CustomerServiceRequestAnalysis

August 28, 2023

[1]:
```
import pandas as pd

df = pd.read_csv('311_Service_Requests_from_2010_to_Present.csv')
```

[2]:
```
print(df.head())
```

```
   Unique Key            Created Date       Closed Date Agency  \
0    32310363  12/31/2015 11:59:45 PM  01-01-2016 00:55   NYPD
1    32309934  12/31/2015 11:59:44 PM  01-01-2016 01:26   NYPD
2    32309159  12/31/2015 11:59:29 PM  01-01-2016 04:51   NYPD
3    32305098  12/31/2015 11:57:46 PM  01-01-2016 07:43   NYPD
4    32306529  12/31/2015 11:56:58 PM  01-01-2016 03:24   NYPD

                      Agency Name           Complaint Type  \
0  New York City Police Department  Noise - Street/Sidewalk
1  New York City Police Department         Blocked Driveway
2  New York City Police Department         Blocked Driveway
3  New York City Police Department          Illegal Parking
4  New York City Police Department          Illegal Parking

                    Descriptor    Location Type  Incident Zip  \
0              Loud Music/Party  Street/Sidewalk       10034.0
1                     No Access  Street/Sidewalk       11105.0
2                     No Access  Street/Sidewalk       10458.0
3  Commercial Overnight Parking  Street/Sidewalk       10461.0
4              Blocked Sidewalk  Street/Sidewalk       11373.0

        Incident Address  … Bridge Highway Name Bridge Highway Direction  \
0    71 VERMILYEA AVENUE  …                  NaN                      NaN
1        27-07 23 AVENUE  …                  NaN                      NaN
2  2897 VALENTINE AVENUE  …                  NaN                      NaN
3    2940 BAISLEY AVENUE  …                  NaN                      NaN
4          87-14 57 ROAD  …                  NaN                      NaN

  Road Ramp Bridge Highway Segment Garage Lot Name Ferry Direction  \
0                      NaN                   NaN              NaN
1                      NaN                   NaN              NaN
2                      NaN                   NaN              NaN
```

```
3       NaN                    NaN             NaN             NaN
4       NaN                    NaN             NaN             NaN

  Ferry Terminal Name   Latitude  Longitude  \
0                 NaN  40.865682 -73.923501
1                 NaN  40.775945 -73.915094
2                 NaN  40.870325 -73.888525
3                 NaN  40.835994 -73.828379
4                 NaN  40.733060 -73.874170

                                   Location
0   (40.86568153633767, -73.92350095571744)
1  (40.775945312321085, -73.91509393898605)
2  (40.870324522111424, -73.88852464418646)
3   (40.83599404683083, -73.82837939584206)
4  (40.733059618956815, -73.87416975810375)

[5 rows x 53 columns]
```

[3]:
```
print(df.columns)
```

```
Index(['Unique Key', 'Created Date', 'Closed Date', 'Agency', 'Agency Name',
       'Complaint Type', 'Descriptor', 'Location Type', 'Incident Zip',
       'Incident Address', 'Street Name', 'Cross Street 1', 'Cross Street 2',
       'Intersection Street 1', 'Intersection Street 2', 'Address Type',
       'City', 'Landmark', 'Facility Type', 'Status', 'Due Date',
       'Resolution Description', 'Resolution Action Updated Date',
       'Community Board', 'Borough', 'X Coordinate (State Plane)',
       'Y Coordinate (State Plane)', 'Park Facility Name', 'Park Borough',
       'School Name', 'School Number', 'School Region', 'School Code',
       'School Phone Number', 'School Address', 'School City', 'School State',
       'School Zip', 'School Not Found', 'School or Citywide Complaint',
       'Vehicle Type', 'Taxi Company Borough', 'Taxi Pick Up Location',
       'Bridge Highway Name', 'Bridge Highway Direction', 'Road Ramp',
       'Bridge Highway Segment', 'Garage Lot Name', 'Ferry Direction',
       'Ferry Terminal Name', 'Latitude', 'Longitude', 'Location'],
      dtype='object')
```

[4]:
```
print("Shape of the dataset:", df.shape)
```

```
Shape of the dataset: (6618, 53)
```

