

● ● ● Faculty Mentor: **Satayaki Das**

TTC Subway Delay Data Analysis

Data Analytics Capstone
Project | Group 17



Operational Context



Public transit reliability is critical for Toronto's economy; in 2025, subway delays resulted in approximately **1,179 lost service hours**. The lack of a structured framework at the TTC to identify root causes by line, station, or time has led to inefficient allocation of maintenance and workforce resources. This project aims to transform raw delay logs into an **interactive dashboard** to enable data-driven maintenance scheduling and workforce planning.

Context & Problem





Data Pipeline & Cleaning



Data was sourced from the City of Toronto Open Data Portal covering Jan–Dec 2025 with 25,713 rows. Cleaning included replacing 36.8% missing "Bound" (direction) values and standardizing over 20 inconsistent line names down to six canonical codes. Feature engineering added five columns — Month, Hour, Delay_Category, Time_Period, and Is_Delayed — to support temporal and severity analysis.

Pipeline overview

Key Performance Indicators

35.37%

Delay Rate stood at ~35.37%, representing the significant share of incidents that caused actual service disruption across the entire network system.

~42.2%

AM Peak Delay Rate is notably higher at ~42.2%, highlighting a pronounced and significant impact on morning commuters during their daily travels.

~70,754
minutes

Aggregate Total Delay Minutes reached ~70,754 minutes, which equates to roughly ~1,179 hours of operational loss and quantifies the scale of the problem.

Major Data Observations



Line 1 (YU Line) is the network's weakest performer with a delay rate of 38.7%, indicating specific and targeted operational issues on that particular line.

Line performance



Seasonality analysis shows February as the worst month with 917 incidents, likely driven by harsh winter weather conditions affecting operations.

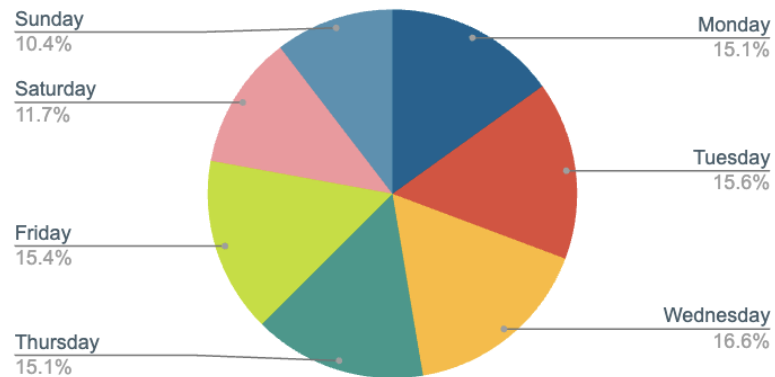
Seasonality



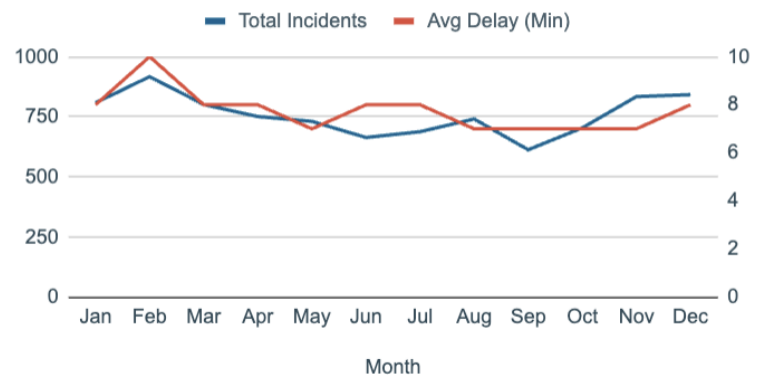
Sundays have the fewest incidents (946) but the highest average delay (10 minutes), likely due to reduced staffing or slower recovery on low-service days.

Day-of-week pattern

DAY OF WEEK (Avg Delay)



MONTHLY TREND (SEASONALITY)

