



Info Challenge 2025

DC WMATA METRO RIDERSHIP TREND ANALYSIS

Ramya Nataraj, Saisidharth
Seyyadri, Roshan Aterugu

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Introduction

- **Goal**
 - Analyze DC WMATA Metro ridership trends to identify key patterns.
- **Factors analyzed**
 - Time of day, day of the week, seasons, and major events.
- **Methods**
 - Data analysis & visualization to examine ridership trends.
 - Identified peak hours, event-driven spikes, and seasonal changes.
- **Impact**
 - Provides insights for transit planners and organizations like MindPetal to optimize Metro operations.

Overview



Data

What is the dataset we utilized?



Trends and Observations

What did we notice and observe from our data?



Summary

Final conclusions

WMATA Metro ridership dataset



CSV files for 8 Days

4 different months with two days each for weekend and weekday



Station Data

98 metro stations were included



Five Different Time Periods

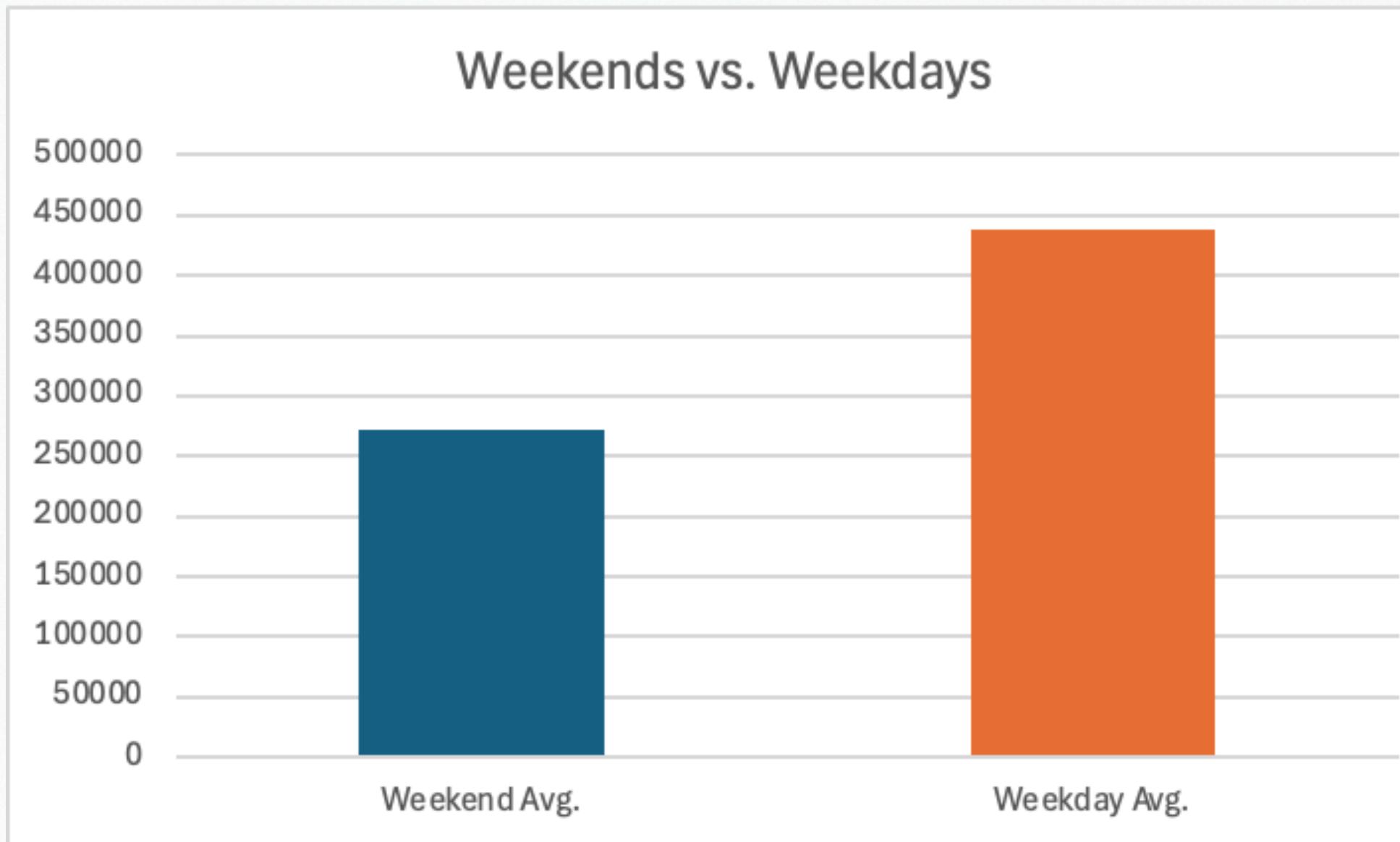
Open-close



Avg. Daily Entries

Average Daily Entry per station at that specific time

Weekend vs. Weekday



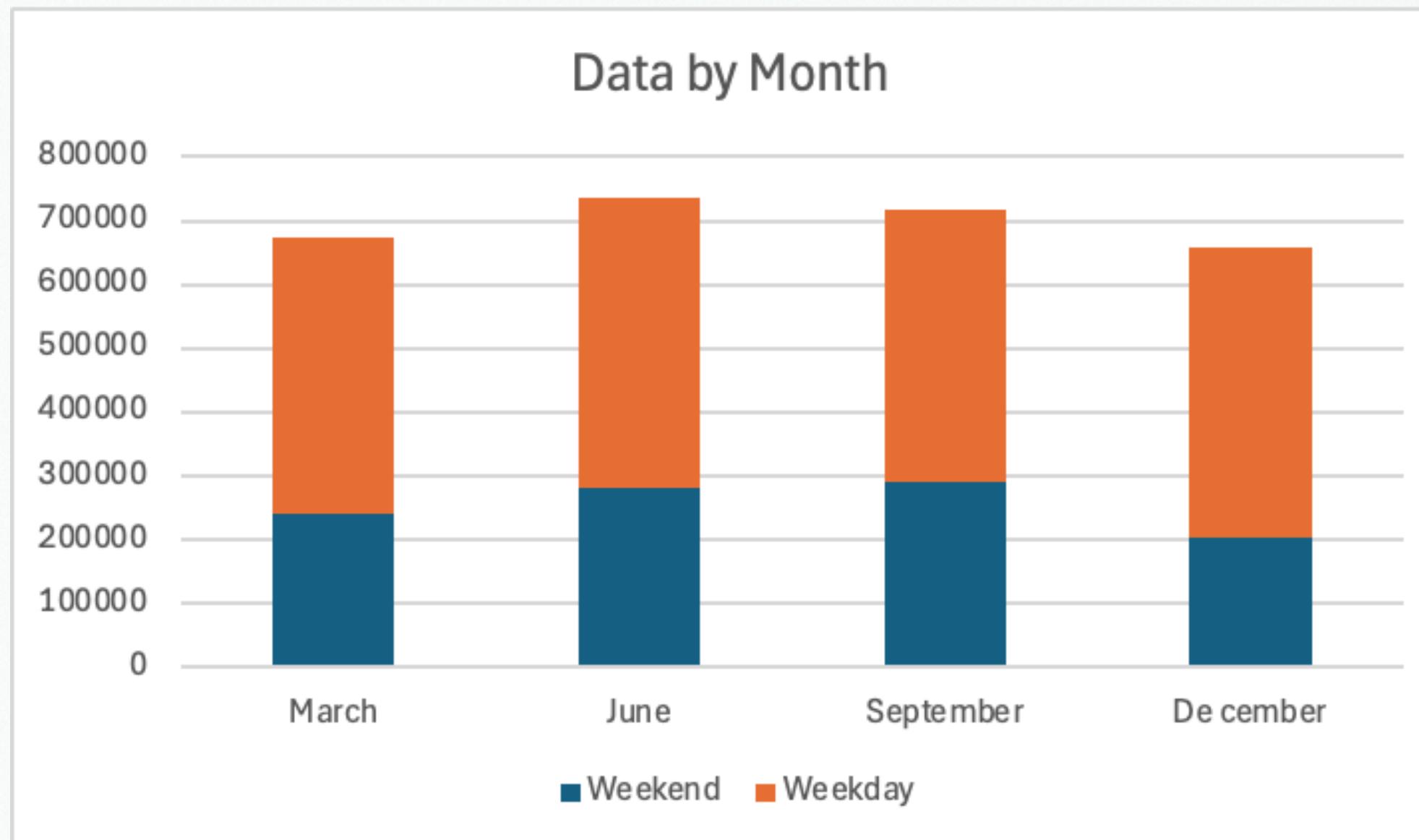
Weekday ridership is higher than weekend ridership