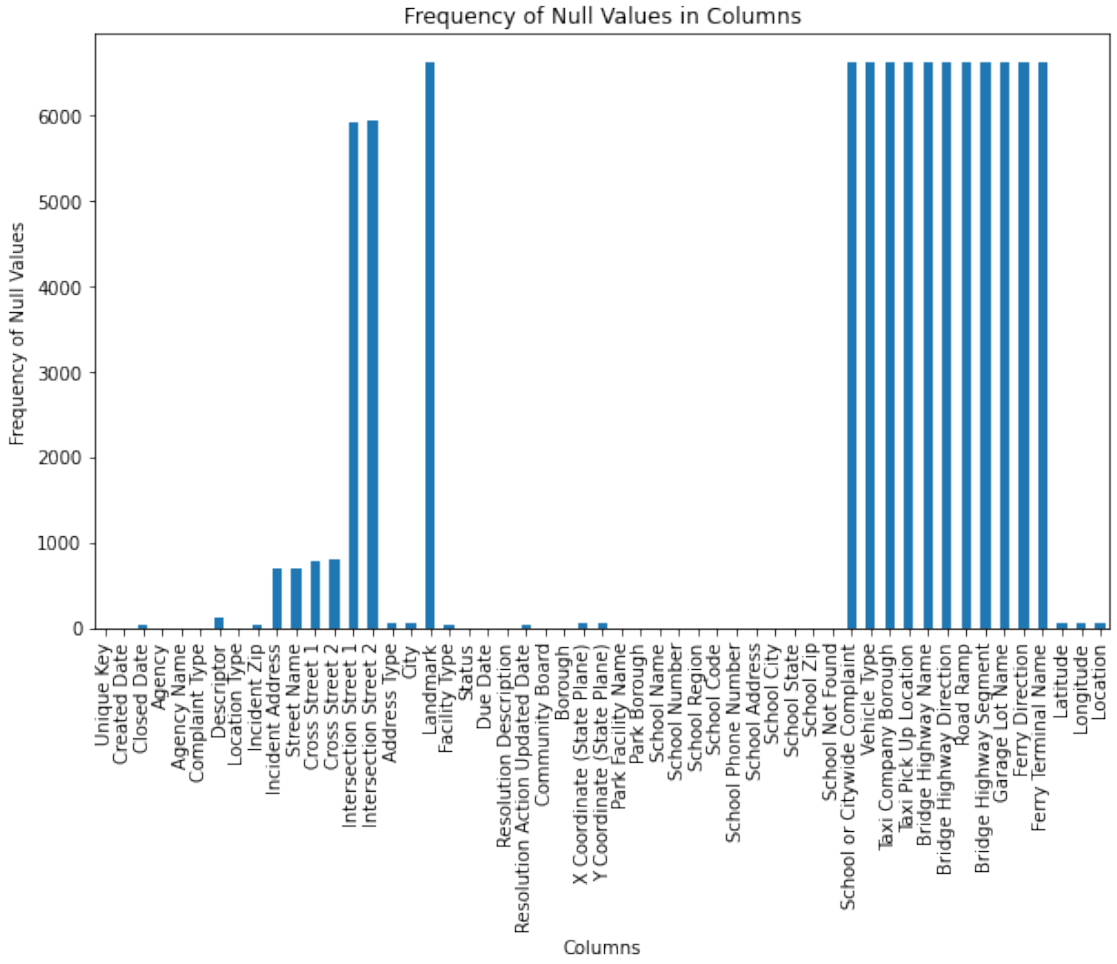
[5]:
```
null_variables = df.columns[df.isnull().any()]
print("Variables with null values:", null_variables)
```

```
Variables with null values: Index(['Closed Date', 'Descriptor', 'Incident Zip',
'Incident Address',
       'Street Name', 'Cross Street 1', 'Cross Street 2',
```

```
       'Intersection Street 1', 'Intersection Street 2', 'Address Type',
       'City', 'Landmark', 'Facility Type', 'Status', 'Due Date',
       'Resolution Description', 'Resolution Action Updated Date',
       'Community Board', 'Borough', 'X Coordinate (State Plane)',
       'Y Coordinate (State Plane)', 'Park Facility Name', 'Park Borough',
       'School Name', 'School Number', 'School Region', 'School Code',
       'School Phone Number', 'School Address', 'School City', 'School State',
       'School Zip', 'School Not Found', 'School or Citywide Complaint',
       'Vehicle Type', 'Taxi Company Borough', 'Taxi Pick Up Location',
       'Bridge Highway Name', 'Bridge Highway Direction', 'Road Ramp',
       'Bridge Highway Segment', 'Garage Lot Name', 'Ferry Direction',
       'Ferry Terminal Name', 'Latitude', 'Longitude', 'Location'],
      dtype='object')
```

