RAT PACK Consulting

Analysis of weekend late-night subway traffic patterns and crime analysis for the NYPD

Problem Statement

The NYPD is interested in placing additional officers at subway stations late at night on Fridays and Saturdays. They request recommendations of stations that would benefit from more staffing.

Email from NYPD

To: Rat Pack Consulting

I am writing on behalf of the NYPD organization. We intend to increase our police coverage in subways on Friday and Saturday nights in order to ensure the safety of our citizens. We have a limited amount of officers available and so would like to maximize our coverage in the stations that have the most popularity on weekends in the late night/early mornings.

Can you tell me which MTA stations have the most traffic during this time?

I appreciate your prompt reply.

Srgt John McClane

Our Initial Assumptions

To start with we made some initial assumptions that went into our analysis:

- Initial analysis is for 12-4am on Friday nights and Saturday nights
  - Late-night passengers have greater potential for crime related activity
- We used data for 16 weeks from May 27-Sept 15 2017
- Traffic for late-night commuters is potentially higher-crime risk individuals
- Good predictors for high risk traffic:
  - High ratio of late night weekend traffic to overall traffic on weekends.
  - Substantially increased late night traffic on Weekends vs Weekdays
  - These two predictors indicate that the high late night traffic volume at a given station reflects actual high-risk traffic and is not just indicative of the

station's being a hub.

Our Approach

Using MTA Turnstile Weekly data for 16 weeks from May 27-Sept 15 2017 from "http://web.mta.info/developers/turnstile.html" we started by combining entries and exit counts to create total traffic counts and then filtered to capture data for late Friday and Saturday from 12-4am. We then identified the top 10 trafficked stations for these time frames and compared against average weekday traffic and also compared against average daytime traffic for the specified day.

Initial Task

Our initial task was to find the highest trafficked stations on Friday and Saturday nights for the period of 12-4am and map against Precinct Crime Data to provide recommendations on where to place officers and resources. We started by identifying the top 10 most highly trafficked subway stations at night.

Top 10 Trafficked Stations

| 1	TIMES SQ-42 ST	6	50 ST
2	34 ST-HERALD SQ	7	GRND-CNTRL-42 ST
3	34 ST-PENN STAT	8	145 ST
4	JKSN HT-ROOSEVELT	9	59 ST COLUMBUS
5	BEDFORD AVE	10	59 ST

We looked at the most trafficked stations for each 12-4 AM window and the variability of the traffic vs the stations daily average for the chosen day in order to show which stations have increased late-Friday night activity. These stations are the most likely to need a ramp up of NYPD resources.

