

Macro Level Assessment of TTC

About TTC

TTC: Public transportation agency in Toronto, Canada

- Operates buses, streetcars, subways, and rapid transit lines
- Facilitates over 1.6 million daily rides
- Vital for commuters, residents, and visitors
- Network connects neighborhoods, workplaces, institutions, and leisure spots
- Significant impact on the city's economy and social life



TTC subway service resumes on Line 1 after train gets stuck in tunnel

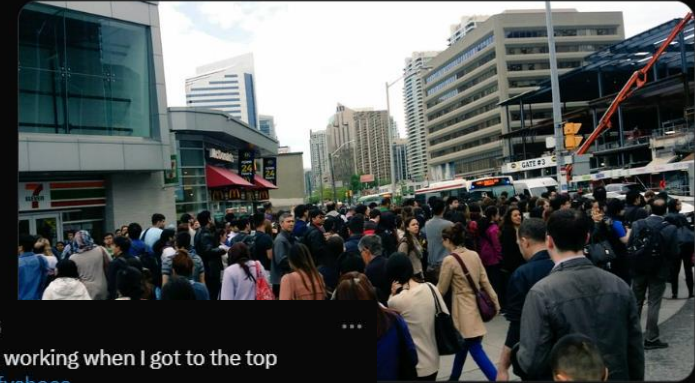
Shuttle buses have been brought in with subway service suspended on Line 1 between Bloor-Yonge and Osgoode stations.

JUN 5, 2019



Hyesoo Kim @imhyesookim · May 30, 2017

Current morning commute situation at Yonge&Shep #ttc #ttcdelay #nosubway #frustration



A @sublimepolyestr · Feb 9, 2017

See the smoke in the tunnel? #ttc #ttcdelay #sherbourne



TTC delays during morning rush hour highlight councillor

Toronto city councillor Paul Bedford on Twitter called for more money

TRAFFIC | JAN 2



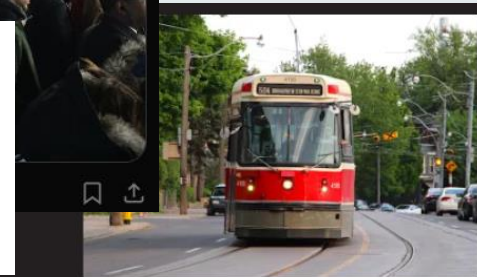
Angela @angelapiggott · Feb 9, 2016

Found out why the escalator was not working when I got to the top #ttcdelay #hopeyouarewearingcomfyshoes



66% of subway delays are caused by passengers, CBC Toronto data analysis shows

Most of the incidents are unpredictable, the TTC says



TTC Delays!



REFERENCES:

<https://torontolife.com/deep-dives/who-broke-the-ttc-inside-torontos-public-transit-disaster/>



So, what do you think is the major challenge faced by TTC here?

◆ 1. Intro to our project:

Our project focuses on analyzing TTC delays during the period of 2022-2023.

◆ 2. Purpose:

To understand the factors contributing to delays and disruptions in TTC services.

◆ 3. Data Characteristics:

The dataset includes columns for **Date, Route, Time, Day, Location, Incident, Minimum Delay, Minimum Gap, and Direction**

◆ **3. Analytical Approach:**

We aim to apply various data analysis techniques (series of graphical representations) to derive insights and actionable recommendations.

◆ **4. Key Objectives:**

- Identify patterns and trends in delay incidents.
- Assess the impact of delays on TTC operations.
- Propose strategies for improving service reliability and reducing delays.

◆ **5. Why this analysis?**

By addressing delay issues, we strive to enhance the overall quality of TTC services and improve the commuting experience for passengers.

Technical aspects of the project



Hive

- Data Collection and Storage: Establishing a centralized repository for TTC delay data to ensure accessibility and organization.
- Data Processing: Utilized Hive to create tables for each dataset and loaded data into them.
- Data Integration: Combined tables from 2022 and 2023 into a single table for comprehensive analysis.