[7]:
```python
#Task2
import matplotlib.pyplot as plt

plt.figure(figsize=(10, 6))
df.isnull().sum().plot(kind='bar')
plt.title('Frequency of Null Values in Columns')
plt.xlabel('Columns')
plt.ylabel('Frequency of Null Values')
plt.show()
```

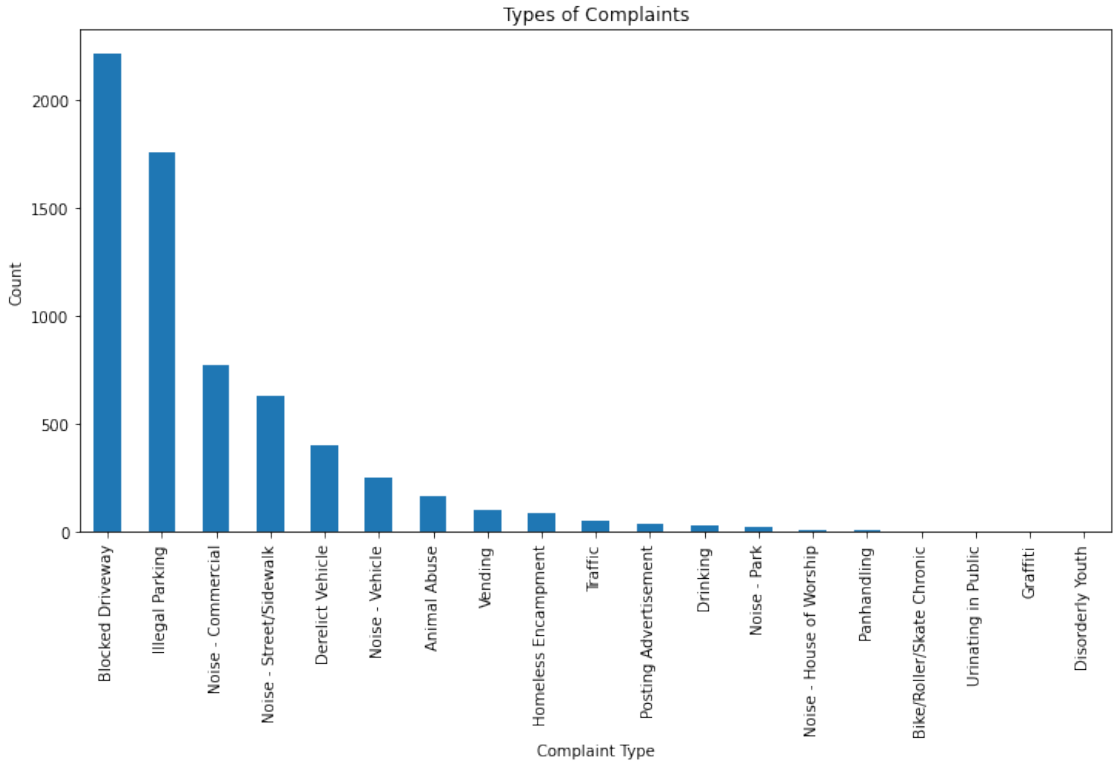


[8]:
```
df = df.dropna(subset=['Closed Date'])
```

[10]:
```
df['Closed Date'] = pd.to_datetime(df['Closed Date'])
df['Created Date'] = pd.to_datetime(df['Created Date'])

df['Time Elapsed'] = (df['Closed Date'] - df['Created Date']).dt.total_seconds()
```