Most trafficked stations Friday nights

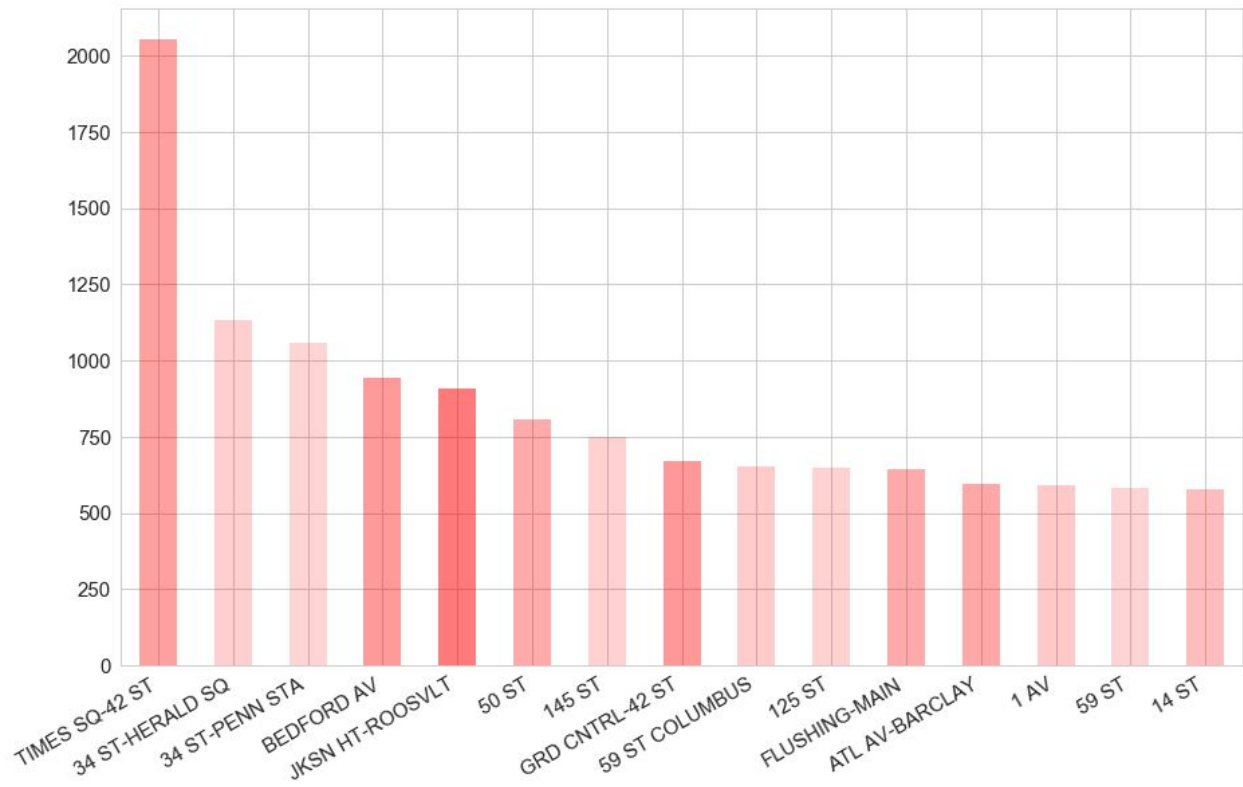### Friday night traffic - top 12 stations
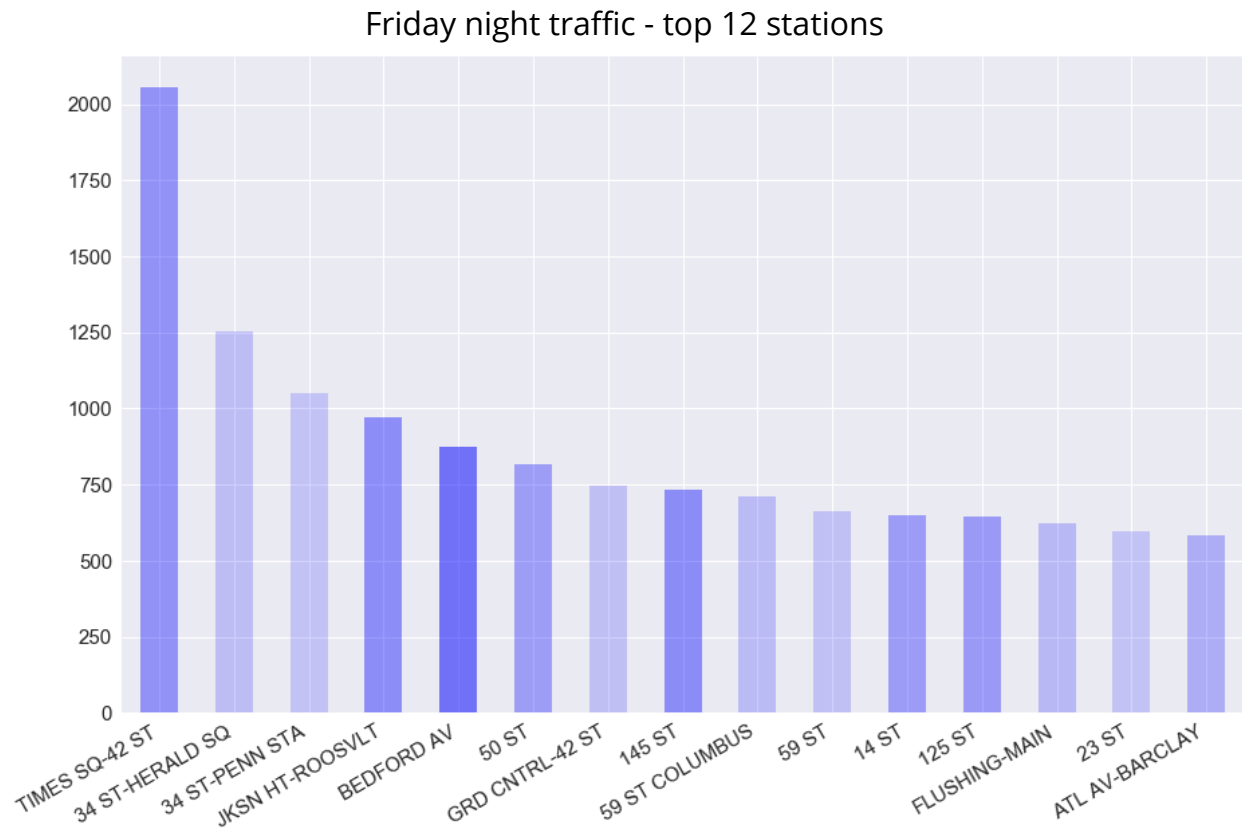
