

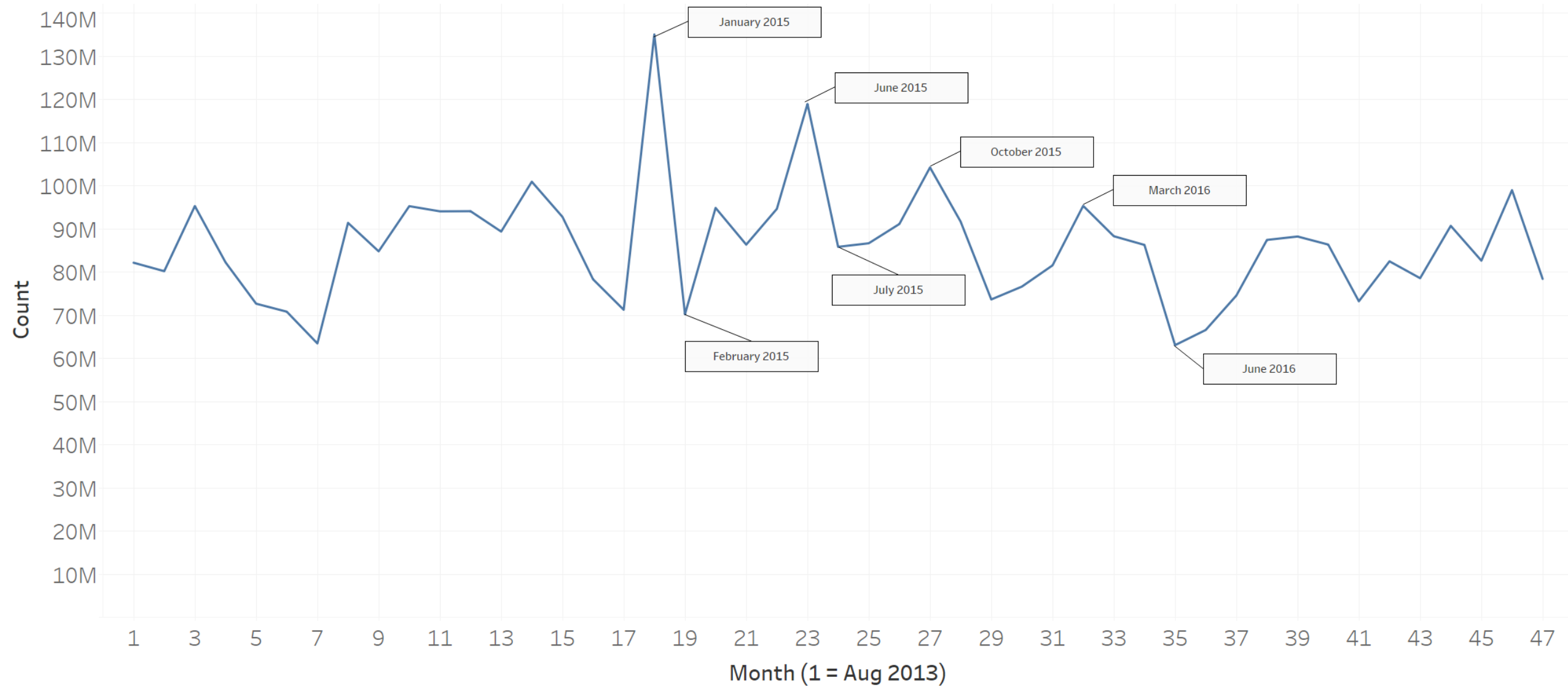
An aerial photograph of the New York City skyline, featuring numerous skyscrapers and buildings. The Empire State Building is prominent in the center. The text "Parking Violations in NYC" is overlaid in a large, white, serif font across the middle of the image.

