critical concern for the wellbeing of Boston residents. Poor air quality could be detrimental to public health, causing respiratory issues such as Asthma. To address the issue of air quality around Boston, we are looking at how public transportation can play a crucial role in reducing emissions and increasing air quality.

| **<u>Goals</u>**	**<u>Background Needed for Project</u>**
Improving Air Quality in Boston	Basics of Air Quality and Pollution: Understanding what constitutes air quality, the common pollutants, and how they affect health
Understanding Air Quality Variability	Understanding the relationship between vehicle emissions, traffic congestion, and air quality.
Understand how public transportation can contribute to reducing emissions	Geographical and Demographic Factors in Boston
Engage and educate the community in Boston about air quality issues.	Understanding the principles of environmental policy, urban planning, and how they can be leveraged to improve air quality.
Inform and guide decision-making processes with data	Data Analysis and Research Methods

Current Progress

- Divided the datasets/resources per teammate
- Weekly meetings

Data Used/Processing:

(Merged Datasets into a visual map of Boston)

- Proximity to Roads (PPI Index)
  - Looked at relation between community types and ppi
- Air Quality Sensor
  - Sensor Data from AirNow Api by zip code 2019-2023
- MBTA Transit Data
  - Data about MBTA Stops across Boston
- Census Data
  - Pulled 2017 - 2022 (excluding 2020) ACS census data from U.S. Census for every census tract and Boston neighborhood in Suffolk County.
- Social Vulnerability
  - Acquired housing and population density from Analyze Boston.
- Health Dataset
  - Centers for Disease Control and Prevention
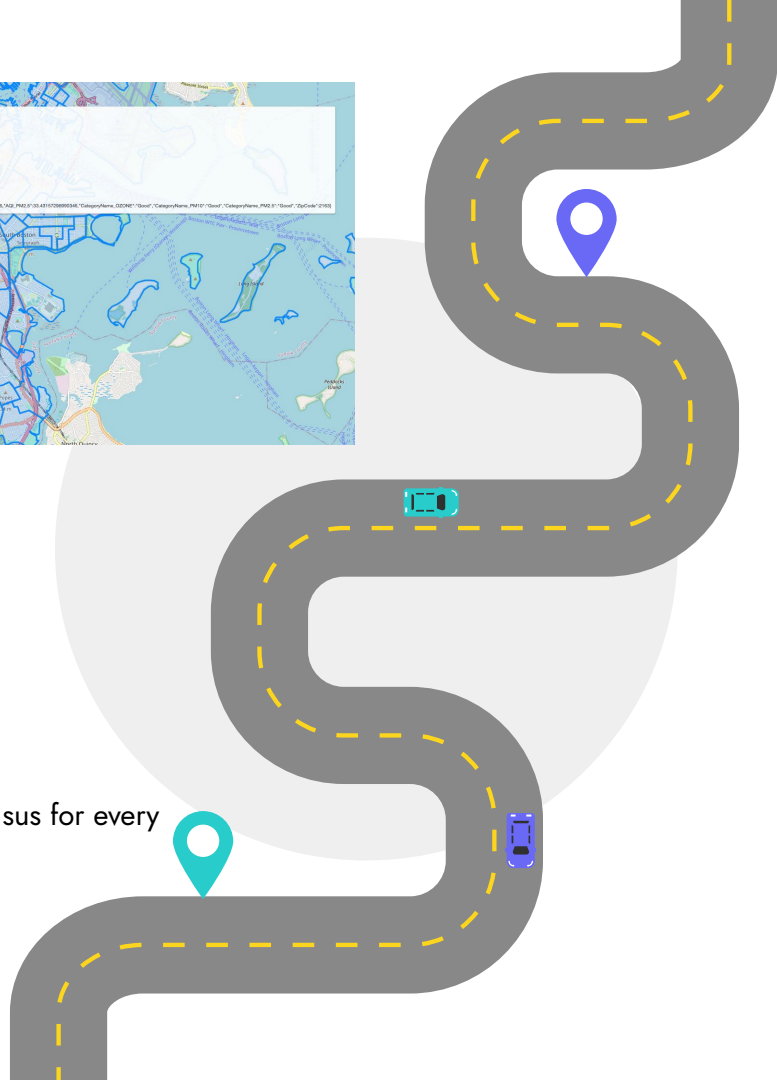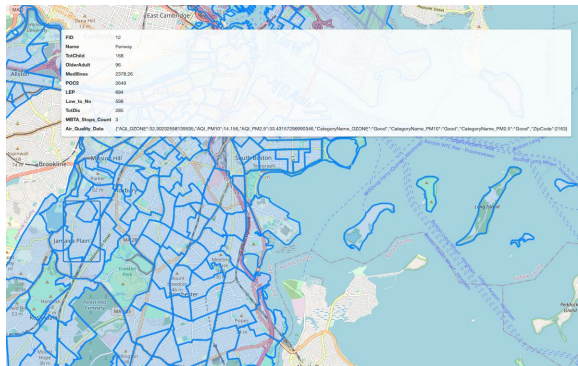
Early observations