This graph shows highly trafficked stations for Friday night. The bars are more opaque when the ratio of evening traffic to daytime traffic is greater.
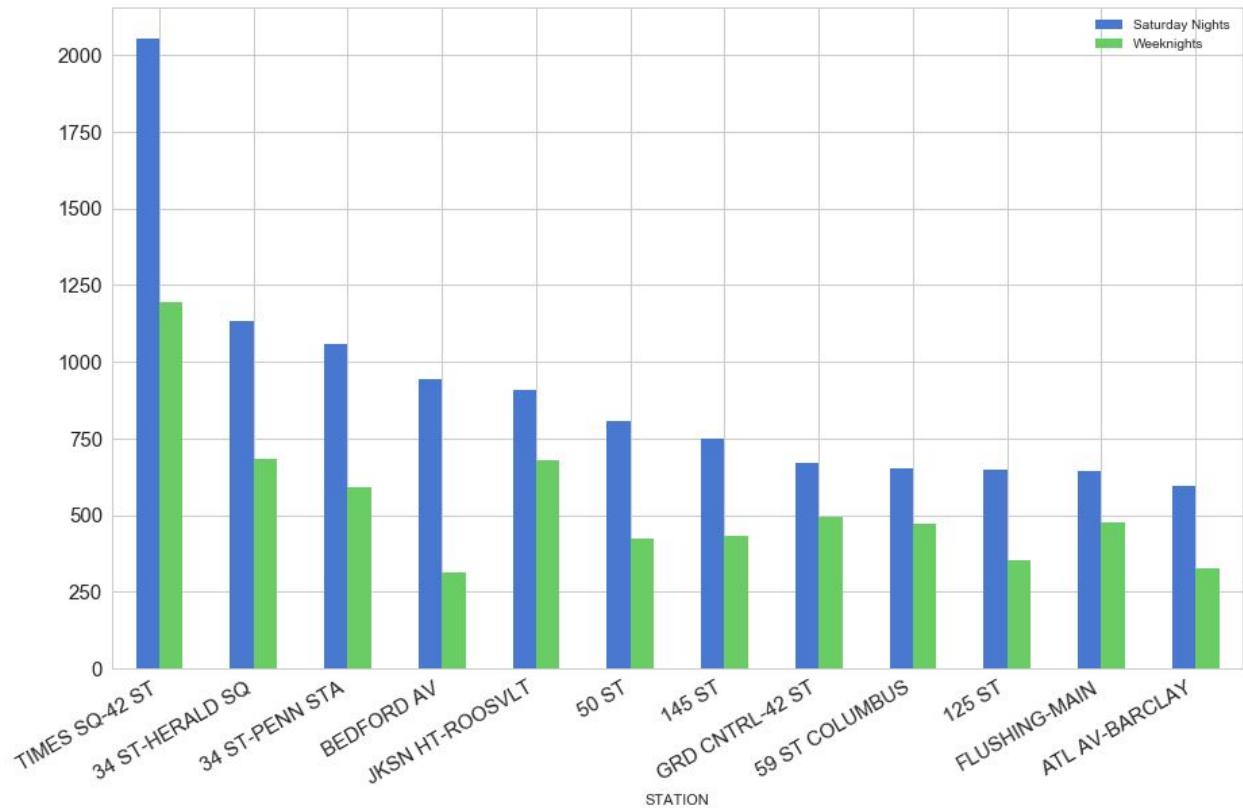
Friday late-night night vs weekday late-nights
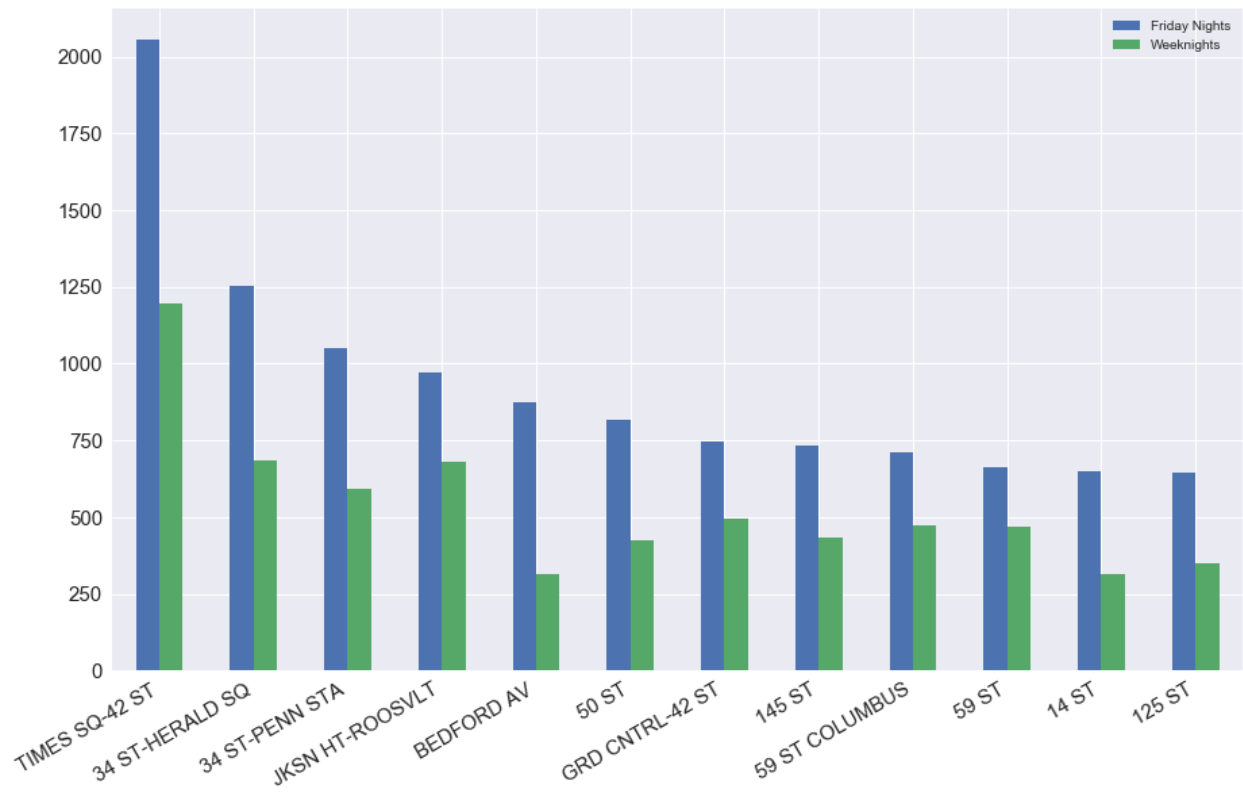
Most trafficked stations Saturday nights

