Choosing TTC Subway Service Provides the Most Time Stability during Weekday Rush-Hours*

Analysis on the Delay Magnitude of different TTC Services

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This paper analyzes the magnitude of TTC delays in 2023 based on service types. TTC delay data for buses, streetcars, and subways are obtained through Open Data Toronto data portal and data is used to visualize delay magnitude during different days and hours throughout the year. We find that, although TTC streetcars offered the least number of delays in 2023, riding on TTC subways provides the least average time of delay during weekday rush-hour traffic. Our results suggest that, if the time required to arrive at one's office is the same for all TTC service options, choosing subway over other services could provide the most time stability.

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*Code and data are available at: https://github.com/Jingying-yu/ttc_delay.git

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1 Introduction

Analyses and findings in this paper are structured into several sections: Section 2 – Data, **?@sec-results** – Results, and Section 4 – Discussion. The Data section introduces the context of the datasets and examines all datasets and variables kept for analysis. The Result section focuses on visualizing and presenting the data results in Data section. The Discussion section further evaluate the implications behind the data results presented in the previous section, expands the topic beyond pure data, and touches on any weaknesses and next steps.

2 Data

2.1 TTC Bus Delay

Table 1: Sample of Cleaned TTC Bus Delay Dataset

Date	Line	Time	Day	Station	Cause of Delay	Min Delay	Min Gap	Direction	Vehicle
2023-01-01	91	02:30	Sunday	WOODBINE AND MORTIMER	Diversion	81	111	NA	8772
2023-01-01	69	02:34	Sunday	WARDEN STATION	Security	22	44	S	8407
2023-01-01	35	03:06	Sunday	JANE STATION	Cleaning - Unsanitary	30	60	N	1051

2.2 TTC Streetcar Delay

```
Attaching package: 'kableExtra'
```

```
The following object is masked from 'package:dplyr':
```

```
    group_rows
```

Table 2: Sample of Cleaned TTC Streetcar Delay Dataset

Date	Line	Time	Day	Station	Cause of Delay	Min Delay	Min Gap	Bound	Vehicle
2023-01-01	509	02:37	Sunday	QUEENS QUAY AND SPADIN	Operations	0	0	E	4403
2023-01-01	505	02:40	Sunday	BROADVIEW AND GERRARD	Held By	15	25	W	4460
2023-01-01	504	02:52	Sunday	KING AND BATHURST	Cleaning - Unsanitary	10	20	W	4427

2.3 TTC Subway Delay

2.3.1 Delay Code

Table 3: Sample of TTC Subway Delay Code

Code	Code Description
EUAC	Air Conditioning
EUAL	Alternating Current
EUATC	ATC RC&S Equipment

2.3.2 Delay Data

Table 4: Sample of Cleaned TTC Subway Delay Dataset

Date	Time	Day	Station	Delay Code	Min Delayed	Min Gap	Bound	Line	Vehicle
2023-01-01	02:22	Sunday	MUSEUM STATION	MUPAA	3	9	S	YU	5931
2023-01-01	02:30	Sunday	KIPLING STATION	MUIS	0	0	E	BD	5341
2023-01-01	02:33	Sunday	WARDEN STATION	SUO	0	0	W	BD	0

2.4 TTC Delay Comparision

3 Results

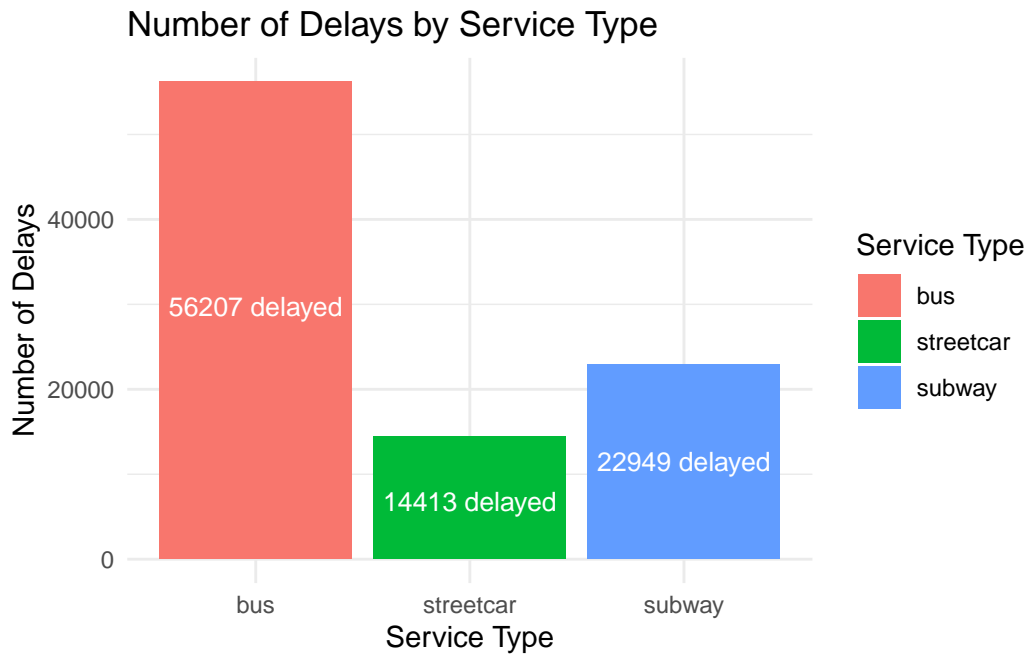## 3.1 Highest Number of Total Delayed

Figure 1: Visualization to show the TTC service that has the highest number of delays in year 2023