Parking Violations in NYC

NYC Parking Citation Counts

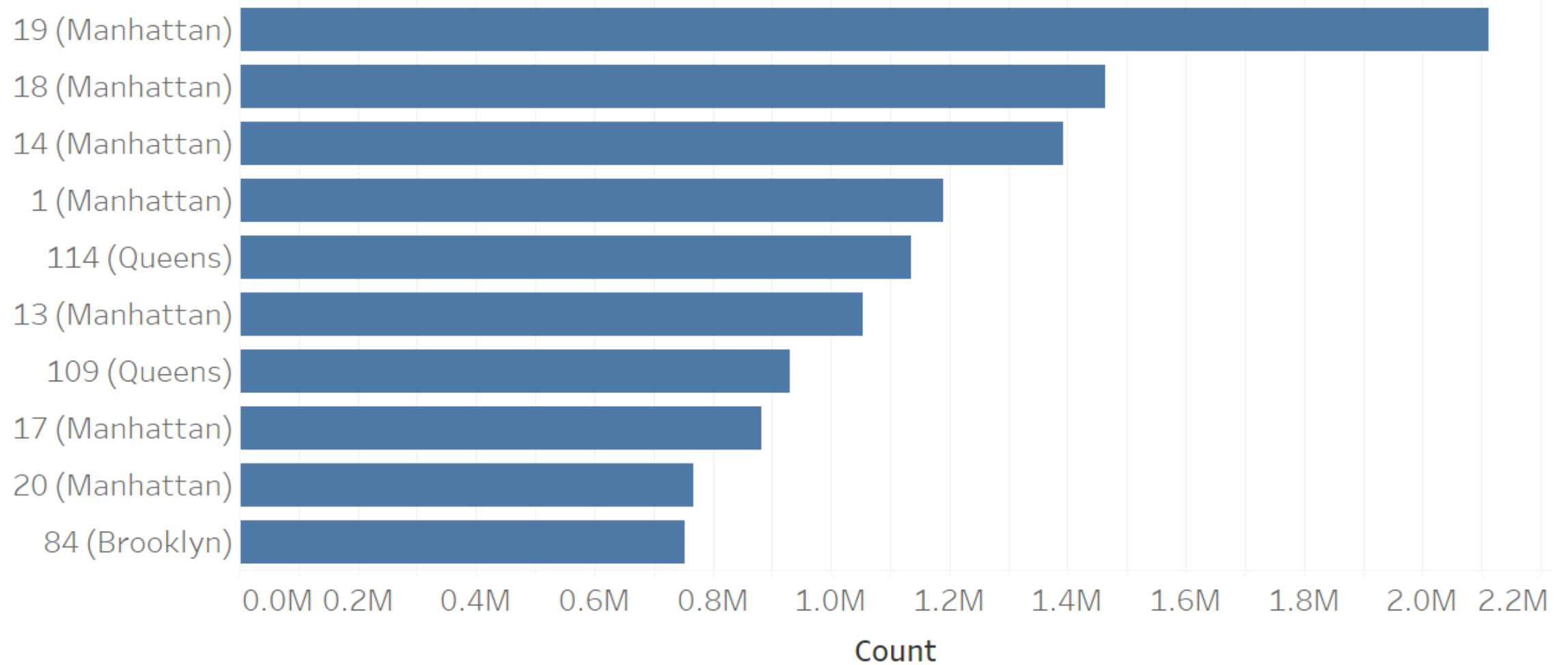
August 2013 - June 2017

n = 42,150,378



Top 10 Violation Precincts

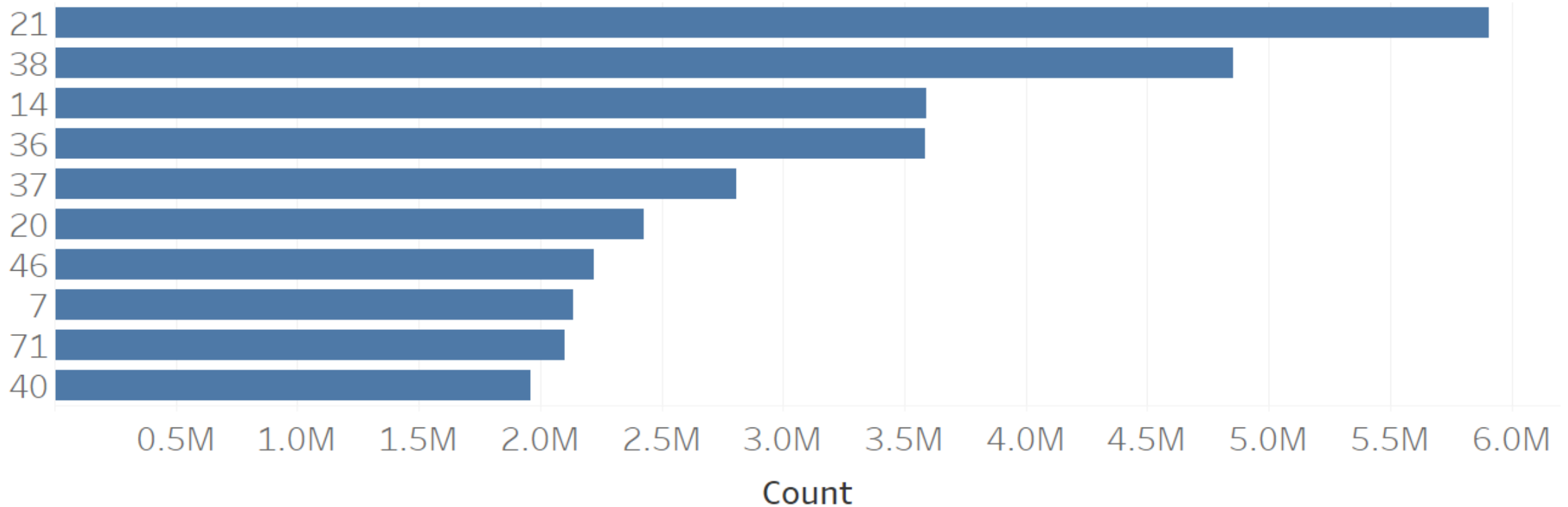
August 2013 - June 2017



Violation Precinct Monthly Counts 2015

	January	February	June	July	October
19 (Manhattan)	74,108	41,748	59,203	47,322	53,951
18 (Manhattan)	51,319	28,039	40,312	31,901	33,680
14 (Manhattan)	48,140	30,227	40,726	31,887	32,008
1 (Manhattan)	40,142	22,826	31,601	26,280	27,797
114 (Queens)	38,031	20,610	32,787	26,235	28,136
