

ARTG 5330 SPRING 2023 FINAL PROJECT

Riding The Rails:

A Visualization Of The MBTA Subway
& Lightrail Ridership Patterns

By Jane Effanga

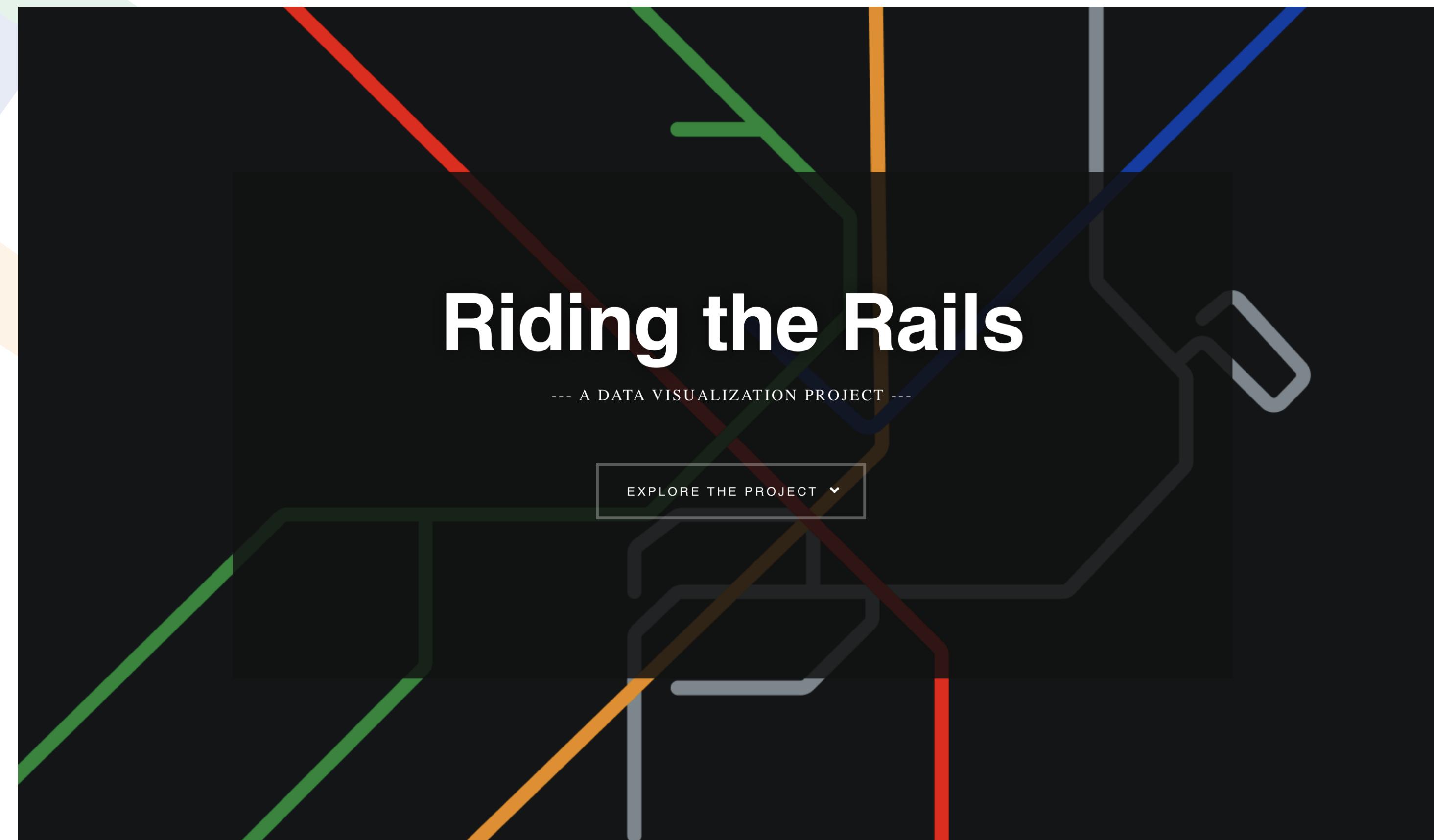
April 18, 2023



Introduction

- "**Riding the Rails**" explores ridership patterns of the Massachusetts Bay Transportation Authority (MBTA) using data from the MBTA Subway and Light Rail Transit Ridership dataset for 2019–2022, obtained from MassDOT Mobility Dashboard.
- **Goal:** Create interactive visualizations to understand MBTA subway ridership patterns in Boston.
- **Dataset:** Contains daily ridership data by station and subway line for the Greater Boston area.
- **Additional data:** GeoJSON file of Boston neighborhoods and station coordinates for spatial visualization and analysis.