### Saturday night traffic - top 12 stations

Saturday late-night night vs weekday late-nights

Next we combined the filtered data to include data on crime statistics from "http://www1.nyc.gov/site/nypd/stats/crime-statistics/borough-and-precinct-crime-stats.page" for the precincts in which the Top 10 Trafficked Subway Stations were located.

As may be intuitive, there was a relatively high correlation between the total traffic and levels of crime rates.

Top 10 Trafficked Station Traffic and Crime Data
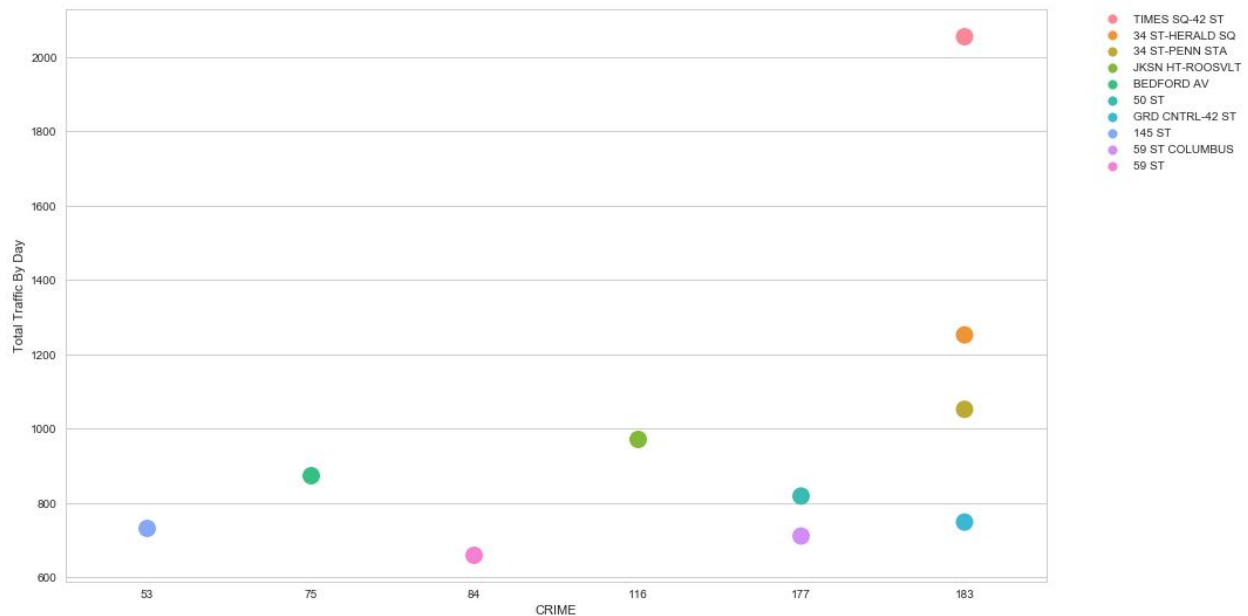
Conclusions

The top three stations fall into Precinct 14 (Midtown North) and consistently have a high rate of traffic regardless of time of day. These should be given high priority as per the large volume and high crime incidents. Bedford Ave stands out against the rest as having the largest shift from average weeknight traffic to weekend-night traffic. For this reason, it should be considered a good candidate for increased police monitoring on weekend nights. Others that show a strong increase in weekend night traffic are 145 ST, Jackson Hts - Roosevelt Av, 50 ST. From the data we have, the increase in staffing should be prioritized as follows:

Midtown North stations - Times Square, 34th ST Herald SQ, 34th St Penn Station

- Bedford Ave station
- 145 ST
- Jackson Roosevelt
- 50th St

- Grand Central
- 59th ST - Columbus
- 59th St

Furthermore, The department should prioritize allocating more resources to the following stations based on the weekend day:

On FRIDAYS: Times Square–42nd Street, Jackson Heights–Roosevelt, Bedford Ave, 145th St, 14th St, and 125th St

And on SATURDAYS: Times Square–42nd Street, Bedford Ave, Jackson Heights–Roosevelt, Grand Central–42nd Street, Flushing–Main Street, and Atlantic Avenue–Barclays Center

Future Tasks and Next Steps

This initial analysis is only the beginning of what can be learned by digging further into subway and crime data.   As next steps we propose that NYPD provide us with data describing time and location of crimes taking place near specific subway stations or even turnstiles so that we can more accurately target the staff requirements for those areas. We would also suggest looking for other areas and times that show a high increase in traffic away from the average.