13 (Manhattan)	33,652	19,787	32,688	23,360	26,467
109 (Queens)	29,451	17,146	24,635	19,577	22,628
17 (Manhattan)	31,864	17,286	25,243	20,212	18,673
20 (Manhattan)	30,928	16,174	21,026	16,344	20,303
84 (Brooklyn)	27,015	15,505	21,776	16,581	18,854

Top 10 Violation Codes August 2013 - June 2017



21: Street Cleaning

38: Parking Meter: Parking in excess of the allowed time

14: General No Standing

36: Speeding School Zone

37: Parking Meter: Fail to show receipt or tag in windshield

20: General No Parking

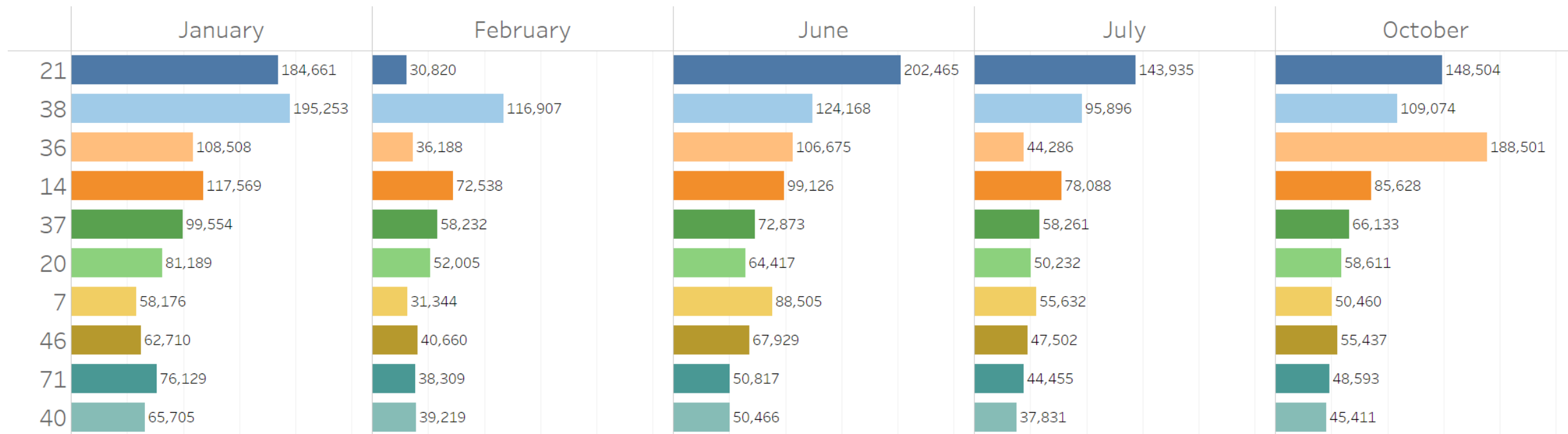
46: Standing/parking roadway stopped vehicle/curb