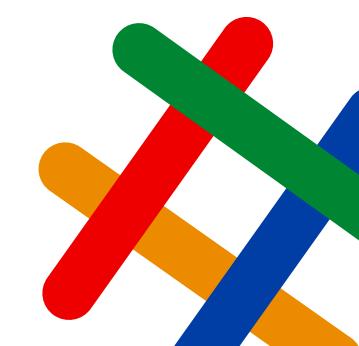
Project Demo



[Launch Website](#)



Key Design Decisions



Exploratory Data Analysis

Data Collection and Preparation:

- Compiled the dataset provided on MassDOT for each of the 64 stations into a single CSV file
- Manually compiled the longitude and latitude coordinates and neighborhood for each station
- Filtered out stations that fell outside of the Boston area for map-based visualizations

MassDOT dataset

Validations by Stations_data-59[35]				
Servicedate	Route Or Line	Most Recent Date_string	Stationname	Validations
3/3/2023	Green Line	March 3rd, 2023	Symphony	1183
3/2/2023	Green Line	March 3rd, 2023	Symphony	1011
3/1/2023	Green Line	March 3rd, 2023	Symphony	1141



line	date	stationname	ridership
Blue Line	1/1/19	Airport	3774
Blue Line	1/1/19	Aquarium	2180
Blue Line	1/1/19	Beachmont	1009
Blue Line	1/1/19	Bowdoin	283



Manually compiled dataset

Stationname	Latitude	Longitude	neighborhood
Airport	42.3745013031163	-71.0301812577942	East Boston
Aquarium	42.3601713745465	-71.0527929875714	Downtown
Beachmont	42.3981206421350	-70.9926487796101	Revere
Bowdoin	42.3619354547228	-71.0619512029131	Downtown
Government Center	42.3603570918293	-71.0594452489418	Downtown

newData Array

```

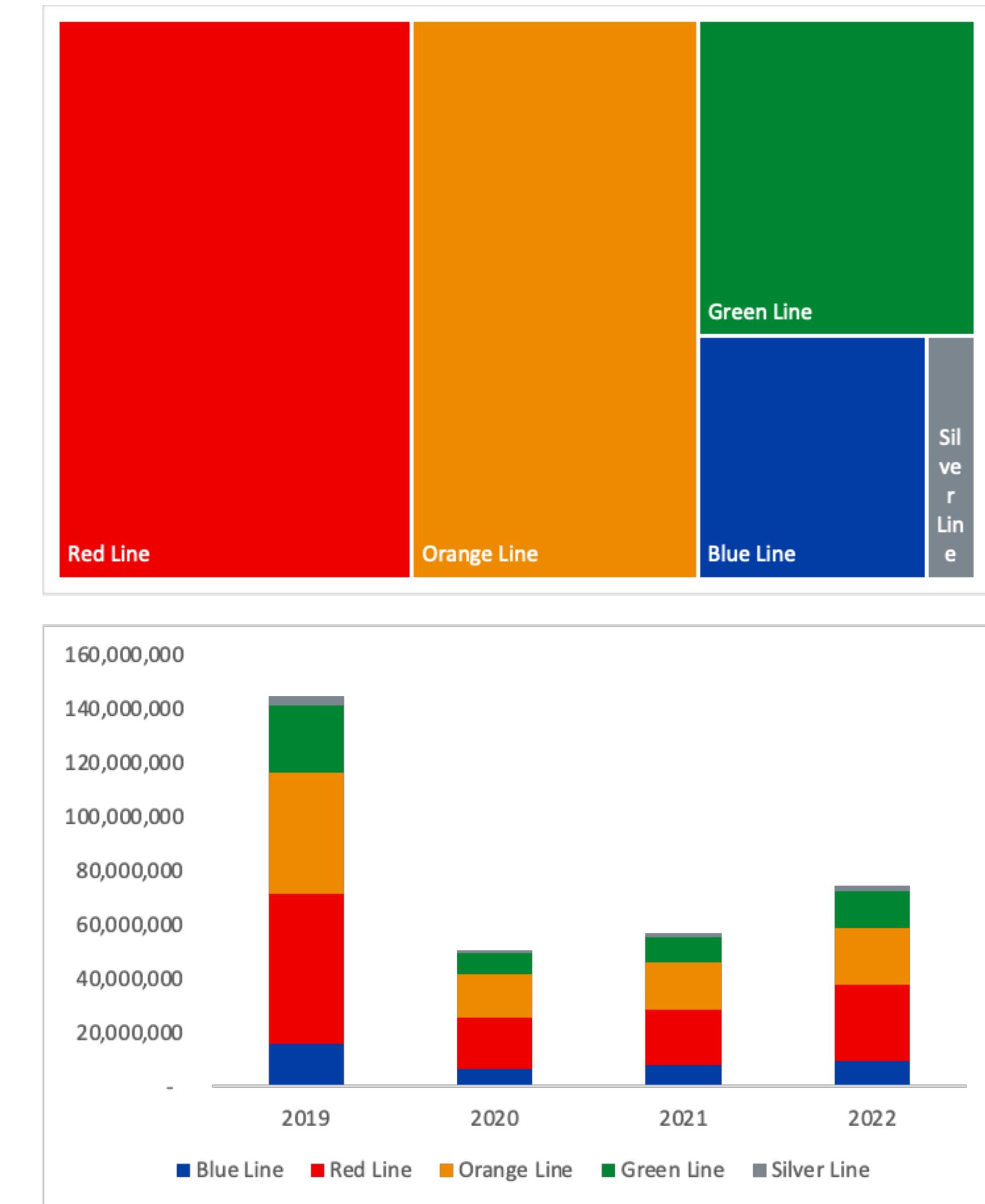
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  Longitude: "-71.0602200336011"
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  neighborhood: "Downtown"
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      ▼ ridership_by_line: Array(2)
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          ridership: 3456682
          ► [[Prototype]]: Object
        ▼ 1:
          line: "Red Line"
          ridership: 3548761
          ► [[Prototype]]: Object
        length: 2
        ► [[Prototype]]: Array(0)
      totalRidership: 7005443
    
```

