Parking Violations In New York City

Group no:- 09

Group members:-

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Abstract :

New York city is one of the biggest metropolis in the world. There are a lot of parking violations. We are trying to analyze the parking violations and finding the trends in the violations according to time, area, and other parameters. We are using the Parking Violation for Fiscal Year 2018' dataset which we pulled from data.ny.gov. We are also using another dataset, 'Open Parking Violations' which contains data on fine amounts. So we can analyze different parameters based on fine amounts. We are using different visualizations to increase data interpretability and to confirm some obvious trends. Our group analyzed the parking violations data provided by the City of New York in an effort to prove or disprove that claim.

Introduction:

With a population of more than eight million New York City is the largest and one of the most densely populated cities in the United States. Per the United States Census Bureau in 2010 New York City's Manhattan borough had a density of around 70,000 people per square mile! Space comes at a premium, and that statement holds even truer for parking. These factors motivated us to analyze New York City's parking data. We want to play with the data to get various outcomes out of parking violations in the New York City and make some conclusions from the results we get.

Dataset description:

We are using two datasets here both are pulled out from data.ny.gov.

Master Dataset: Parking Violations Issued - Fiscal Year 2018

Link : <https://data.cityofnewyork.us/City-Government/Parking-Violations-Issued-Fiscal-Year-2018/pvqr-7yc4>

Rows: 3.88 Million; Columns: 43

This dataset contains some columns for area description where parking violation has been occurred. Also it contains unique summons number for every violation. It also describes day on which the particular violation is occurred, type of violation and some brief information about the person or vehicle which violated the rule.

Supporting Dataset: Open Parking and Camera Violations

Link: https://data.cityofnewyork.us/City-Government/Open-Parking-and-Camera-Violations/nc67-uf89

Rows: 21.4 Million; Columns: 19

Columns of interest: Fine Amount, Fine Penalty

This dataset contains again unique summons numbers, various types and fines for each violation and the nature of the violations which is can head us to numerous analysis methods.

Data modeling:

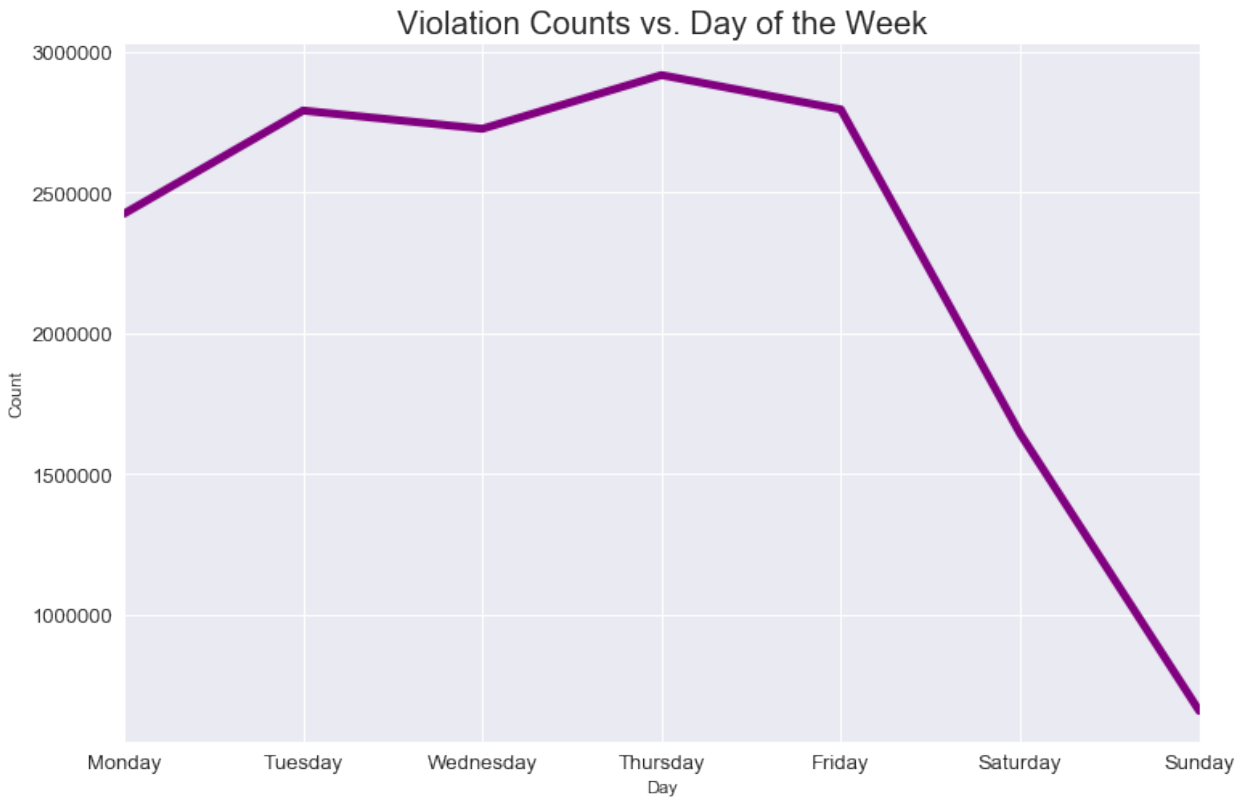
Our primary dataset contained 43 columns. All of them were not the relevant or useful for us for the analysis. Also some of the columns contained most of the NA values. These columns would have added discrepancy in our analysis. So removed such columns from the dataset. Now our updated clean data contains 23 relevant columns. All columns are used for the analysis in this project.

