

NYC Subway Stations Fare Evasion Recommendation

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Abstract

The New York City Subway is the largest rapid transit system in the world by number of stations, with 472 stations in operation. However, according to MTA, unpaid fares on subways and buses cost an estimated \$215 million in 2019 and \$59 million during the first quarter of 2021. The goal of this project was to find the most subway stations with traffic and fare evasion in New York city in order to help in combating and minimizing the millions of dollars in losses. New York subway MTA turnstile data and NYPD arrests data were used for the analysis. The chosen timeline was the last six months of 2019 and the first six months of 2020. That is pre Covid pandemic and during it.

Design

Each station daily entry count was calculated from MTA data. NYPD arrests data has a breakdown of every arrest effected in NYC by the NYPD from 2006 to 2020. Theft of service arrests was filtered and further filtered by arrest geo location is no more than 250 meters from a subway station. The stations with most arrests and traffic were then determined and recommended for restrict policing.

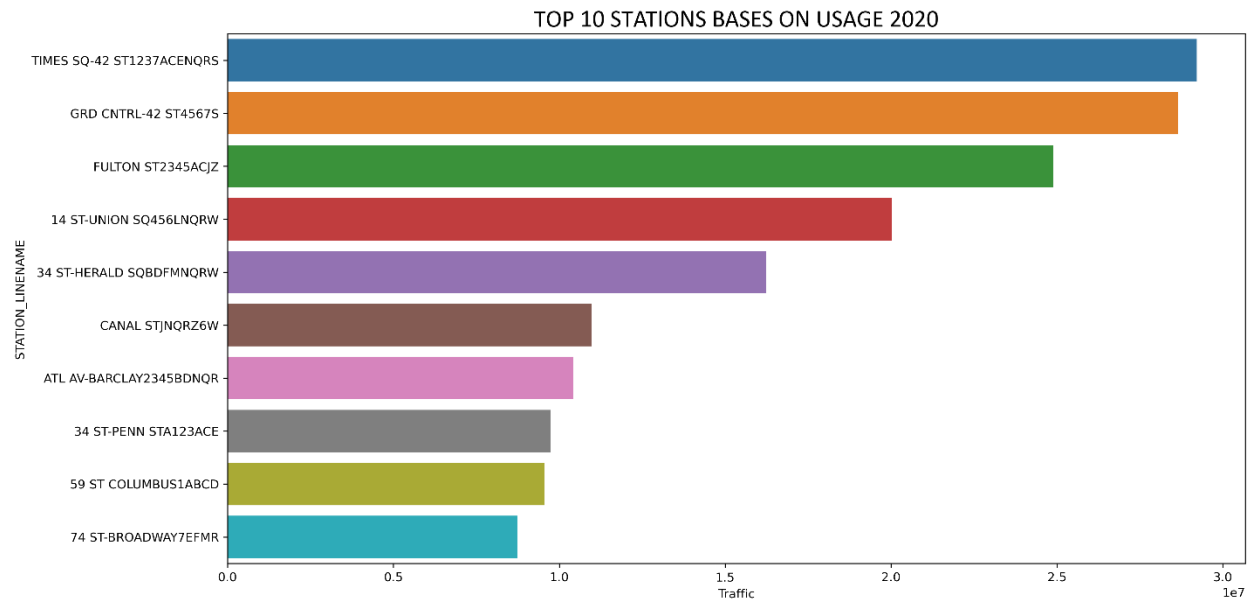
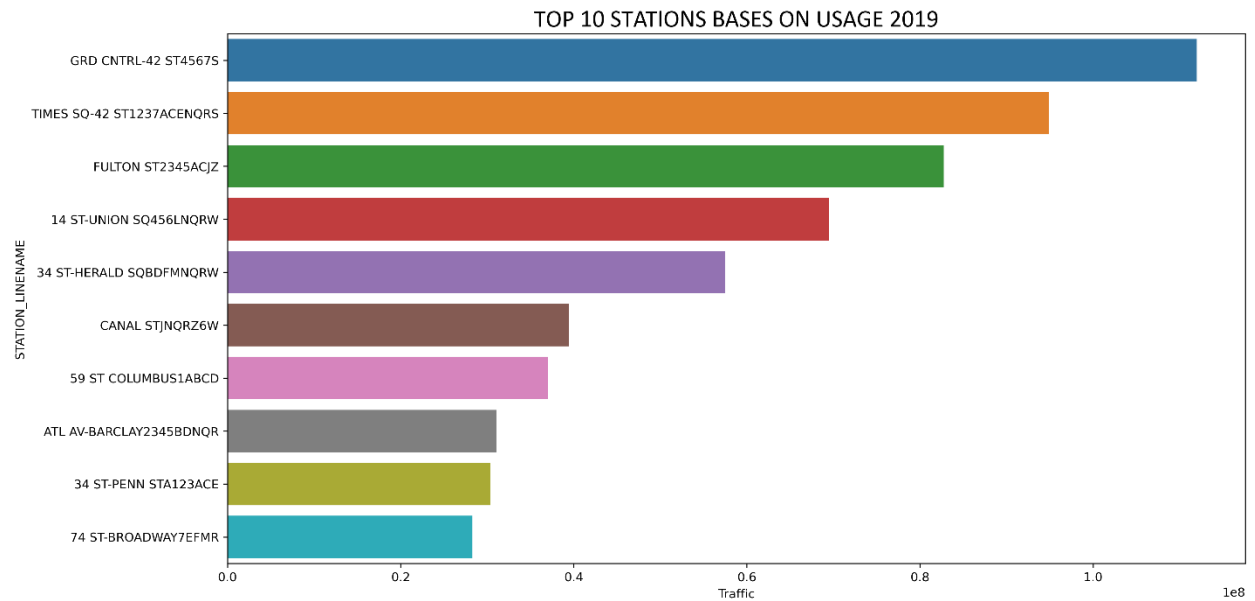
Data