Suggests the Metro is primarily used for commuting due to work and school

Weekend ridership is lower but still notable

Driven by leisure activities, events, and tourism

Trends by Month



June - highest overall ridership

Increase in tourism, summer internships, and large events in DC

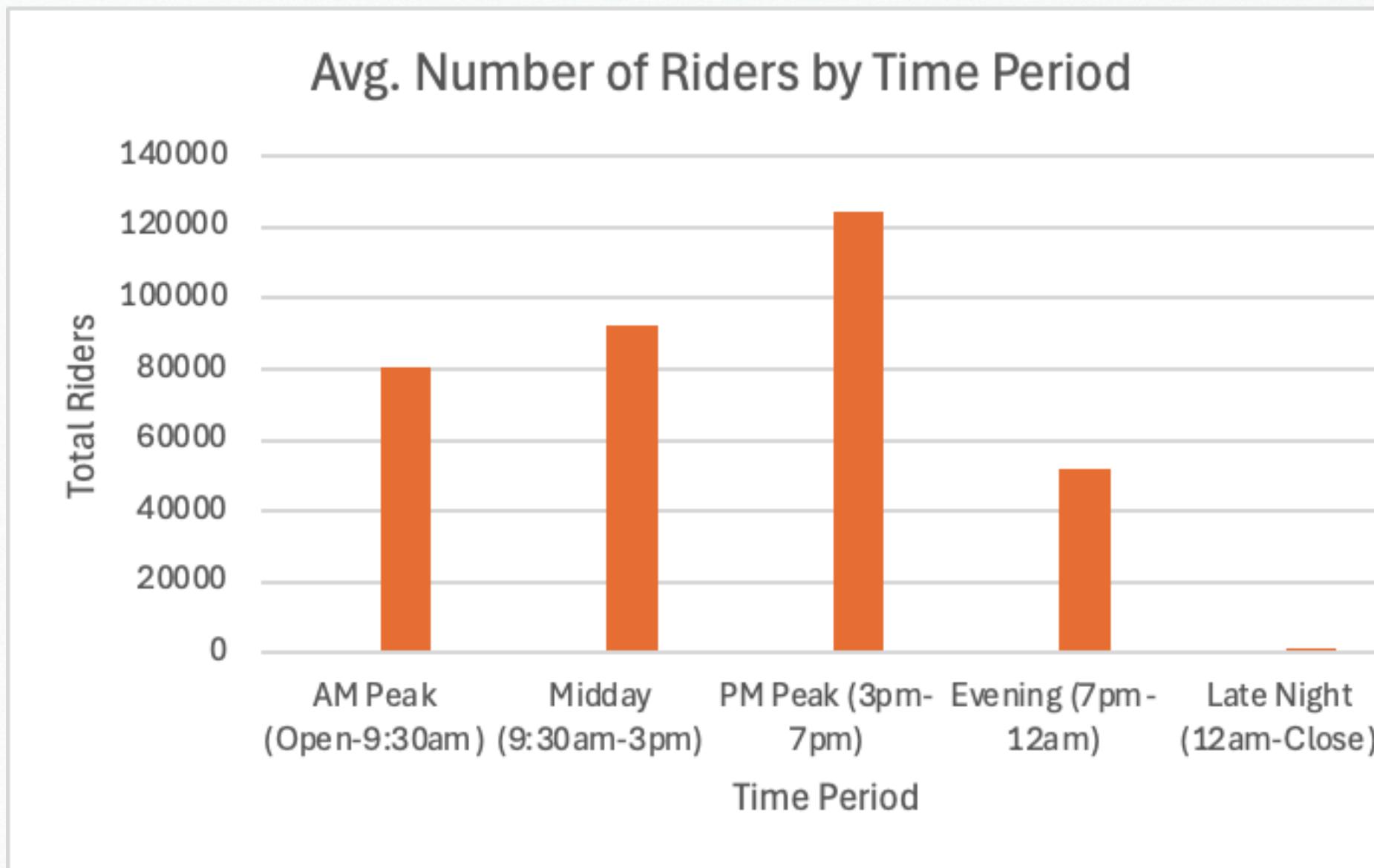
December - lowest overall ridership

Colder, holiday vacations

March and September show steady ridership

Aligns with work and school schedules

Trends by Time Period



PM Peak (3 PM - 7 PM) has the highest ridership

Likely due to commuters heading home from work/school

AM Peak (Open - 9:30 AM) and Midday (9:30 AM - 3 PM) also see high ridership

Reflects morning commutes and work/school schedules

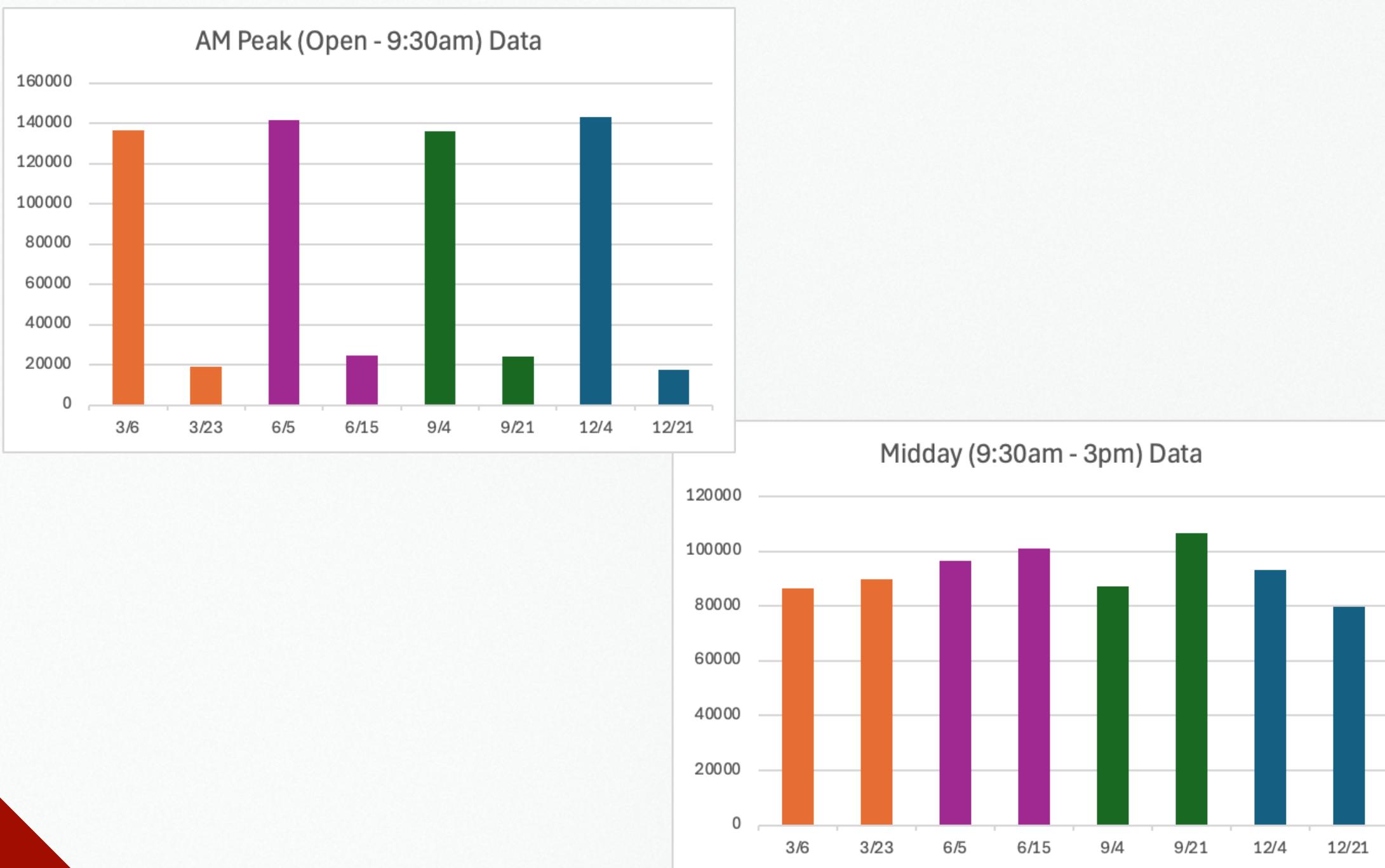
Evening ridership (7 PM - 12 AM) is lower but still notable