Some of the information which we wanted to analyze is not present present in our primary dataset. That is why, we are using a supportive dataset which contains fine amount and nature of the violation. The supporting dataset which we are using here contains data from 2006 till present. If we continue using the same dataset, it would have been fine, but run-time complexity would have been much greater. That is why, we chopped the data for only 2 years (Jan 2016- Present). The sliced dataset contains almost 4 million rows.

The dataset was available in csv format ad was imported into MySQL database. The advantages of using database over pandas dataframe is the low complexity of the queries and the time taken by the database queries is very small as compared to dataframe.

Now, summons number is the common column in the both dataset. (Plate Id is also there, but its not unique for each violation). So, we are joining these two tables using Join Query in the MySQL.

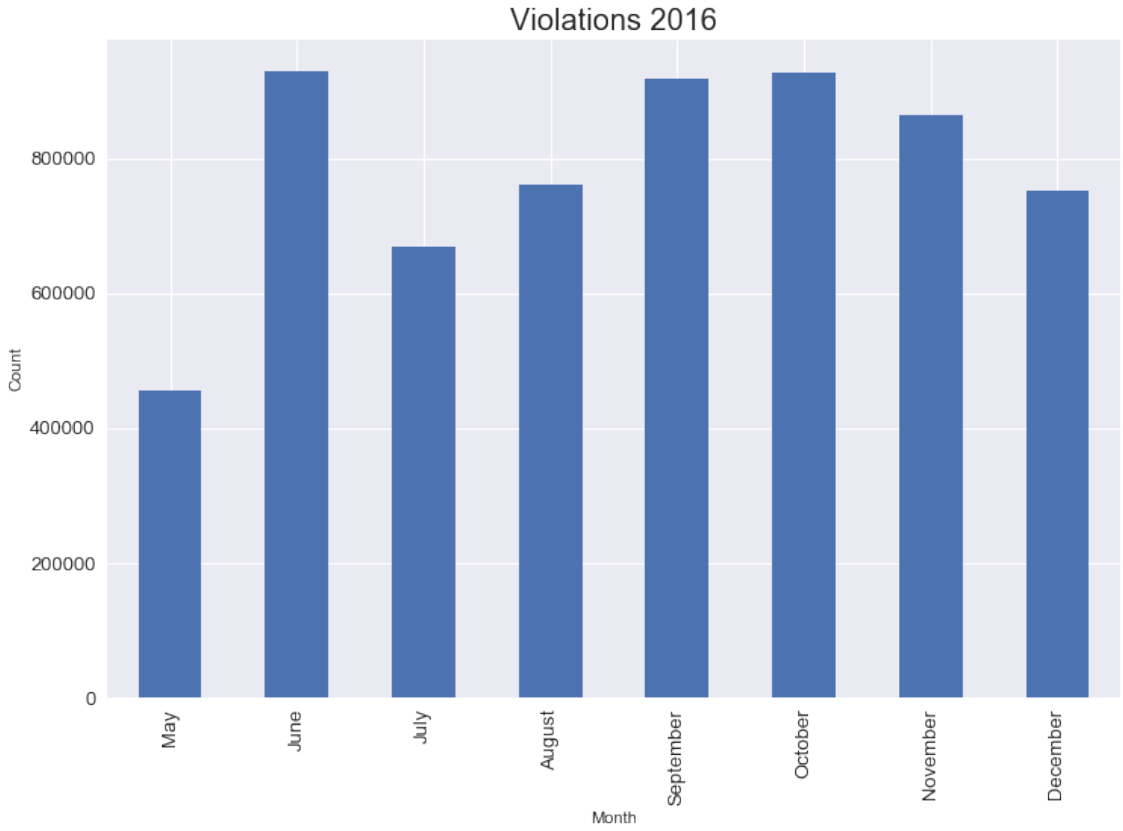
Analysis:

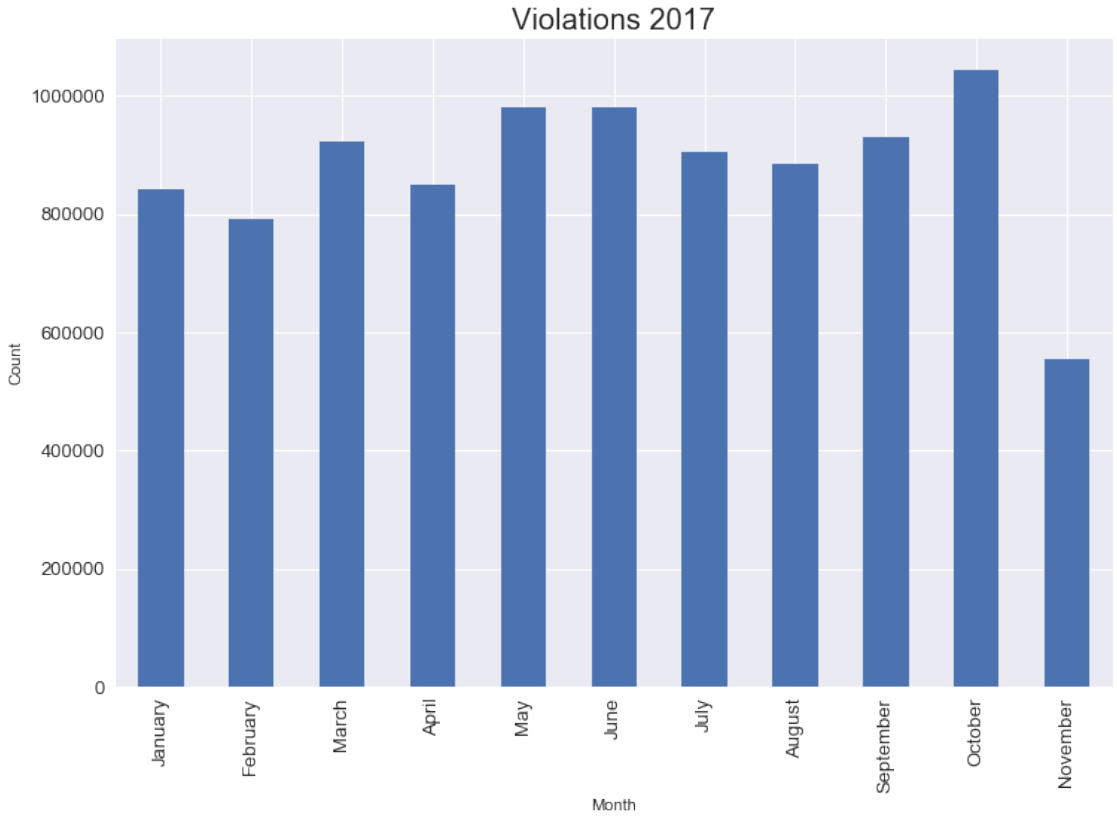


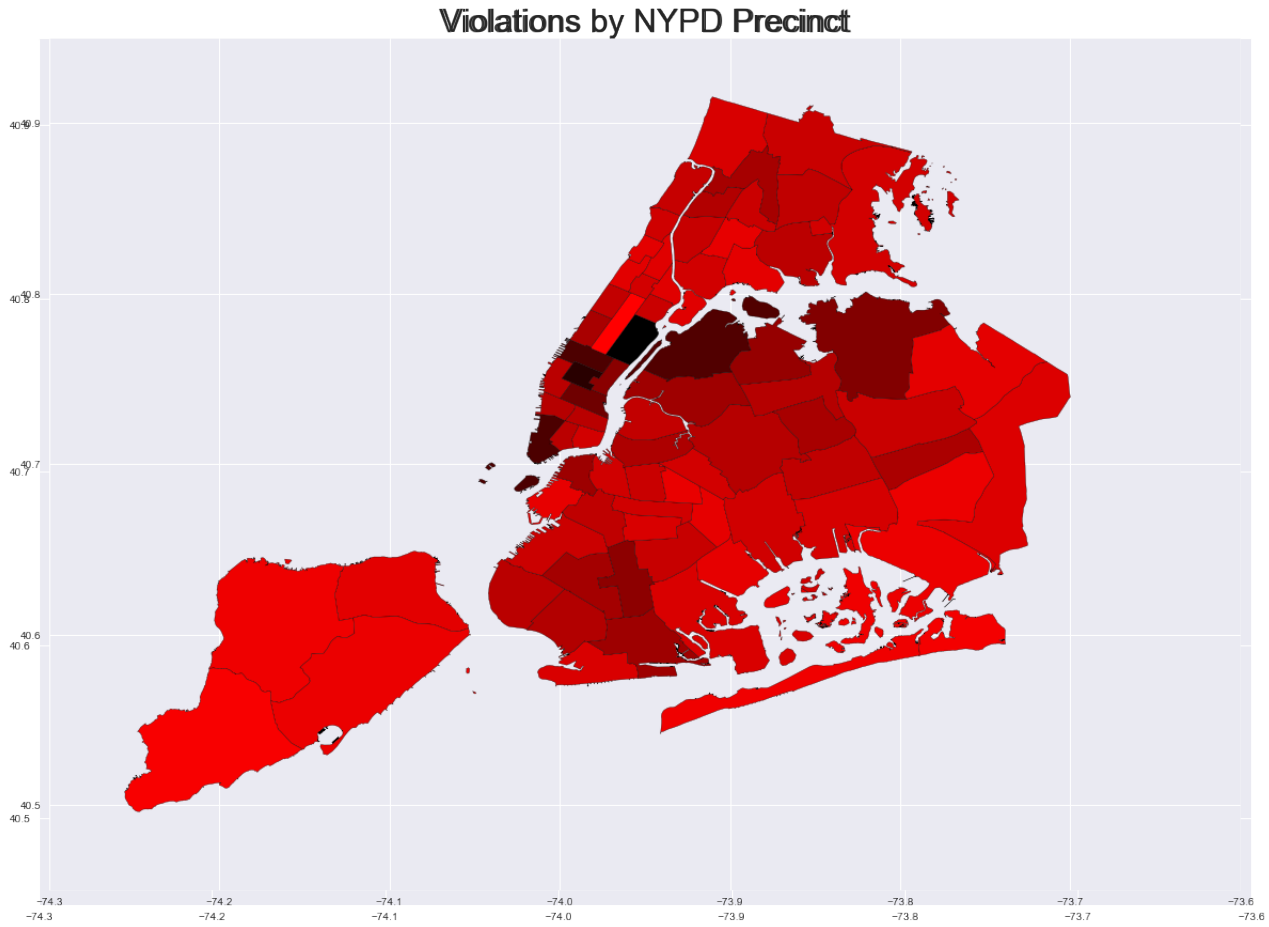
1) Analysis of violations for days of the week for a year:

The first metrics we wanted to visualize were the number of violations broken down by day of the week and violations broken down by month. The plots we generated from these are shown below. It can be seen the most tickets were distributed during Weekdays: Monday through Friday. This intuitively makes sense since with work hours between 8AM – 5PM for most New Yorkers legal street parking becomes relatively scarce, ripe for New Yorkers and visitors in a hurry parking illegally. Saturdays accounted for fewer violations than the weekdays. Sundays accounted for the absolute least number of parking tickets of all the days. Those counts did not surprise us however, our counts in our monthly plots did. We noticed the most parking Violations occurred in June, September, and October in 2016, and the least violations during this May – December time period occurred in July. We were surprised one of the highest violation count months occurred after one of the least. We

also would have expected a noticeable decline during the winter months, but looking at the 2016 and 2017 data, we did not see a significant decrease that we would have otherwise expected due to the impact of weather on parking enforcement operations.

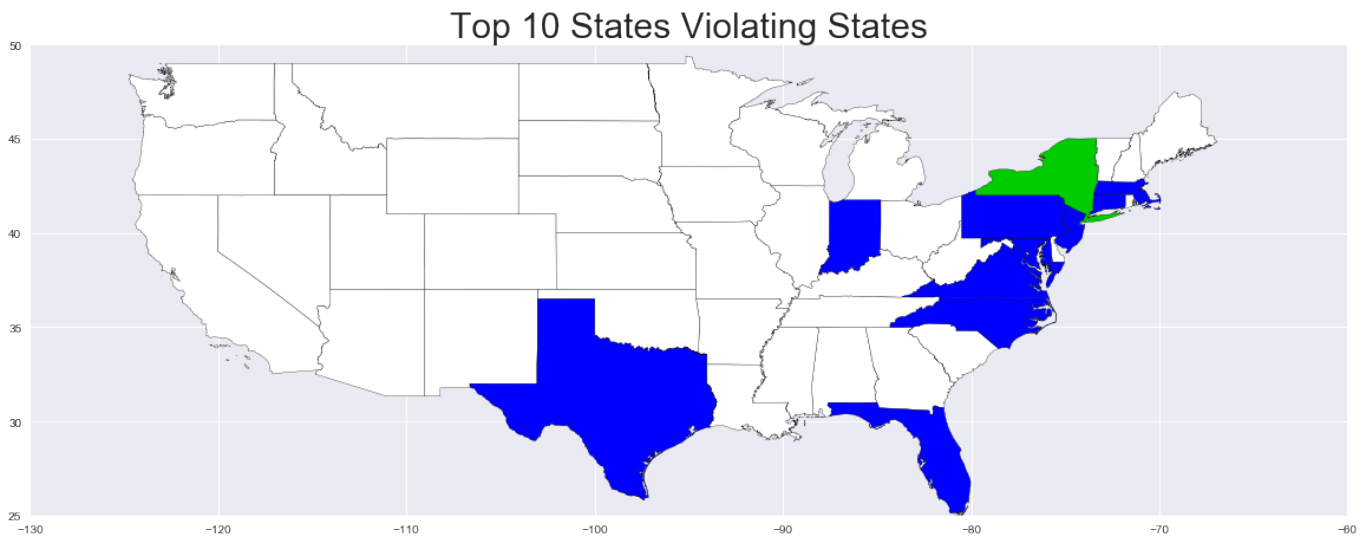




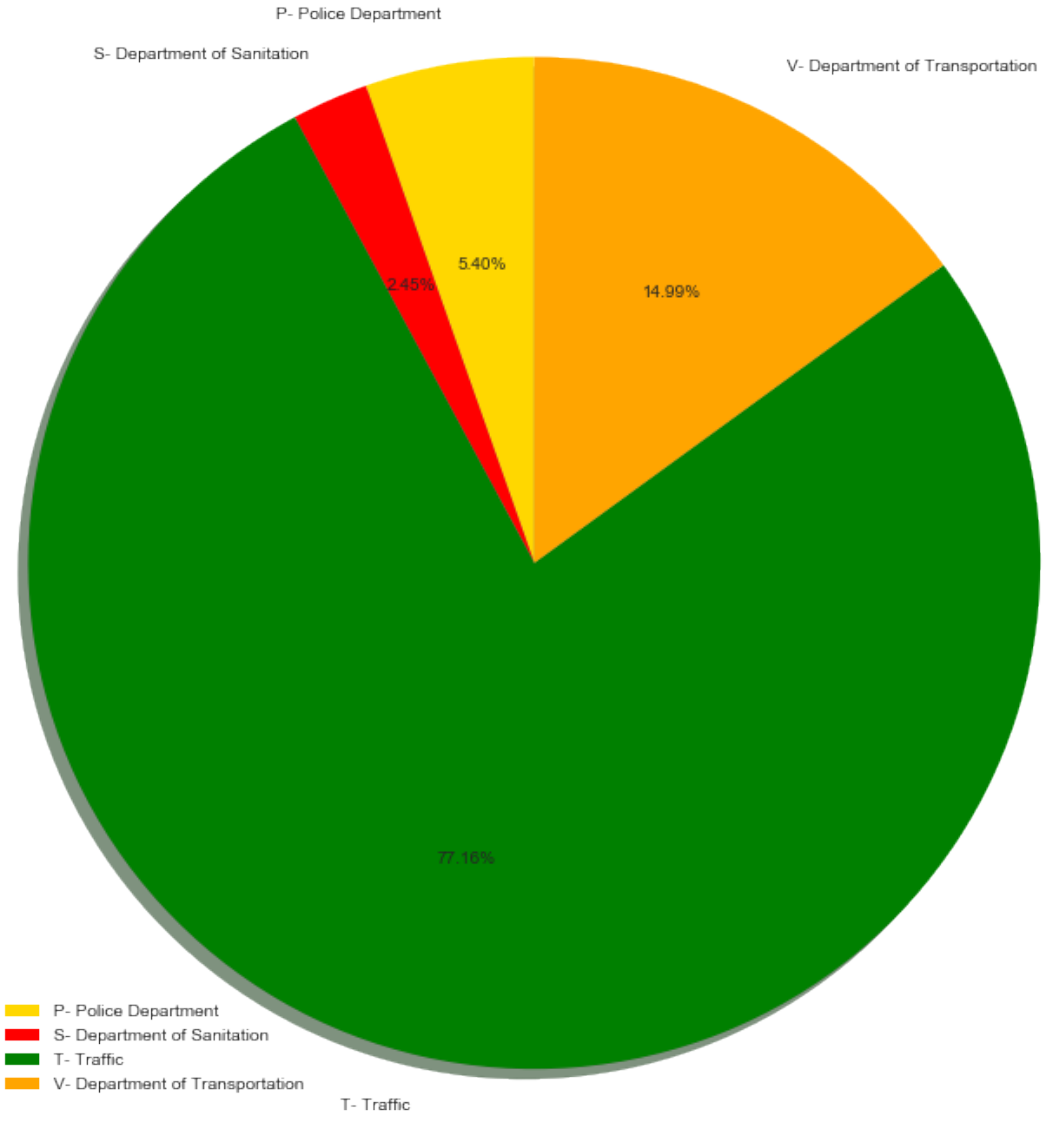


2) Parking Violation for the boroughs:

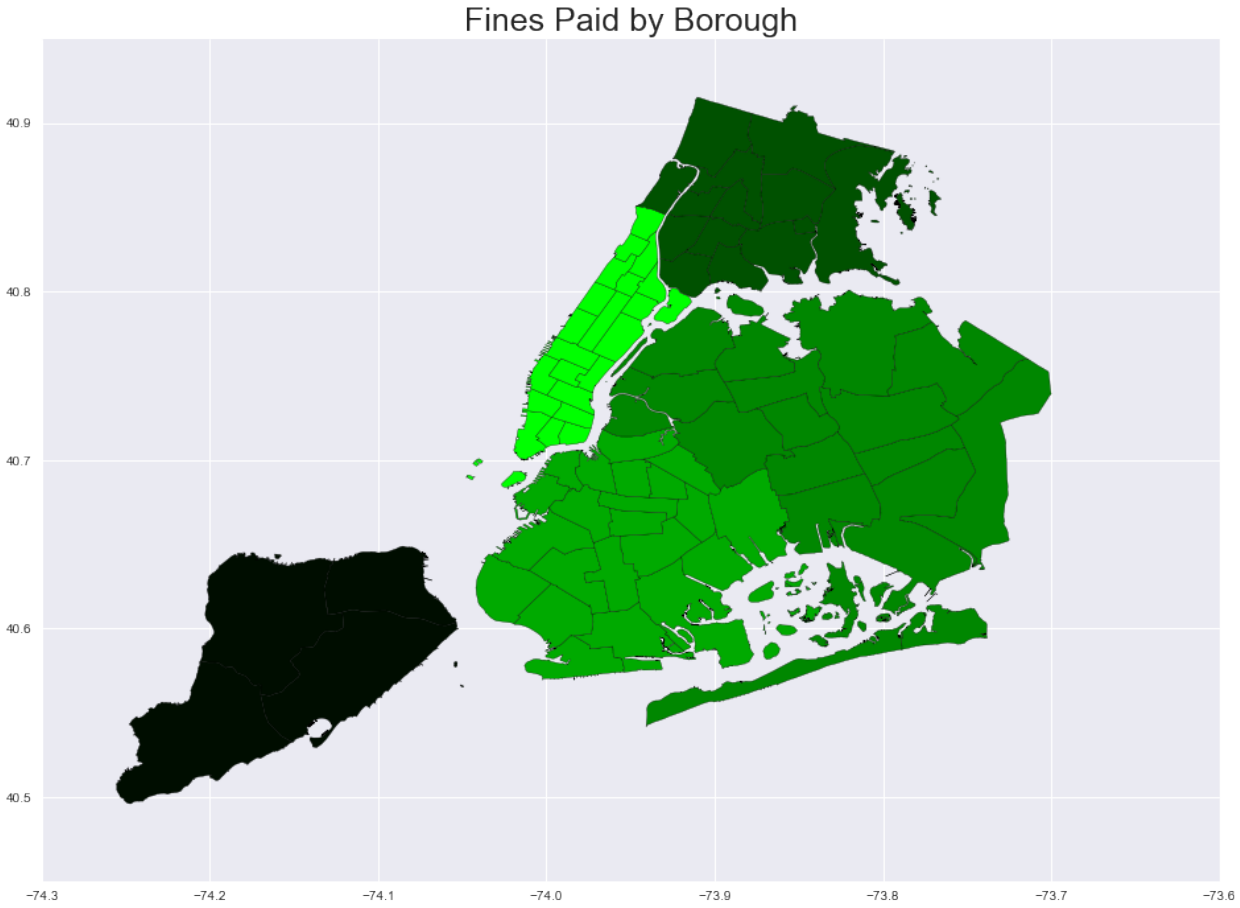
To get a visual feel of our data with respect to each borough, we obtained a Basemap file of the five boroughs and plotted two metrics: the number of violations by NYPD precinct and the average revenue by borough. While there were a lot of parking violations throughout the city, there was a majority in the borough of Manhattan given that it houses the highest number of precincts in NYC. It is plotted as a solid black precinct. With this Basemap file, we also plotted the total revenue from violations grouped by each borough. Again, Manhattan had a solid lead in comparison to the other four boroughs with about 443 million in total fines issued. One possible reason for this trend occurring could be the fact that Manhattan is the financial hub of NYC, thus leaving very few legal parking spots. A second reason as to why there is such a huge difference between the total fines collected from Manhattan and the other boroughs can be attributed to the Average Fine in each Borough. It is shown in the table that the Average fine in Manhattan is $88 whereas in other boroughs it is about $65.