7: Vehicles photo'd going through red light

71: Standing/parking w/out showing NY inspection sticker

40: Stopping/standing/parking < 15 ft. fire hydrant

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Association Mining

Summons_ID	Type	Color	items
1131623812	TAXI	GRAY	[TAXI,GRAY]
1113471517	SDN	BLACK	[SDN,BLACK]
1118119952	SDN	BLACK	[SDN,BLACK]

- Minimum Support = .001
- Minimum Confidence = .01

Association Mining

Antecedent	Consequent	Confidence	Lift
DELV	BRN	.0557	5.4519
BRN	DELV	0.4835	5.4519
UTIL	WHITE	0.3272	1.9922
SUBN	BLACK	0.1382	1.3405
BLACK	SUBN	0.4056	1.3405
GREEN	SUBN	0.3905	1.2906
SUBN	GREEN	0.0273	1.2907

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Violation Code Prediction

- **Pre-Process Data:**

- Get the first 10,000 rows of 2014 violation data
- Filter the data, only include the top 2 violation code data
 - Violation Code: It is about 100 violation code but top 10 violation code count for 70% of tickets.
 - 38: Parking Meter- Parking in excess of the allowed time
 - 21: Street Cleaning

Categorical Data

- **Registration State**

NY	73%
NJ	8%

- **Plate Type**

PAS	70%
COM	21%

- **Issuing Agency: P and S issued the 80% tickets.**

Registration_State	Plate_Type	Vehicle_Body_Type	Issuing_Agency
NY	PAS	SDN	P
NJ	COM	SUBN	S
Others	Others	VAN	Others
		DELV	
		Others	

Violation Code Prediction

Random Forest Algorithm

- Split the dataset to training data set and testing data set

```
df_list <- randomSplit(violation_df, c(7,3), 2)
```

```
violation_training_df <- df_list[[1]]
```

```
violation_testing_df <- df_list[[2]]
```