Late night workers, events, and leisure travel

Late Night (12 AM - Close) has the lowest ridership

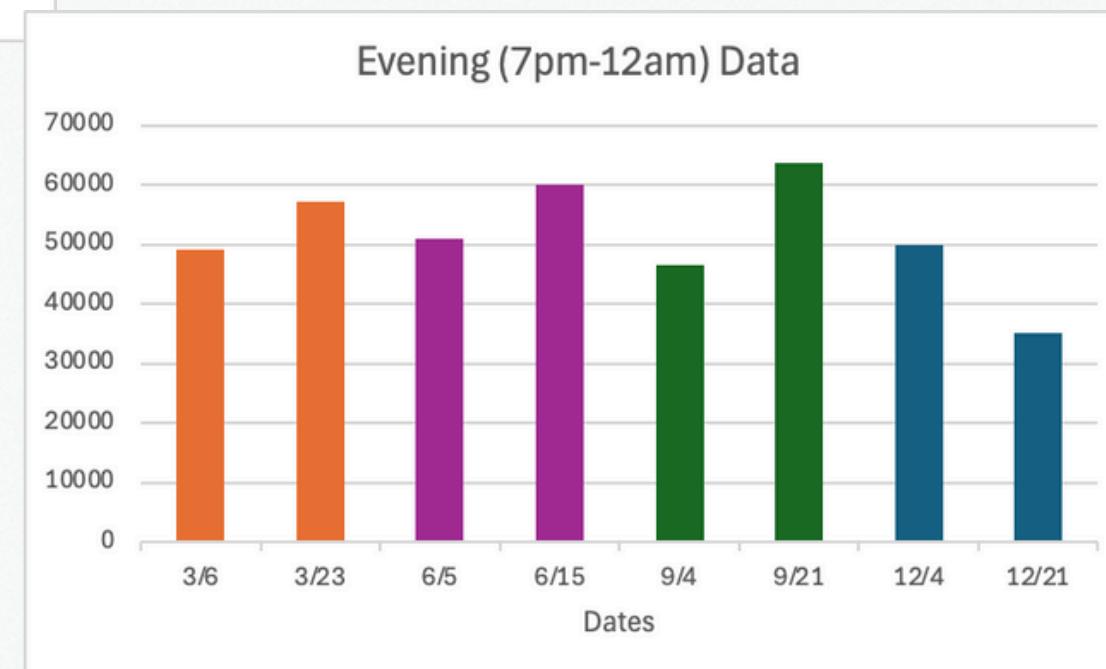
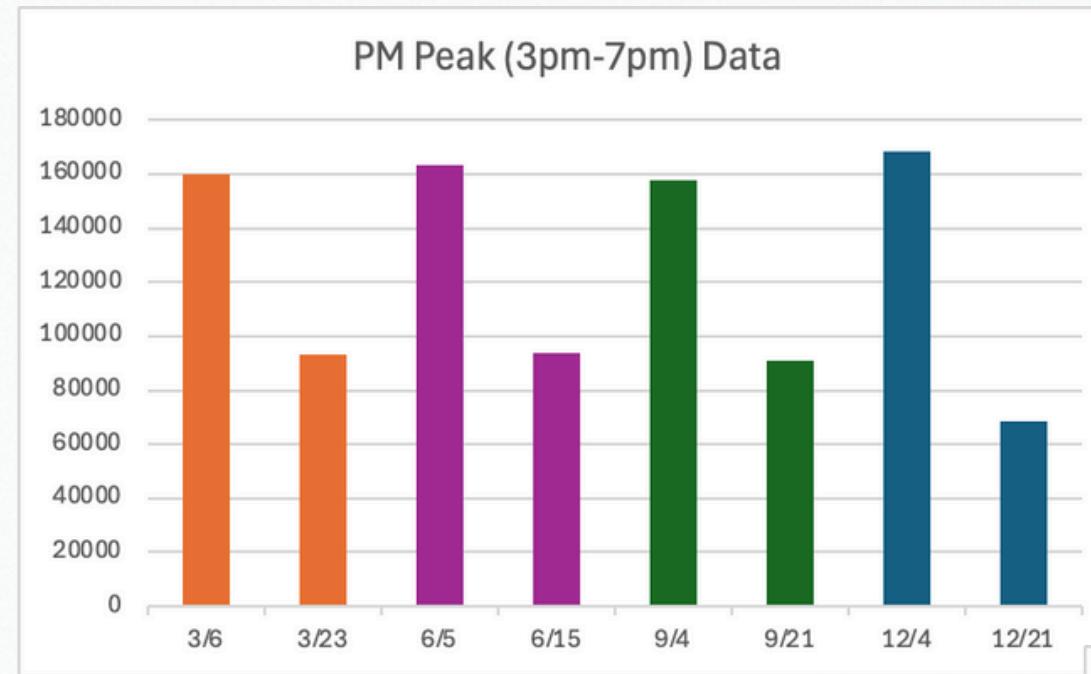
Reduced service, safety concerns