Top 10 States Violating States
50
45
40
35
30
25
−130
−120
−110
−100
−90
−80
−70
−60

3)

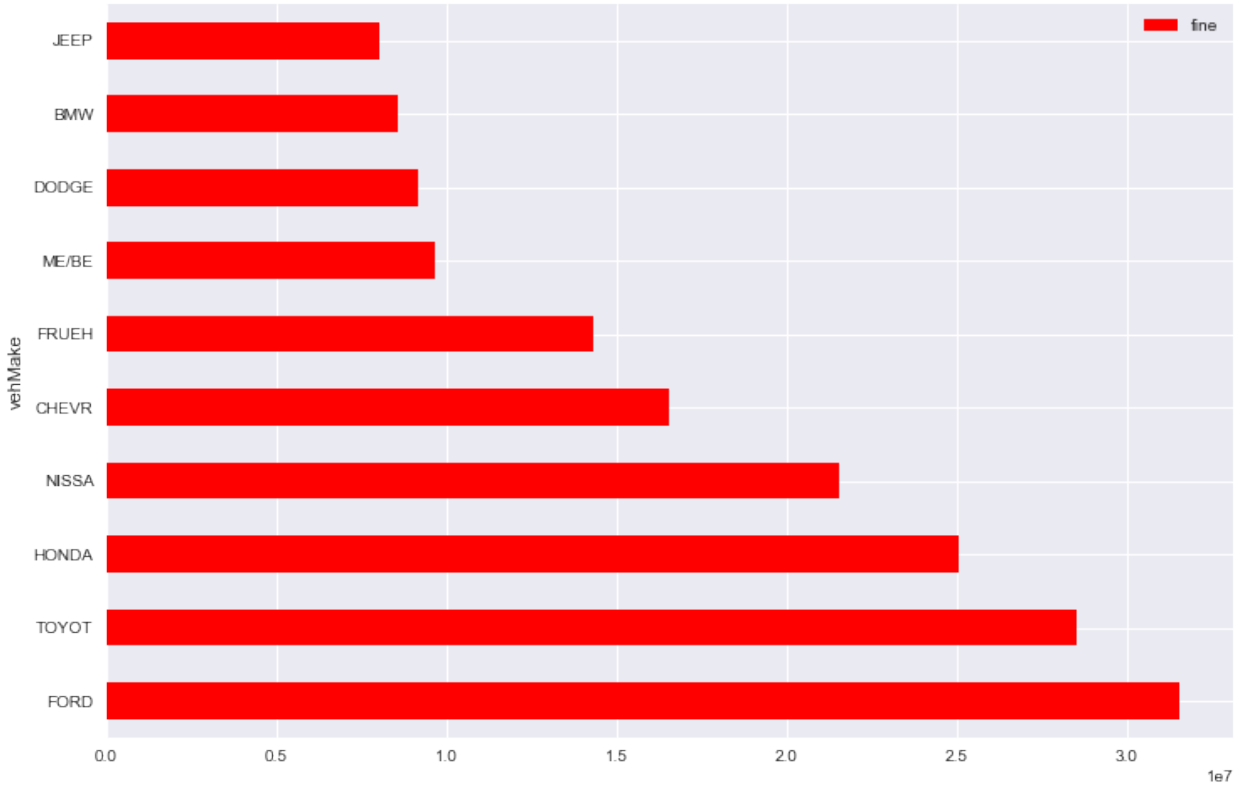

P- Police Department
S- Department of Sanitation
V- Department of Transportation
5.40%
2.45%
14.99%
77.16%
P- Police Department
S- Department of Sanitation
T- Traffic
V- Department of Transportation
T- Traffic

We were curious which agency was responsible for handing out the most parking tickets in New York City. We visualized this with a pie chart shown below. New York City's Traffic Department was responsible a sizeable fraction of tickets handed out, accounting for a massive 77% of tickets handed out. That was followed next by the Department of Transportation with 15%, the NYPD at more than 5% and the Department of Sanitation responsible for about 2.5% of tickets handed out.



From a dataset tabulating 16 million violations, we were naturally interested in knowing which violations were catching New Yorkers the most. The most common violation with more than 2.3 million tickets issued were Street Cleaning parking tickets. Most roads in the city have a specified time, usually about a two-hour block; in which parking is prohibited so street cleaners can clean that section of the road. These tickets are issued by the sanitation department and we can see a clear disagreement between the most prevalent violations and the share of tickets collected per department. This is due to the fact that the sanitation department only hands out penalties for violating street cleaning rules whereas the Traffic Department has numerous types of violations for which tickets can be handed out, which

accounts for the massive 77% of the total tickets issued in New York City. The next common violation came not from paid city officials, but from school zone speeding cameras! They were responsible for more than two million traffic tickets. The third most common violation was failing to display proof of payment for parking, and the fourth and fifth most common violations were for not obeying ‘No Standing’ and ‘No Parking’ orders, respectively.



Our final analysis was geared toward finding out which model cars obtained the most number of violations. Our results showed Ford cars were responsible for the most violations with just shy of half a million violations for those modeled vehicles. Toyota followed second with 427,000 violations. The next most popular cars for violations were Honda, Nissan, and Chevrolet branded automobiles with 381,000, 327,000, and 253,000 violations respectively. The distribution of cars sold was outside the scope of our project, so we do not know whether these results fall in line with the distribution of car brands sold in New York City or drivers behind the wheel of certain makes were more likely to get a violation.