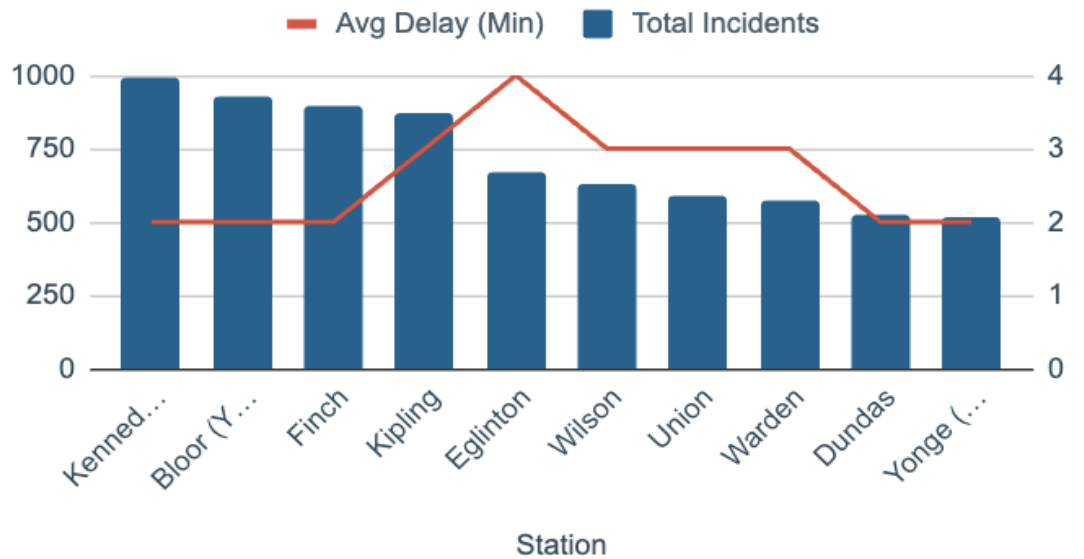


LINE PERFORMANCE



Segmentation & Severity

TOP 10 WORST STATIONS



Pareto analysis shows top 10 stations (12% of network) cause 27% of incidents, highlighting intervention hotspots. 64.6% of logs are 'No Delay', but 2.3% 'Major' (over 16 mins) have big impacts. Stations like Kennedy and Bloor, with severe delays, need priority fixes.

Pareto hotspots & severity

Operational Dashboard

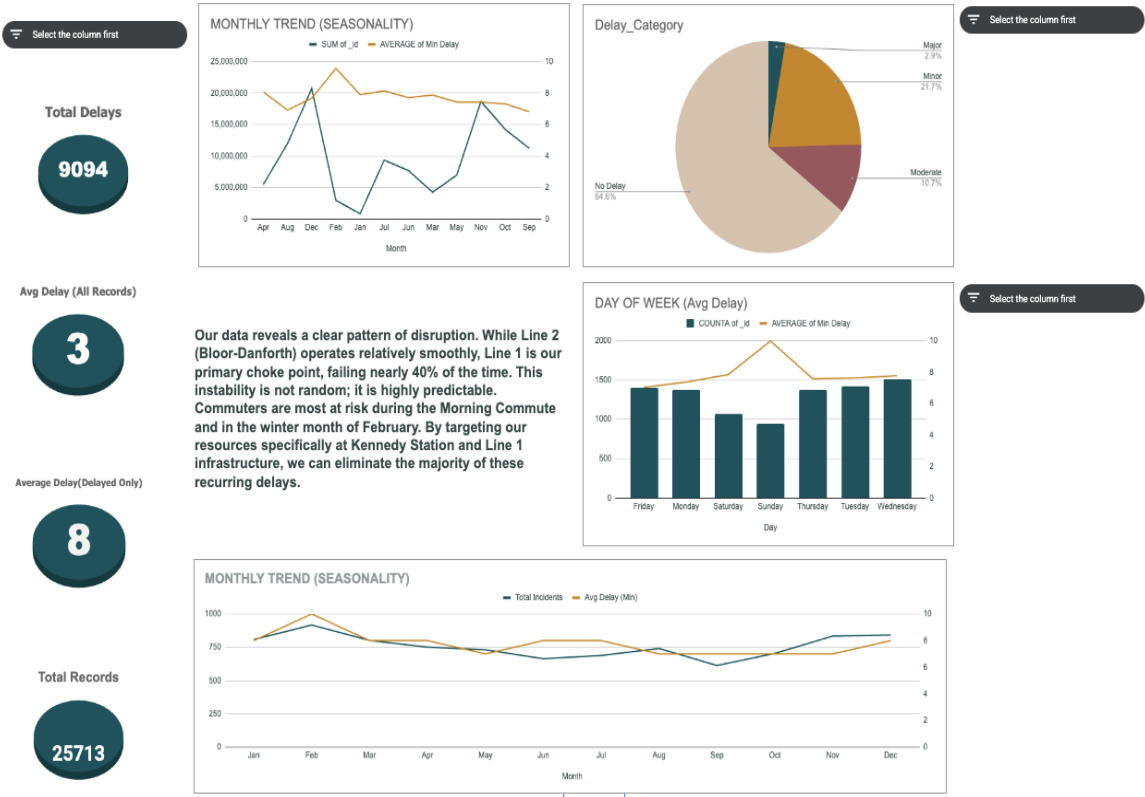


The dashboard provides an executive overview of TTC Subway Delay Analysis 2025 with key KPI cards showing Total Delays, Average Delay, and Total Records for quick decision-making. It includes a Monthly Trend chart to track seasonality, a Delay Category pie chart to understand severity distribution, and a Day-of-Week analysis to identify peak risk periods. Together, these insights support targeted operational improvements and long-term planning.

Dashboard overview

TTC Subway Delay Analysis 2025

This project contains a comprehensive analysis of Toronto Transit Commission (TTC) subway delay data for the year 2025. The dataset includes detailed information about delay incidents across the TTC subway network, providing insights into operational patterns, peak delay periods, and affected stations.



Operational Impact & Value



- 15% potential delay reduction
- ~10,600 delay minutes saved
- ~177 service hours recovered

Operational Improvement



- Fewer AM peak disruptions
- Targeted investment focus
- Better maintenance allocation

Efficiency Gains



- Improved commuter reliability
- Stronger public trust
- Data-driven decision support

Strategic Value