Turnstile data was provided by New York Metropolitan Transportation Authority (MTA) which contains cumulative number of entries and exits by station, turnstile, date, and time. MTA turnstile data contains about 10.7 million rows in total for NYC subway stations. NYPD arrests data contains 5.15 million rows and 19 columns describing the arrest which includes information about the type of crime, the location, time of enforcement, and suspect demographics. NYC boroughs, subway lines and stations in shapefiles format were used to plot the maps.

Tools

- SQL and SQLAlchemy for data ingestion, storage, and extraction
- Numpy, Pandas and GeoPandas for data manipulation
- Matplotlib, Seaborn, GeoPlot and Shapely for plotting

Commination



Station	2019	Station	2020
Sutphin Blvd - Archer Av	70	42nd St - Port Authority Bus Term	34
Atlantic Av - Barclay's Center	64	Sutphin Blvd - Archer Av	26
42nd St - Port Authority Bus Term	60	Sutter Ave	24
34th St - Penn Station	50	Atlantic Av - Barclay's Center	24
Nostrand Ave	43	34th St - Penn Station	22
Jackson Hts - Roosevelt Av	42	Nostrand Ave	15
Jay St - MetroTech	36	Broadway Junction	15
74th St - Broadway	33	Crown Hts - Utica Ave	14
Tremont Ave	31	23rd St	11
Sutter Ave	30	125th St	11
Total	1427	Total	525

Stations Traffic and Arrests June2019-June2020



Recommendation (11 Stations out of 472)

Top 10 in Arrests 2019-2020
42nd St - Port Authority Bus Term
34th St - Penn Station
Nostrand Ave
Atlantic Av - Barclay's Center
Sutphin Blvd - Archer Ave
Sutter Ave

Traffic 2019-2020
74 ST-BROADWAY
14 ST-UNION
34 ST
CANAL ST
FULTON ST