Given further study on this topic, our team had several theories we would attempt to test. First, we would be interested in knowing the relationship between the weather on an hour-by-hour basis and the number of violations. It would be informative to know whether more violations were

issued during inclement weather such as rain or snow vs. similar times during clear weather. We predict the number of violations will go down due to the temporarily increased difficulty in enforcing parking violations. Our second theory we would like to test is whether high profile events could be attributed to parking violations in an area. For instance, did violations around Citi Field, the home of the New York Yankees, increase during a Yankees game? Would violations around Madison Square Garden increase due to a Coldplay concert? Obtaining more data along these lines would enable us to make better predictions on the number of violations occurring around the city depending on what high-profile events are going on.

The table below show number of parking violation for each type of violations per month. As we have maximum amount of data for 6 months only (May-Nov), we are analyzing for only those months. We are trying to find trend between number of violations and crime type. If particular crime type is dominant in the particular month.

Month	V	count(*)
5	DOUBLE PARKING	149
5	EXPIRED MUNI METER	3
5	FAIL TO DSPLY MUNI METER RECPT	10
5	FIRE HYDRANT	102
5	INSP. STICKER-EXPIRED/MISSING	10
5	NO PARKING-DAY/TIME LIMITS	120
5	NO PARKING-STREET CLEANING	28
5	NO STANDING-DAY/TIME LIMITS	241
6	DOUBLE PARKING	10838
6	EXPIRED MUNI METER	5483
6	FAIL TO DSPLY MUNI METER RECPT	11276
6	FAILURE TO STOP AT RED LIGHT	22729
6	FIRE HYDRANT	8521
6	INSP. STICKER-EXPIRED/MISSING	3208
6	NO PARKING-DAY/TIME LIMITS	10357
6	NO PARKING-STREET CLEANING	26485
6	NO STANDING-DAY/TIME LIMITS	13998

Month	V	count(*)
6	PHTO SCHOOL ZN SPEED VIOLATION	6447
7	DOUBLE PARKING	35283
7	EXPIRED MUNI METER	40566
7	FAIL TO DSPLY MUNI METER RECPT	90755
7	FAILURE TO STOP AT RED LIGHT	52695
7	FIRE HYDRANT	46417
7	INSP. STICKER-EXPIRED/MISSING	49800
7	NO PARKING-DAY/TIME LIMITS	64046
7	NO PARKING-STREET CLEANING	154398
7	NO STANDING-DAY/TIME LIMITS	81149
7	PHTO SCHOOL ZN SPEED VIOLATION	63704
8	DOUBLE PARKING	36588
8	EXPIRED MUNI METER	41190
8	FAIL TO DSPLY MUNI METER RECPT	95029
8	FAILURE TO STOP AT RED LIGHT	52380
8	FIRE HYDRANT	44098
8	INSP. STICKER-EXPIRED/MISSING	47060
8	NO PARKING-DAY/TIME LIMITS	63704
8	NO PARKING-STREET CLEANING	162979
8	NO STANDING-DAY/TIME LIMITS	81299
8	PHTO SCHOOL ZN SPEED VIOLATION	31987
9	DOUBLE PARKING	35338
9	EXPIRED MUNI METER	40134
9	FAIL TO DSPLY MUNI METER RECPT	93951
9	FAILURE TO STOP AT RED LIGHT	49904
9	FIRE HYDRANT	48741
9	INSP. STICKER-EXPIRED/MISSING	49451
9	NO PARKING-DAY/TIME LIMITS	63596
9	NO PARKING-STREET CLEANING	126330
9	NO STANDING-DAY/TIME LIMITS	83023

Month		V	count(*)
9	PHTO SCHOOL ZN SPEED VIOLATION	115329	
10	DOUBLE PARKING	28431	
10	EXPIRED MUNI METER	38616	
10	FAIL TO DSPLY MUNI METER RECPT	89547	
10	FAILURE TO STOP AT RED LIGHT	24448	
10	FIRE HYDRANT	42962	
10	INSP. STICKER-EXPIRED/MISSING	48189	
10	NO PARKING-DAY/TIME LIMITS	59444	
10	NO PARKING-STREET CLEANING	83439	
10	NO STANDING-DAY/TIME LIMITS	75748	
10	PHTO SCHOOL ZN SPEED VIOLATION	114890	

References:

- US census and NYC statistics from Wikipedia
- Parking Violations Issued for Fiscal Year 2018: https://data.cityofnewyork.us/City-Government/Parking-Violations-Issued-Fiscal-Year-2018/pvqr-7yc4
- Open Parking and Camera Violations: https://data.cityofnewyork.us/City-Government/Open-Parking-and-Camera-Violations/nc67-uf89
- General Statistics about NYC: data.ny.gov