Spark: Zeppelin

- Data Visualization: Employed Zeppelin for creating visual insights and analysis of combined data.

Routes & Incident Types:

BUS ROUTES:

"MARKHAM	YONGE AND DUNDAS
"DUNDONALD	OVERLEA AND THORCLIFFE
"MCCOWAN RD LOOP	YONGE AND STEELES
"YORKDALE	HUMBERLINE LOOP
"20 COMSTOCK RD	KENNEDY STATION
"3795 BATHURST ST	FINCH AND ARROW
"OLD WESTON	DIXON AND WINCOTT
"ON-401	DANFORTH AND DANFORTH
"100 ECHO POINT	KIPLING STATION
"PEARSON AIRPORT	KEELE STATION
"HUMBER COLLEGE	EGLINTON STATION
"PAPE STATION - 1125	MCNICOLL AND BRIMLEY
	AMAZON FULLFILLMENT CE
	SCARBOROUGH CENTRE CEN
	FINCH AND ISLINGTON
	CALEDONIA AND BRIDGELA
	SHEPPARD STATION
	"STEELES AND MARKHAM
	"KENNEDY STATION
	"EGLINTON
	"LAWRENCE AVE WEST
	"VARNA DR
	"KEELE AND ST
	"EGLINTON W
	"FINCH/DRIFTWOOD
	"BARMAC DR
	"HWY 27
	"DIXON RD
	"YONGE
	"LUNDY AVE

INCIDENT TYPES:

General Delay
Diversion
Operations - Operator
Security
Emergency Services
Mechanical
Investigation
Diversion
Cleaning - Unsanitary
Utilized Off Route
Vision
Road Blocked - NON-TTC Collision
Collision - TTC
General Delay
Held By
Cleaning - Disinfection
Late Entering Service

Maximum Incident Count by Location.

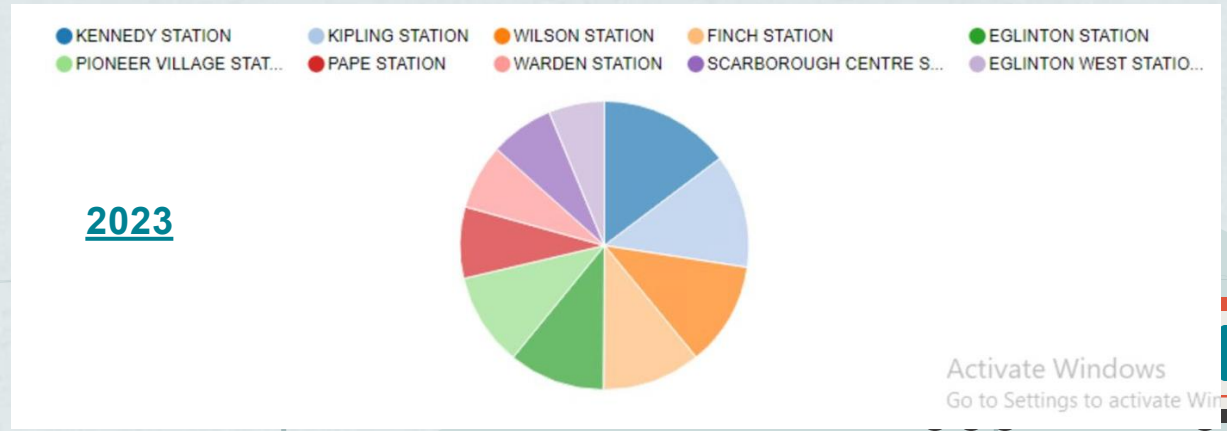
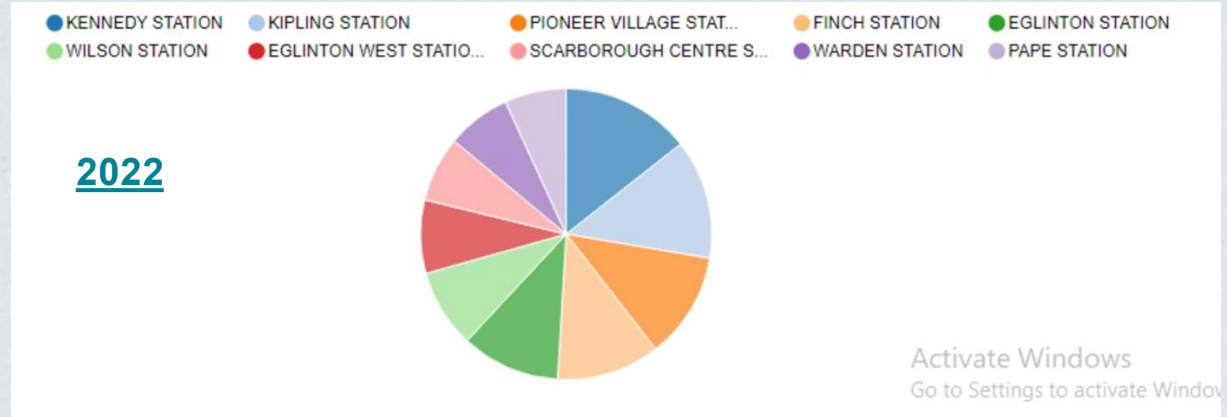
For year 2022:

- Location with Maximum incidents: Kennedy and Kipling, Kennedy having 1384 incidents in 2022 and Kipling having 1276 incidents in the same year.

For year 2023:

- We can see Kennedy with 1231 and Kipling with 1065 incidents.

Additionally, we can see a drop in Incidents for 2023 as compared to 2022.

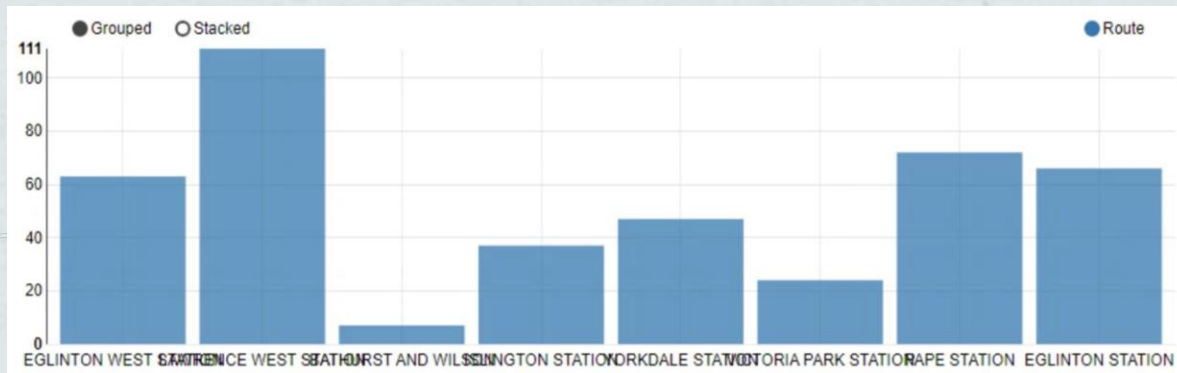


Top 10 Routes with Most Delay

EGLINTON WEST STATIO... LAWRENCE WEST STATIO... BATHURST AND WILSON ISLINGTON STATION YORKDALE STATION
 VICTORIA PARK STATIO... PAPE STATION EGLINTON STATION



- We can observe maximum delay at these routes. **Lawrence West Station, Pape Station, Eglinton Station.**
- Here we have a Bar Chart view which tells us exact values for each route. We can observe that PAPE and Eglinton are similar in terms of delay where PAPE has **approx. 70 mins** delay and Eglinton observes a **little over 60 mins** delay.