Exploratory Data Analysis

- Conducted exploratory data analysis to identify patterns and trends in the ridership data

Insight Discovery

- Discovered interesting insights with the impact of COVID-19 on ridership patterns
- Observed a steep decline in total ridership after 2019, with ridership only starting to recover in 2022 but still below the 2019 benchmark



Narrative Visualization Strategy

- Answering key questions with the visualization to guide the viewer
 1. How does ridership on different subway lines compare, and how has it changed over time?
 2. Which MBTA stations are the busiest, and how does their ridership compare to other stations?
 3. How does MBTA ridership vary by neighborhood
- Using multiple visualizations to provide a comprehensive understanding of the MBTA ridership patterns
- Incorporating a spatial visualization and analysis to provide a deeper understanding of the geographic distribution of ridership across the city.
- Incorporating interactive and exploratory visualization elements to allow users explore the data and draw their own insights (such as tooltips, dropdown menu, zoom)

Visual Encodings & Data Models

Dataset Type

- Tabular (GeoJSON, CSV)

Attribute Types

- Stations (Nominal)
- Date (Quant-Interval)
- Ridership (Quant-Ratio)
- Neighborhoods (Nominal)
- Lines (Nominal)

ridership.csv

line	date	stationname	ridership
Blue Line	1/1/19	Airport	3774
Blue Line	1/1/19	Aquarium	2180
Blue Line	1/1/19	Beachmont	1009
Blue Line	1/1/19	Bowdoin	283
Blue Line	1/1/19	Government Center	1886
Blue Line	1/1/19	Maverick	4032
Blue Line	1/1/19	Orient Heights	1361
Blue Line	1/1/19	Revere Beach	1214
Blue Line	1/1/19	State Street	251
Blue Line	1/1/19	Suffolk Downs	197

boston_neighborhoods.geojson

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              ]
            ]
          ]
        }
      }
    }
  ]
}
```

station_location.csv

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Maverick	42.3696893842688	-71.0396587796229	East Boston
Orient Heights	42.3874458275371	-71.0047493029015	East Boston
Revere Beach	42.4094991034521	-70.9920480152408	Revere
State Street	42.3594519009668	-71.0574393722290	Downtown

Visual Encodings & Data Models

Visual Encodings

Color, size, and position

Bubble Map:

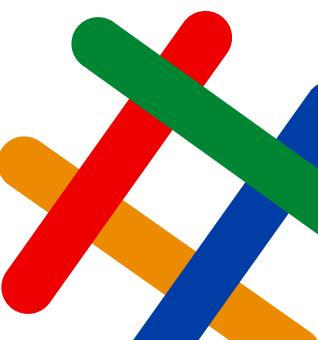
- **Position:** Showing the location of each station on the map to provide a clear spatial understanding of ridership patterns across the city
- **Size:** Using the size of the circle on the bubble map to represent the ridership of each station. Larger circles indicate higher ridership
- **Color:** Using the line colors to indicate the subway lines with the maximum ridership at each station

Bar Chart:

- **Size:** Using the height of the bars to indicate the ridership of the different subway lines
- **Color:** Using the distinct colors of the subway lines to help viewers distinguish between them easily

Choropleth Map:

- **Color:** using color gradient to represent the ridership levels in different neighborhoods of Boston

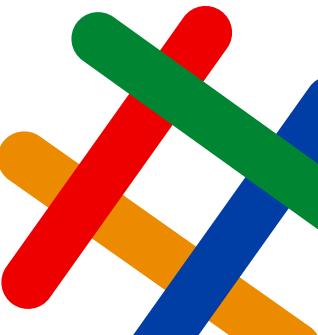


Future Considerations

Some potential future considerations could be:

- **Seasonal variations:** Exploring how ridership varies by season across these different years.
- **Multi-modal analysis:** Expanding the analysis beyond the subway system to include other modes of transportation, such as buses, commuter rail, and ferries to give a more comprehensive picture of transportation patterns in the Greater Boston area.

Q&A + Feedback Session



Thank You!

For Riding...