Trends in AM Peak and Midday Data



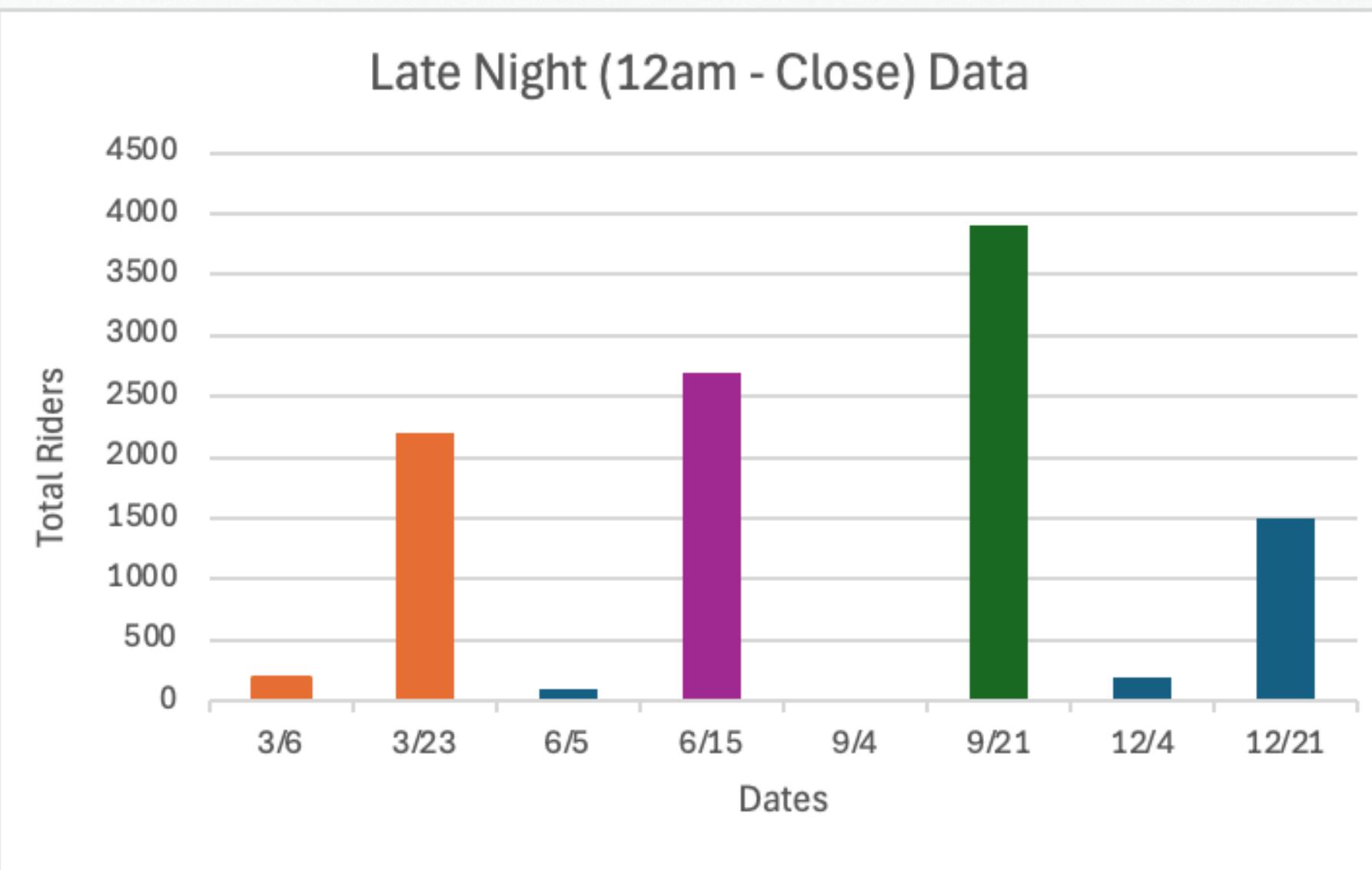
- Less Riders on metro during weekends in the opening hours
- Due to Peak commuting between VA, MD, and DC
- Normally distributed data across all days for midday
- Weekend prices lesser than weekday
Prices over the weekend are lower than weekdays can reach \$6.75 (till 9:30pm on weekdays), high is \$2.50 on weekends