- All neighborhoods in Boston are having similar distributions regarding Ozone, PM2.5, and PM10 values.
- For Ozone values, there are four zip codes (02131, 02132, 02136, 02126) that have significantly large Ozone values on 2023-06-02.
- For the Air quality versus census data, there is no significant relationship between population by race and AQI.
- There are slight positive relationship between ozone levels and health conditions.
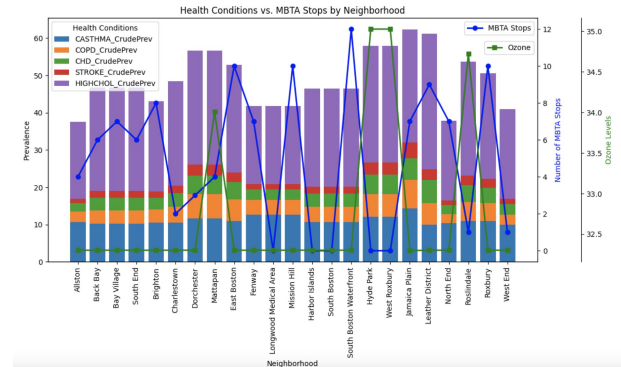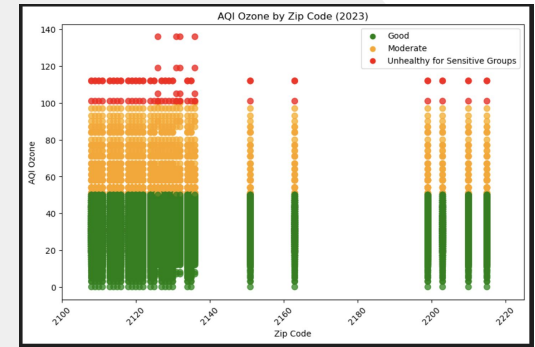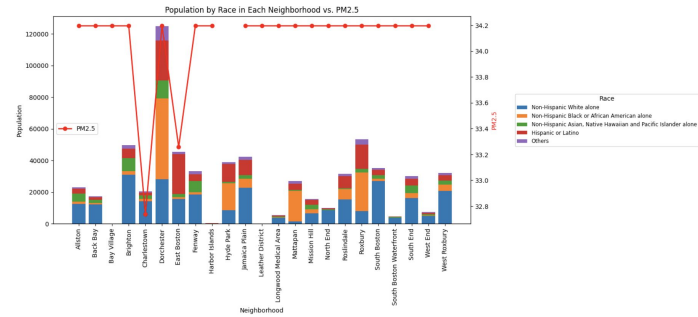
Challenges/Limitations

- Challenges
  - Process the data
    - Merge the raw data
    - Clean the useless / low quality data
    - Null values
  - Combination
    - Explore the relationship between the dataset
    - Finding correlation limited range in input values

- Limitations
  - Data limitations:
    - Some of data is insufficient quantity.
    - Data cannot reflecting bigger patterns that are not representative of the broader context.
    - Only 3 active sensors available.

Note: Main issues with regards to Air Quality were brought up by Hemanshu and 2 other teams with the Professor in OH yesterday.

Conclusion So Far

- We've not seen major any major correlation between air quality across neighborhoods and zip codes.
- However, there is a negative correlation between Ozone and Number of MBTA stops
- Areas that tend to have a greater number of people of color correlate to a lower air quality - this being, the presence of single day bad AQ values.
- We saw a positive correlation between ozone levels and prevalence of certain health conditions in Boston neighborhoods.

Extension Project

Making use of Buses, Blue Bikes, and Weather data to understand their effect on Air Quality by Neighborhood.

Rationale	A key aspect that we thought was missing from the base project was the inclusion of bus routes within Boston. Our initial dataset only had T stop data, however, transit through bus also plays a key role in helping reduce pollution and cars off the road. Additionally, a key infrastructure of Boston is the Blue Bikes service. Often, people bike rather than commute by car to help reduce pollution, therefore, it would be interesting to see how this data relates to AQI.
Questions for Analysis	1. How does number of bus stops/routes affect air quality by neighborhood? 2. How do number of bikes available/bike docks impact air quality by neighborhood? 3. How does overall transit availability play a role in the overall weather in an area?
Data Sets and Sources	Bus stop/route data from MBTA, Blue Bikes data, Weather data (Temperature, Wind Speed, etc.), EV Vehicle registration by Zip Code/Charging Station count (if possible)
Data Visualizations	1. Overall Public Transit Available by Neighborhood vs Air Quality - this would help us get a holistic overview of each neighborhoods transit access and how it affects air quality. 2. Weather vs Air Quality, finding the correlation between air quality indicators and their effect on weather in an area.
Additional Information	After discussion with professor, there would be a bit of a shift in the focus of the overall project. However, we will look to see if either creating a proxy to Air Quality would help provide a better understanding.