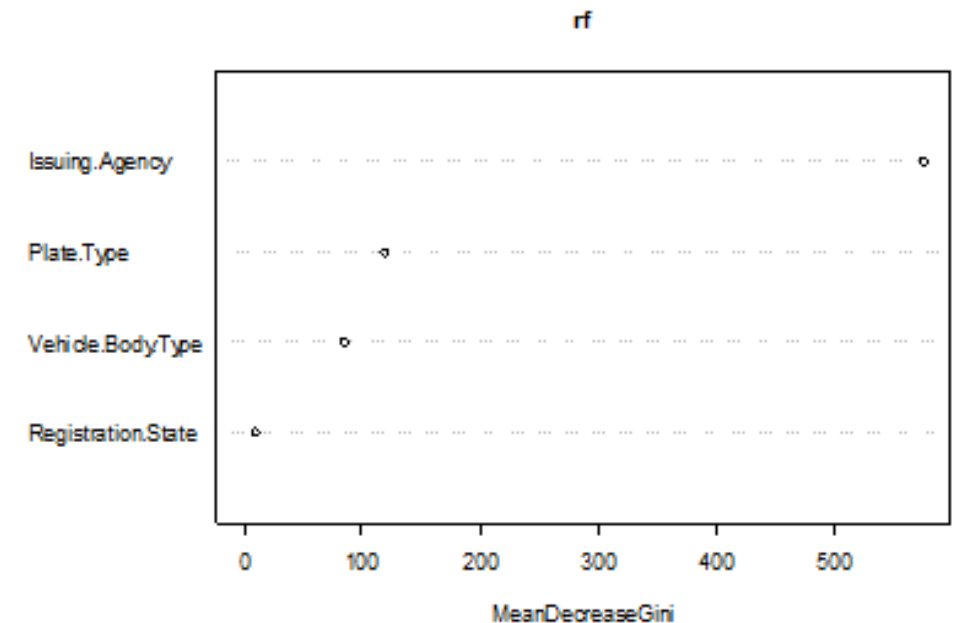
- Features:**

- Registration_State + Plate_Type + Vehicle_Body_Type + Issuing_Agency

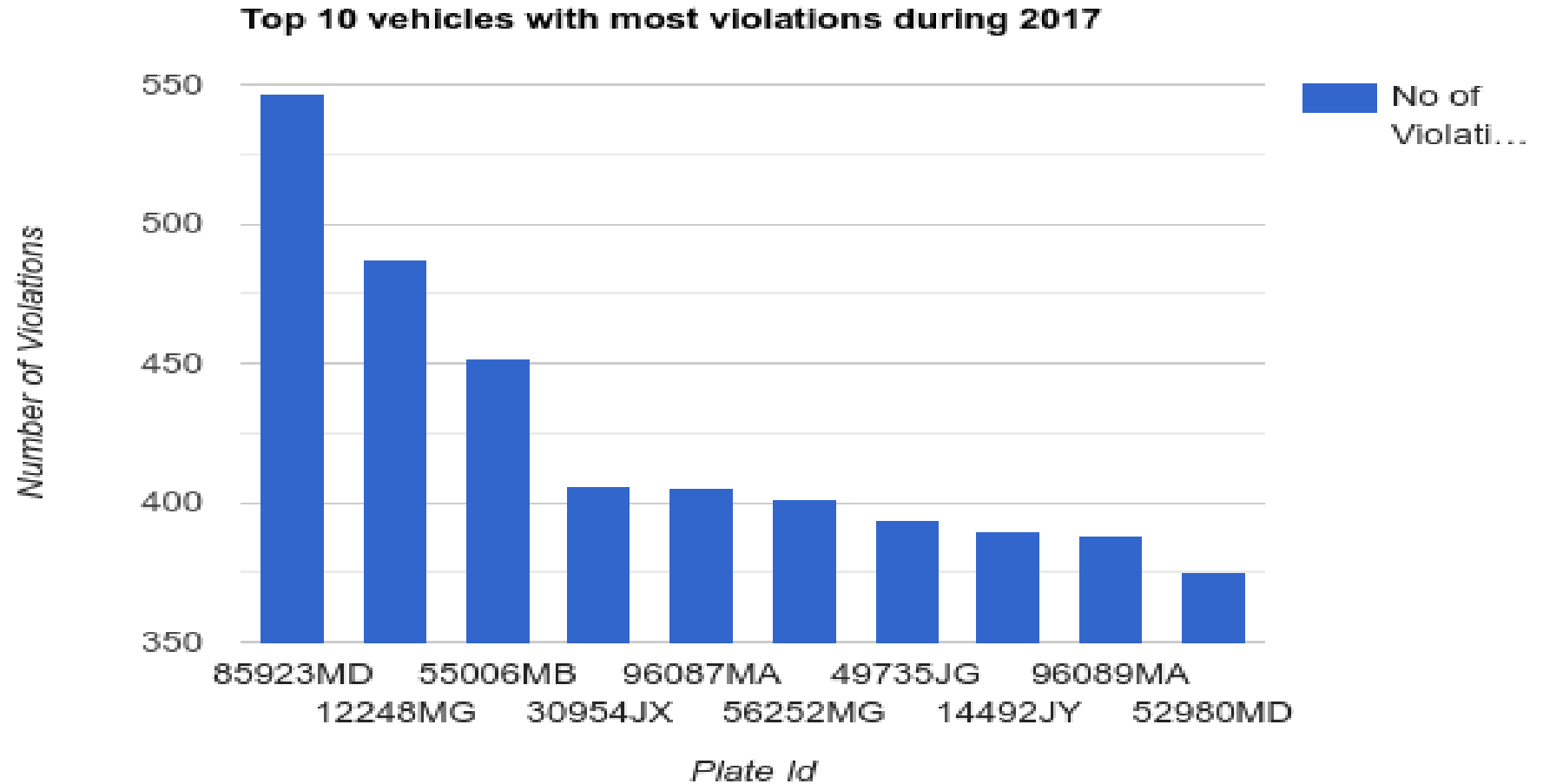
- Measures**

- Accuracy = 0.9018405 ; Precision = 0.9673469; Recall = 0.8555956

Variables Importance Plot



Top 10 Vehicles with most violations in 2017



- Some of these vehicles could be food or grocery delivery vehicles which could belong to Dominos, Pizza Hut or etc.
- Couple of tickets a day might be normal for these guys as they strive to deliver goods on time.
- One of the most common violation that this guy with plate id '85923MD' committed is "Standing or parking on the roadway side of a vehicle stopped, standing or parked at the curb"

Predicting violations
due to "Parking during
Street Sweeping
time" using Random
Forest