Trends in PM Peak and Evening Data



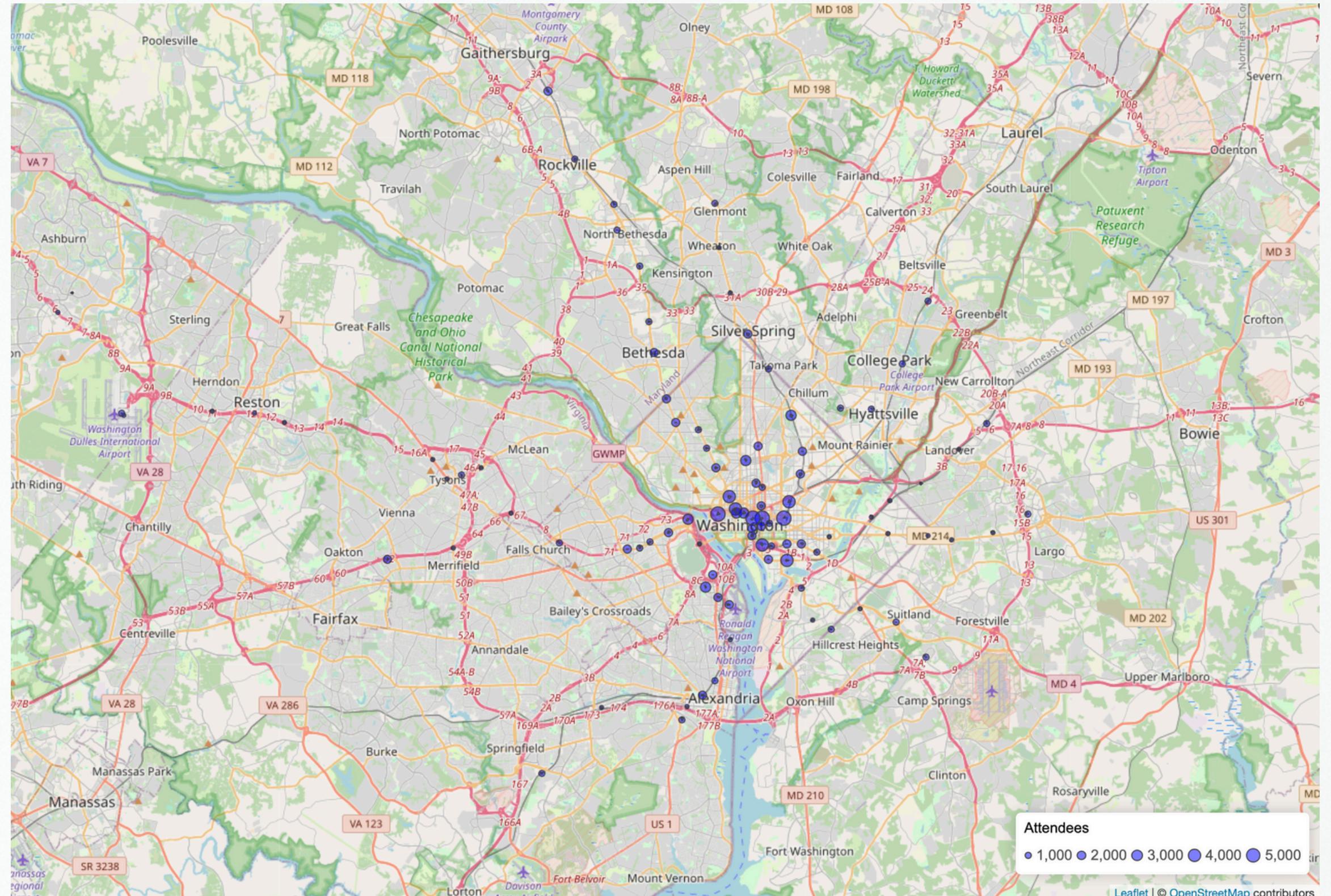
- Greater activity on the metro in the earlier hours before 7pm
- Higher number of people on weekdays during PM Peak hours
- Evening hours (late night) had higher number of riders on weekends
Higher chance of people to hangout and stay in DC for late night activities
- Higher number of people for both weekend and weekday found in June for PM Peak

