Boston Bus Equity

Spring 2025 Project Description

SPARK – HUB – CS506

Client Name and Description:

Spark! has worked with several organizations interested in police overtime, including the City of Boston's Analytics Team and GBH.

*** more information about the organizations is available at the end of this document*

Project Summary/ Description:

Public transport in Boston has a nearly 400-year history, with the first ferry services starting in the 1600's. Today, the MBTA is a staple of the Massachusetts bay area, serving more than 1 million people a day. The added economic value of the MBTA for the greater Boston area is estimated to be around 11.5 billion per year. Public transport plays an important role in the quality of life for residents in Massachusetts and Boston in terms of economic development, the environment, and equity. It is important to note that public transit is managed by the MBTA, a state agency, and not the City of Boston but they can provide input into decisions such as bus routes, on behalf of the community. The goal of this project is to better understand the impact of bus performance on Boston residents by using MBTA bus data to examine service performance trends by geography.

Ideal Output & Final Deliverables (Base Project):

The final deliverables should include:

- All code and cleaned datasets upload onto designated Google Drive and GitHub
    - All code used to change the datasets and create visualizations – including cleaning and any preparation.
- A Final Report and Presentation with:
    - Answer the base questions and the extension questions (listed further below).
    - Detailed report of the nature of these types of complaints
    - Visualizations for both phases of the project
        - The deliverable for the base questions should include a *minimum* of 5-7 visualizations (see here for recommendations) that address the base questions
- A Presentation with:
    - Detailed statistical summary that includes key findings
    - Best/most important visualizations for support

roject Details: Base Project	

Preferred Tech Stack	• Python, Google Colab, Power BI, ArcGIS
	  • BU access to Power BI (Windows Only)
	  • ArcGIS access for BU Students

Base Project Details / Key Questions	• What is the ridership per bus route? How has this changed from pre pandemic time to post pandemic time?
	• What are the end-to-end travel times for each bus route in the city?
	  • On average, how long does an individual have to wait for a bus (on time vs. delayed)?
	  • What is the average delay time of all routes across the entire city?
	  • What is the average delay time of the target bus routes (22, 29, 15, 45, 28, 44, 42, 17, 23, 31, 26, 111, 24, 33, 14 - from Livable Streets report)?
	• Are there disparities in the service levels of different routes (which lines are late more often than others)?
	• *If there are service level disparities, are there differences in the characteristics of the people most impacted (e.g. race, ethnicity, age, income, etc.)?*
	  • *Potential point of comparison: 64 Hours*
	  • *Liveable Streets*
	• Can we chart changes over TIME?
	  • Compare the results from 2015-2017 to the most recent survey

Data Sets + Data Dictionary	• Interactive tool for our "Rider Census"
	  • MBTA 2023 System-Wide Passenger Survey Data
	  • ***Technical Documentation/Data Dictionary
	• Ridership
	  • Bus Ridership by Trip, Season, Route/Line, and Stop
	• Reliability
	  • MBTA Bus Arrival Departure Times 2018 - 2024
	  • 18 and 24 (to 23 if 2024 datasets are not complete)

roject Details: Extension Project	
Extension Project Details	• If you complete the base project before the end of the semester, you can move on to extension projects. It will be up to you and your team to come up with creative additional analyses

Extension Project Data Sets + Data Dictionary	• Additional Data Sources that may be interesting for further analysis:
	  • V3 API | Developers | MBTA
	  • MBTA-performance | Developers
	  • https://mbta-massdot.opendata.arcgis.com/search?tags=bus
	  • https://data.boston.gov/dataset/2020-census-for-boston
	  • ACS Means of Transportation by Travel Time to Work
	  • PATI Bus Stop Coordinates Data

Project Milestones	• Data review + initial questions
	• Data preprocessing, infrastructure, engineering/ visualization checklist
	• *Data Analysis
	• *Early Insights presentation
	  • Answer all base questions
	  • Challenges/limitations encountered, assumptions made
	• *Final Report
	  • Cover pages, Intros (goal/overview/ethics/misconceptions/ big picture), answer key questions
	  • Visualizations are properly created, and described
	  • Started extension mini-chapters
	• *End of Semester Showcase (Final Presentation)

Additional Details

Background Readings	• OPMI data blogs
	  • On CBA for the bus network
	  • On a bus lane pilot, which intros some useful bus terms
	  • An access to transit post, which talks about different sizes of "access sheds" for walking or biking to a station

	• Livable Streets Report **Top Priority Routes: Underserved riders by percentage of total ridership** | Route	Riders (%)			2018 Average Weekday Ridership	Ridership Rank	E. Per Route M
---	---	---	---	---	---	---
Route	Low-Income	Very Low-Income	People of Color			
22*	69.6	21.4	96.2	8,015	12	6,41
29	69.6	21.4	96.2	2,254	60	7,48
15*	67.2	31.1	96.2	5,808	21	8,19
45	69.5	27.1	94.6	3,142	41	7,84
28*	65.0	23.0	97.8	12,880	1	7,53
44	66.0	23.6	94.2	3,453	36	6,65
42	66.0	23.6	94.2	2,564	54	7,10
17	68.9	13.3	94.9	3,091	43	8,53
23*	59.0	27.6	96.3	11,808	5	7,62
31*	57.7	24.4	95.9	6,096	19	5,78
26	66.7	25.0	90.4	1,585	84	9,59
111*	59.7	20.4	92.6	12,037	3	4,95
24	55.9	25.4	92.9	1,672	76	4,75
33	55.9	25.4	92.9	1,356	96	4,68
14	NA	NA	91.2	1,293	100	5,73	 *** Current Key MBTA Bus Route** • MBTA A Guide to Ridership Data • SL documentary • https://www.mbta.com/news/2024-10-07/phase-1-bus-network-redesign-launches-december-15-bring-more-frequent-service
Common misconceptions, and solutions roadblocks (If relevant)	• Roadblocks/ common blockers in this project.

**The Citywide Analytics Team is the City of Boston's central data organization. Through better understanding and usage of data, the Analytics Team works to increase the quality of life for residents and enhance City government. Our analysis and visualizations focus on improving how the City operates. This project will help the city understand trends that can be addressed at a strategic level.*