- Training dataset: 2016
Parking Violations
- Test dataset: 2017 Parking
Violations
- Precision = 0.8398484
- Recall = 0.5461105

summons_number street_code3	violation_location rawPrediction	issuer_code probability	violation_precinct prediction	violation_code violation_in_front_of_or_opposite	s
1413609545	71	960290	71	0.0	F
54930 [14.8406638026338...	[0.74203319013169...	0.0	0.0		
1407740258	106	960979	106	0.0	
40404 [17.1788485274854...	[0.85894242637427...	0.0	0.0		
1416492320	44	905733	44	1.0	F
74260 [18.8450299372093...	[0.94225149686046...	0.0	0.0		
1413656420	73	960758	73	0.0	F
82230 [15.0471147697229...	[0.75235573848614...	0.0	0.0		
1416638830	17	940179	17	0.0	O
10010 [19.2450291131398...	[0.96225145565699...	0.0	0.0		
1419707358	60	589383	60	1.0	O
23030 [1.90856235401961...	[0.09542811770098...	1.0	1.0		
1416527722	45	0	45	0.0	F
11130 [10.9411225180355...	[0.54705612590177...	0.0	0.0		
1418809688	32	958723	32	0.0	O
13510 [18.7774345844962...	[0.93887172922481...	0.0	0.0		
1416140300	49	535013	49	1.0	F
20520 [1.91308127018710...	[0.09565406350935...	1.0	1.0		
1418609274	18	926685	18	0.0	O
0 [19.2641563008996...	[0.96320781504498...	0.0	0.0		
1418138575	62	981230	62	1.0	F
64730 [15.8701759957844...	[0.79350879978922...	0.0	0.0		
1405823926	100	938358	100	0.0	F
15450 [18.3990373421482...	[0.91995186710741...	0.0	0.0		
1400876217	100	539527	100	1.0	F
60820 [5.52580779542544...	[0.27629038977127...	1.0	1.0		
1417599716	24	950441	24	0.0	F
35790 [18.8505526017758...	[0.94252763008879...	0.0	0.0		
1414702700	72	534939	72	0.0	O
8980 [2.22385966479100...	[0.11119298323955...	1.0	1.0		
1408575656	90	350318	90	0.0	
0 [16.6955940990578...	[0.83477970495289...	0.0	0.0		

Violations due to "Parking close to Fire Hydrant"

- Training dataset: 2016
Parking Violations
- Test dataset: 2017 Parking
Violations
- Precision = 0.6139902
- Recall = 0.9629886

summons_number street_code3	violation_location rawPrediction	issuer_code probability	violation_precinct prediction	violation_code	violation_in_front_of_or_opposite	street_code	street_name
1413609545	71	960290	71	1.0	F	54070	
54930 [18.4410514948202...	[0.92205257474101...	0.0					
1407740258	106	960979	106	0.0		0	
40404 [18.4410514948202...	[0.92205257474101...	0.0					
1416492320	44	905733	44	0.0	F	53620	
74260 [18.4410514948202...	[0.92205257474101...	0.0					
1413656420	73	960758	73	1.0	F	59630	
82230 [18.4410514948202...	[0.92205257474101...	0.0					
1416638830	17	940179	17	0.0	O	17650	
10010 [18.4410514948202...	[0.92205257474101...	0.0					
1419707358	60	589383	60	0.0	O	28830	
23030 [18.4410514948202...	[0.92205257474101...	0.0					
1416527722	45	0	45	0.0	F	11620	
11130 [18.4410514948202...	[0.92205257474101...	0.0					
1418809688	32	958723	32	1.0	O	36770	
13510 [18.4410514948202...	[0.92205257474101...	0.0					
1416140300	49	535013	49	0.0	F	9620	
20520 [18.4410514948202...	[0.92205257474101...	0.0					
1418609274	18	926685	18	0.0	O	0	
0 [18.4410514948202...	[0.92205257474101...	0.0					
1418138575	62	981230	62	0.0	F	10430	
64730 [18.4410514948202...	[0.92205257474101...	0.0					
1405823926	100	938358	100	0.0	F	31640	
15450 [18.4410514948202...	[0.92205257474101...	0.0					
1400876217	100	539527	100	0.0	F	33290	
60820 [18.4410514948202...	[0.92205257474101...	0.0					
1417599716	24	950441	24	0.0	F	25690	
35790 [18.4410514948202...	[0.92205257474101...	0.0					
1414702700	72	534939	72	0.0	O	5010	
8980 [18.4410514948202...	[0.92205257474101...	0.0					
1408575656	90	350318	90	0.0		0	