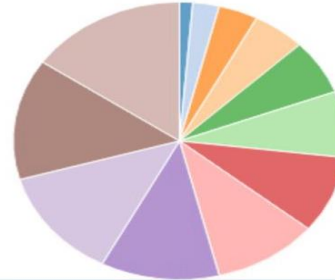
Months with maximum delay in minutes

In 2022 and 2023, we can observe delay increases at the end months of the year from **July to December**.

This can be due to holiday season, weather conditions and traffic conditions.

2022

1.2022 2.2022 3.2022 4.2022 5.2022 6.2022 7.2022 8.2022 9.2022 10.2022 11.2022 12.2022



2023

1.2023 2.2023 3.2023 4.2023 5.2023 6.2023 7.2023 8.2023 9.2023 10.2023 11.2023 12.2023



Top 10 Incident Types by Frequency

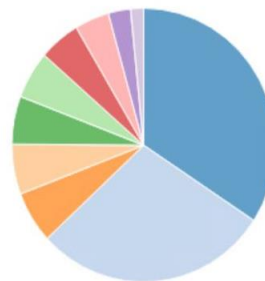
Incidents
with Maximum Frequency:

- Operator, Mechanical, where OP is **19583** and Mech is **16465** also OP is **11359** and Mech is **19228** for the year 2022 and 2023 respectively.

- Incidents with Minimum Frequency: Cleaning, Investigation.

2022

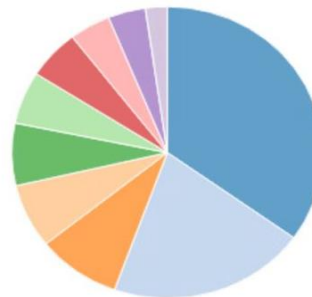
Operations - Operator Mechanical Collision - TTC Security Utilized Off Route General Delay Diversion Emergency Services
Cleaning - Unsanitary Investigation



Incident	Frequency
Operations - Operator	19583
Mechanical	16465
Collision - TTC	3511
Security	3373
Utilized Off Route	3240
General Delay	3217
Diversion	2881
Emergency Services	2416
Cleaning - Unsanitary	1561
Investigation	905

2023

Mechanical Operations - Operator Security Collision - TTC Diversion General Delay Emergency Services
Utilized Off Route Cleaning - Unsanitary Investigation



Incident	Frequency
Mechanical	19228
Operations - Operator	11359
Security	4803
Collision - TTC	3909
Diversion	3805
General Delay	3199
Emergency Services	3016
Utilized Off Route	2361
Cleaning - Unsanitary	2152
Investigation	1247

Maximum Incident Count by Station

For both years (2022 & 2023),
the station with maximum
incident counts are :

- Kennedy Station
- Kipling Station
- Both of these stations are
terminal stations on Line 2.

2022

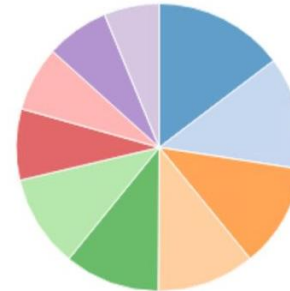
KENNEDY STATION KIPLING STATION PIONEER VILLAGE STAT... FINCH STATION EGLINTON STATION
WILSON STATION EGLINTON WEST STATIO... SCARBOROUGH CENTRE S... WARDEN STATION PAPE STATION