Trends in Late Night Data



- Very few people ride the metro near closing on weekdays (near 0)
- Highest and lowest number of people riding metro in September
9/4 (weekday) had 0 riders, 9/21 (weekend) had almost 4000 riders
- Temperatures at nights are lower could lead to lower count
Colder in December and cooler in September --> lower number of riders
- Middle of week has lower probability of people staying out late

Trends in the Map Data

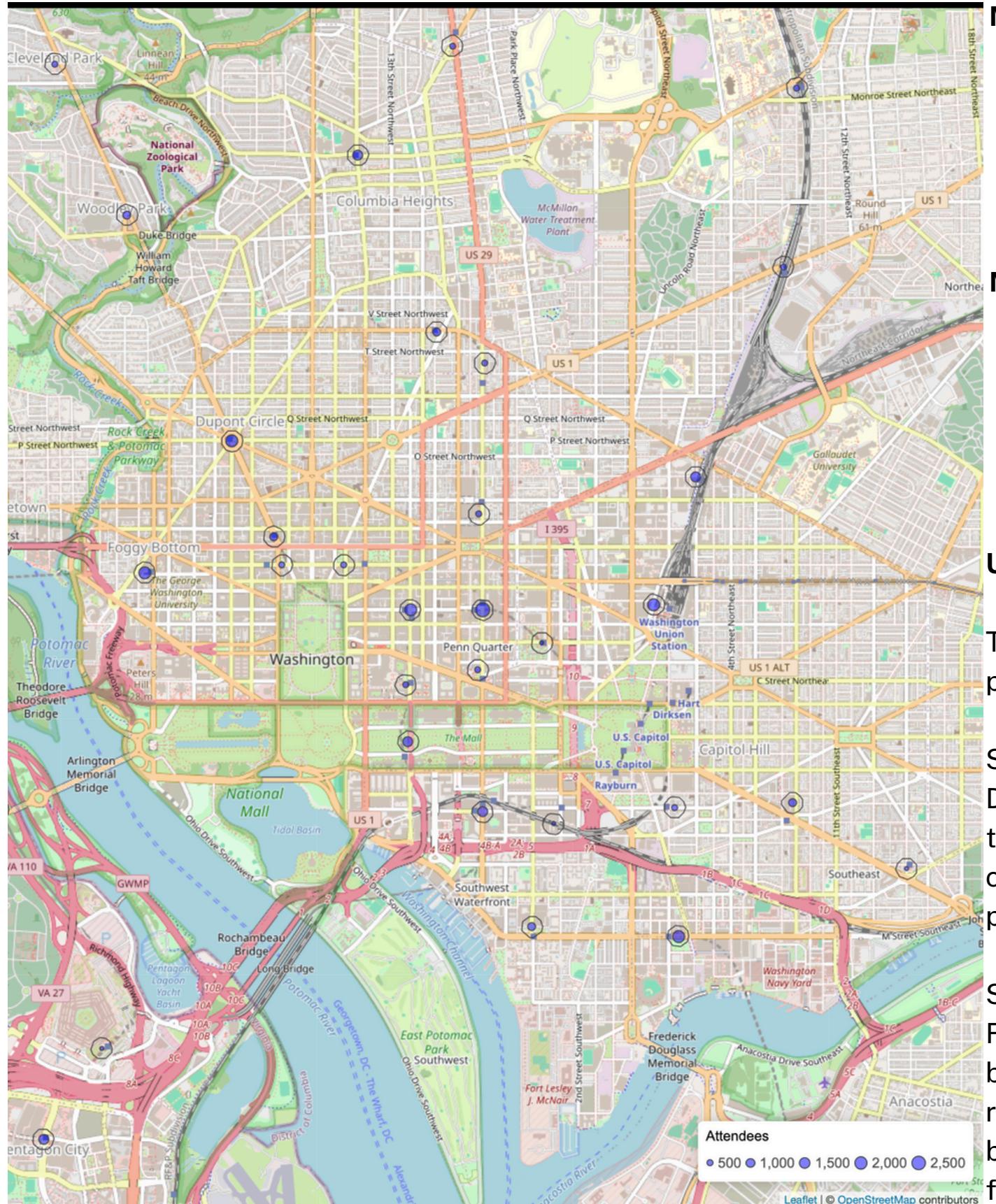


Total Average Number of Users Between All 8 Days:

Stations located near the heart of Washington DC are visited considerably more than the other stations.

- Potential reasons for this include the proximity of these metro stations to businesses, government offices and tourist attractions such as the museums, memorials, monuments and the National Mall.

Total Average in Users for Weekends:



Most Used Metros During The Weekends:

- Gallery Place
- Navy Yard-Ballpark
- Foggy Bottom-GWU
- Union Station
- Dupont Circle

Most Used Metros During The Weekdays:

- Union Station
- Metro Center
- Foggy Bottom-GWU
- Gallery Place
- Farragut North

