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| MTA Inclement Weather Impacts Study Report |  |

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# Project Summary

This report is on behalf of the New York Metropolitan Transit Authority (MTA) in support of its efforts to increase ridership, and thus increase revenue. The MTA Inclement Weather Impacts Study performed in August 2021 on 2019 MTA Ridership and National Oceanic and Atmospheric Administration Climate data sought to analyze the impacts of inclement weather on MTA subway ridership. If a strong correlation were found between ridership and precipitation and high and low temperatures, capital investments to improve subway stations could be made and targeted marketing campaigns could be created to positively impact ridership.

Methodology

MTA Daily Turnstile data was used from the calendar year 2019 for the five most heavily used subway stations: Penn Station, Grand Central Station – 42nd Street, 34th Street- Herald Square, 23rd Street and Canal Street. Because of the significant drop-off of ridership, weekends and federal holidays (New Year’s Day, Martin Luther King Day, President’s Day, Memorial Day, 4th of July, Labor Day, Thanksgiving and Christmas) were removed from the dataset. NOAA Daily Climate data was used from 2019 and contained the features: daily precipitation (rain) amounts, daily snow amounts, daily high temperature and daily low temperature.

The dataset used in the analysis included: *Daily Entries* which were the total number of turnstile turns, per turnstile, at all five stations; *Dates* of weekdays only from 1/2/2019-12/27/2019, excluding federal holidays; *Precipitation* and *Snow* in inches recorded daily by the NOAA NYC weather station, *Maximum Temperature* and *Minimum Temperature* in degrees Fahrenheit recorded daily by the NOAA NYC weather station.

Tools used in this exploratory data analysis (EDA) effort include: Python, Juptyer Notebook, Python libraries (pandas, matplotlib, seaborn), SQLite and GitHub (to store the repository).

Insights

EDA has revealed the following insights:

1. There is a weak correlation between inclement weather and ridership. The correlation coefficients between precipitation, snow, high temperature, low temperature and daily turnstile entries were 0.09, 0.08, -0.12, and -0.11, respectively.
2. Summer and winter weather temperature extremes appear to have more impact overall on ridership.
   1. Fewer people are riding the subway when it is very hot or very cold outside. When seasonal data was segmented out, the correlation coefficient for high temperature, low temperature and daily turnstile entries were -0.24 and 0.15, respectively.
3. There were few extreme weather events in NYC in 2019. There were only 5 days of snowfall greater than ¾ inch, 18 days of rainfall greater than ¾ inch, only 4 days of 90 degree weather or more, and 31 days below freezing.

Conclusion

There could be some capital investments for station upgrades and/or targeted marketing campaigns that could potentially increase ridership on inclement weather days, but more study is needed on data containing more extreme weather events, like historic rainfalls/snowfall, hurricanes/tropical storms/nor’easters, and with subway stations with reported flooding or HVAC issues.