Activate Windows
Go to Settings to activate Windows

2023

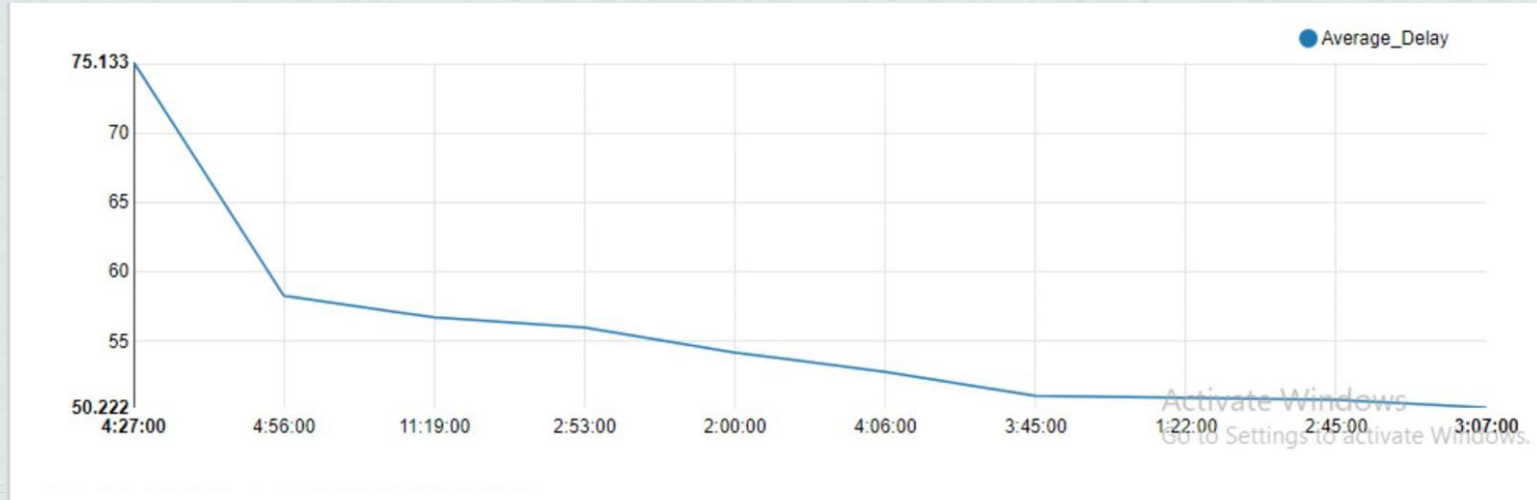
KENNEDY STATION KIPLING STATION WILSON STATION FINCH STATION EGLINTON STATION
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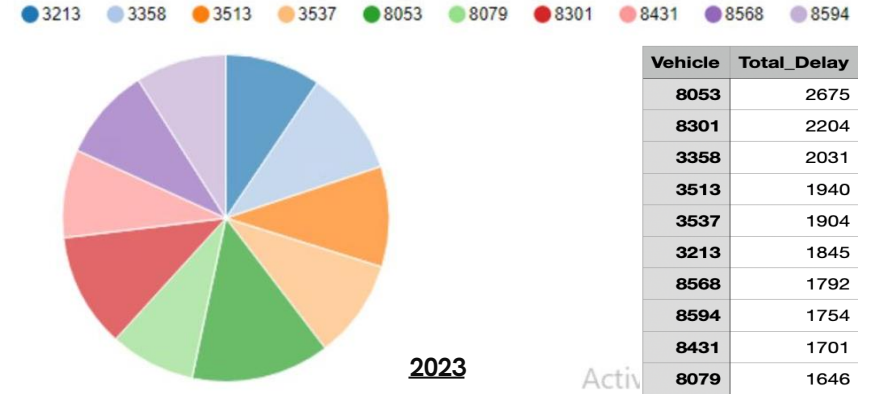
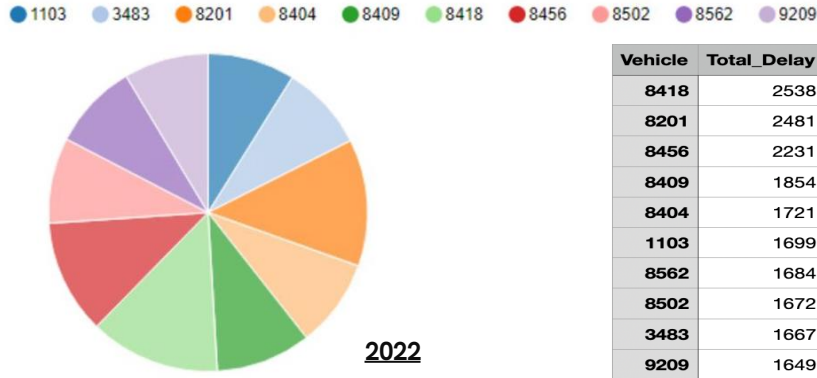
Maximum Delay by Hour in A Day

- It's notable that the highest delay in a day is observed at 4:27 PM. Starting from 4:06 PM, the delay duration is relatively short, but it increases significantly by the time it reaches 4:27 PM, where it peaks and this high level of delay continues until 4:56 PM. Additionally, it's important to mention that around 11:19 AM, the delay is almost an hour long.