3.2 Most Delayed during Weekday

Define Rush Hours: Rush Hours: • Morning Rush-Hour: Approximately 7:00 AM to 9:00 AM • Evening Rush-Hour: Approximately 4:00 PM to 7:00 PM

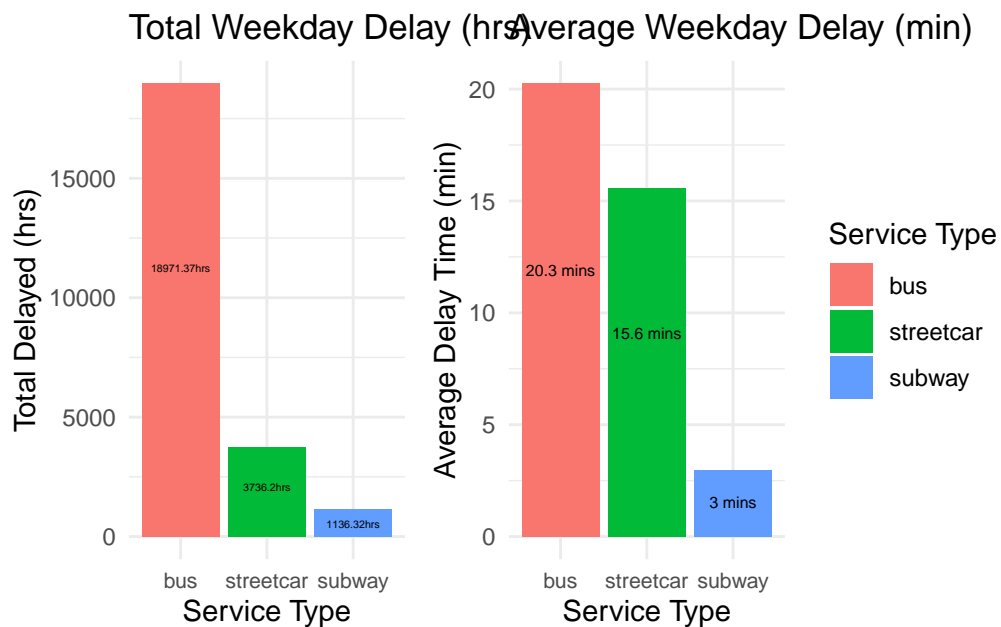Present Results During Rush Hours & at Off-Peak Hours

Figure 2: Visualization to show the total delayed time during weekdays in 2023

3.3 Most Delayed during Rush-Hours

3.4 Most Popular Delay Reasons

- 1 table for all three services
- separate into rush & off-peak hours

3.5 Most Popular Delayed Vehicles

- 1 table for all three services
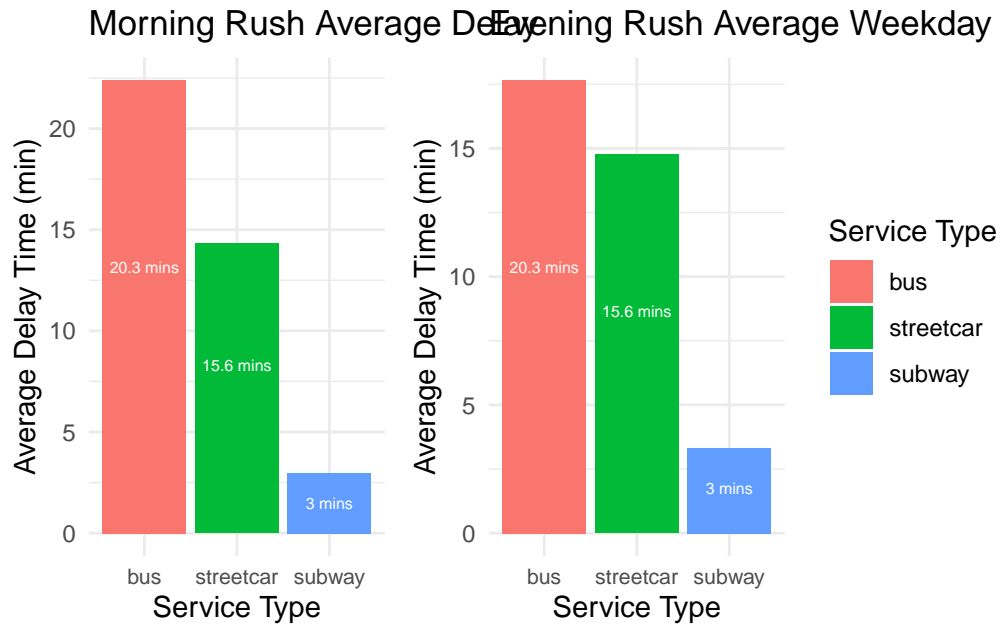- separate into rush & off-peak hours

Figure 3: Barplot used to visualize the longest average delay time for different TTC services during Rush-Hours and Off-Peak Hours

4 Discussion

4.1 TTC Service Prices

- one-fare

4.2 Correlation between Delay and Direction of Travel

- Financial District
- Midtown Direction

4.3 TTC Service Amenities

- The PATH (for financial district)
- AC in Summer & Winter

4.4 Errors in analysis, Limitations and Next Steps

5 Conclusion

6 References