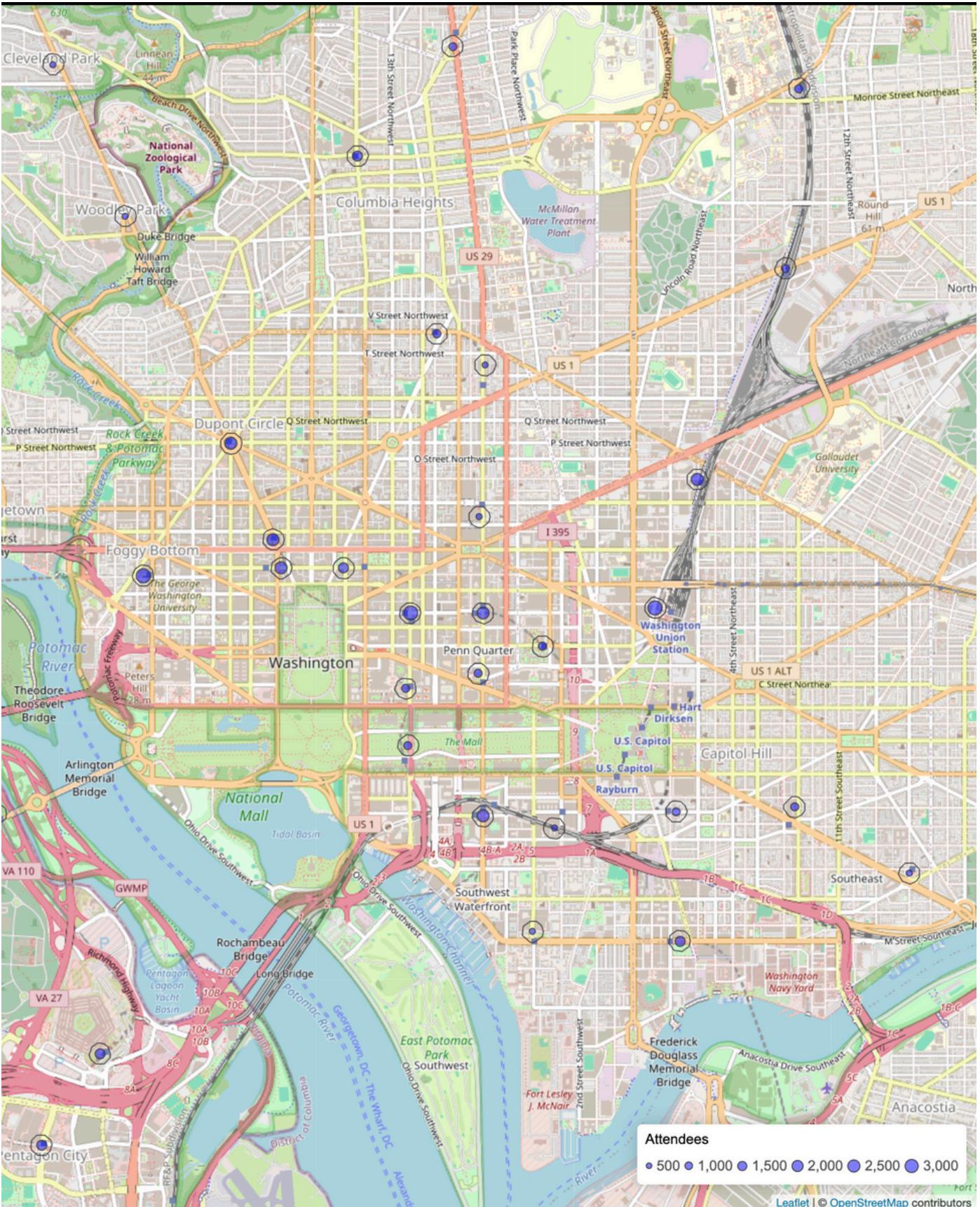
Usage Pattern:

The metro system serves a different purpose on weekdays and weekends.

Stations such as Navy Yard-Ballpark and Dupont are popular on weekends due to their proximity to sports games, concerts, restaurants, nightlife and other places for social gatherings.

Stations such as Metro Center and Farragut North are located near office buildings, government agencies, and retail spaces. These are primarily used by commuters leading them to be more frequently visited during the weekdays.

Total Average in Users for Weekdays:



Conclusion

Trends by Season:

- June received the highest ridership whereas December received the lowest.

Trends by Time Period between Weekends and Weekdays:

- There is a stark contrast during AM Peek where there were significantly lower usage on Weekends when compared to Weekdays. Whereas the opposite trend was true during Late Night.

Trends by Location between Weekends and Weekdays:

- On weekends, stations located near museums, memorials and other attractions experienced the highest ridership. Whereas on weekdays, stations located near government buildings and offices received the highest ridership.





Use of AI & Additional Datasets

AI Tool that we used: ChatGPT

- Finding reliable websites that contain important data such as events occurring in Washington DC during the given days and a spatial map of Washington DC and its surrounding area
- Deepen our understanding with certain libraries in Python and R



Sources

<https://infinitylimocar.com/upcoming-events-2024-in-washington-dc/>

<https://washington.org/find-dc-listings/events>

https://world-weather.info/forecast/usa/washington_1/june-2024/

<https://opendata.dc.gov/datasets/DCGIS::washington-dc-boundary/explore?location=38.768454%2C-76.797989%2C10.00>

<https://opendata.dc.gov/datasets/DCGIS::metro-stations-regional/explore>

<https://clauswilke.com/dataviz/directory-of-visualizations.html>

ANY QUESTIONS?