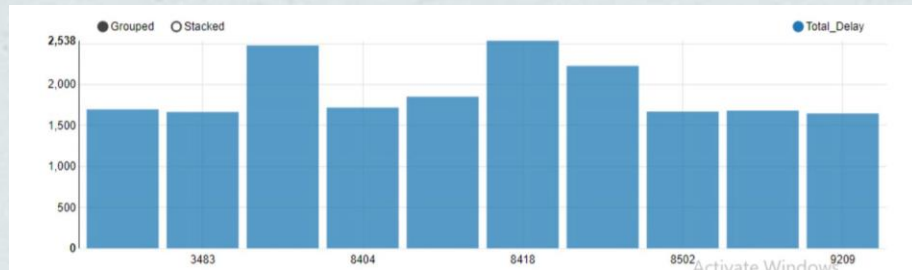
Maximum Delay in Minutes by Vehicle Number for Year 22/23

- Vehicle number with maximum delay in 2022 : 8418, 8456, 8201 (42.18, 41.21, 37.11 HRS)
- Vehicle number with maximum delay in 2023 : 8053, 8301, 3358 (44.35, 36.44, 33.51 HRS)



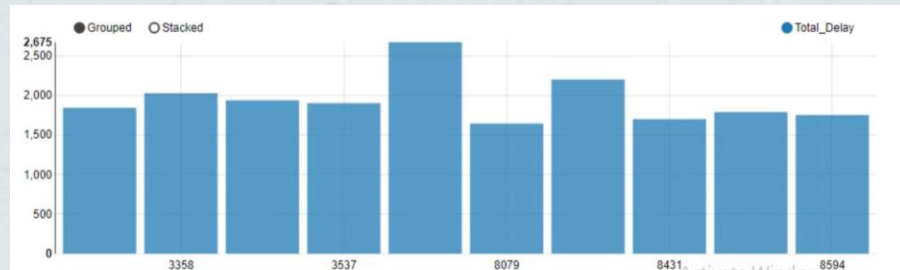
Max Delay by Vehicle Number

2022



Vehicle	Total_Delay
8418	2538
8201	2481
8456	2231
8409	1854
8404	1721
1103	1699
8562	1684
8502	1672
3483	1667
9209	1649

2023



Vehicle	Total_Delay
8053	2675
8301	2204
3358	2031
3513	1940
3537	1904
3213	1845
8568	1792
8594	1754
8431	1701
8079	1646



Summary

This data provides insights into the patterns of the delays and incidents across different stations and vehicles overs 2 years (2022 & 2023):

Delays

- Maximum Delay Locations: Lawrence West Station, Pape Station, Eglinton Station
- There was an observed increase in average delay minutes during the last 6 months of each year, suggesting potential factors such as weather conditions and increased holiday traffic.
- Vehicles with Maximum Delay in 2022: 8418, 8456, 8201
- Vehicles with Maximum Delay in 2023: 8053, 8301, 3537

Incidents

- Incidents with Maximum Frequency: Operator, Mechanical
- Incidents with Minimum Frequency: Cleaning, Investigation
- Stations with Maximum Incident Counts for both years: Kennedy Station, Kipling Station





REFERENCE :

Iamsuzank. (2023, October 16). *TTC delay analysis 2022 to 2023*.
Kaggle. <https://www.kaggle.com/code/iamsuzank/ttc-delay-analysis-2022-to-2023/notebook>

Thanks!