[11]:
```
#Task-3
df['Complaint Type'].value_counts().plot(kind='bar', figsize=(12, 6))
plt.title('Types of Complaints')
plt.xlabel('Complaint Type')
plt.ylabel('Count')
plt.show()
```



[12]:
```
nyc_complaints = df[df['City'] == 'NEW YORK']['Complaint Type'].value_counts()
print(nyc_complaints)
```

```
Noise - Commercial           301
Noise - Street/Sidewalk      275
Illegal Parking              249
Noise - Vehicle               87
Vending                       84
Homeless Encampment           65
Blocked Driveway              37
Animal Abuse                  32
Noise - Park                  16
Traffic                       13
Derelict Vehicle              13
Panhandling                    6
Noise - House of Worship       3
Drinking                       3
Urinating in Public            2
Bike/Roller/Skate Chronic      2
Graffiti                       1
Name: Complaint Type, dtype: int64
```

[13]:
```
top_10_complaints = df['Complaint Type'].value_counts().head(10)
print(top_10_complaints)
```

```
Blocked Driveway           2219
Illegal Parking            1758
Noise - Commercial          771
Noise - Street/Sidewalk     629
Derelict Vehicle            406
Noise - Vehicle             256
Animal Abuse                170
Vending                     106
Homeless Encampment          91
Traffic                      52
Name: Complaint Type, dtype: int64
```

[14]:
```
complaints_by_city = df.groupby(['City', 'Complaint Type']).size().unstack()
print(complaints_by_city)
```

```
Complaint Type       Animal Abuse  Bike/Roller/Skate Chronic  \
City
ARVERNE                       NaN                        NaN
ASTORIA                       4.0                        1.0
BAYSIDE                       NaN                        NaN
BELLEROSE                     NaN                        NaN
BRONX                        24.0                        1.0
BROOKLYN                     40.0                        NaN
CAMBRIA HEIGHTS               NaN                        NaN
COLLEGE POINT                 NaN                        NaN
CORONA                        1.0                        NaN
EAST ELMHURST                 NaN                        NaN
ELMHURST                      NaN                        NaN
FAR ROCKAWAY                  4.0                        NaN
FLORAL PARK                   NaN                        NaN
FLUSHING                      4.0                        NaN
FOREST HILLS                  3.0                        NaN
FRESH MEADOWS                 1.0                        NaN
GLEN OAKS                     NaN                        NaN
HOLLIS                        NaN                        NaN
HOWARD BEACH                  2.0                        NaN
JACKSON HEIGHTS               NaN                        NaN
JAMAICA                       6.0                        NaN
KEW GARDENS                   1.0                        NaN
LITTLE NECK                   NaN                        NaN
LONG ISLAND CITY              NaN                        NaN
MASPETH                       NaN                        NaN
MIDDLE VILLAGE                1.0                        NaN
NEW YORK                     32.0                        2.0
OAKLAND GARDENS               NaN                        NaN
```

OZONE PARK	3.0	NaN
QUEENS VILLAGE	1.0	NaN
REGO PARK	NaN	NaN
RICHMOND HILL	1.0	NaN
RIDGEWOOD	2.0	NaN
ROCKAWAY PARK	7.0	NaN
ROSEDALE	1.0	NaN
SAINT ALBANS	1.0	NaN
SOUTH OZONE PARK	5.0	NaN
SOUTH RICHMOND HILL	NaN	NaN
SPRINGFIELD GARDENS	1.0	NaN
STATEN ISLAND	18.0	1.0
SUNNYSIDE	NaN	NaN
WHITESTONE	NaN	NaN
WOODHAVEN	3.0	NaN
WOODSIDE	4.0	NaN

Complaint Type City	Blocked Driveway	Derelict Vehicle	Disorderly Youth
ARVERNE	NaN	NaN	NaN
ASTORIA	69.0	3.0	NaN
BAYSIDE	5.0	3.0	NaN
BELLEROSE	4.0	2.0	NaN
BRONX	432.0	43.0	NaN
BROOKLYN	747.0	154.0	NaN
CAMBRIA HEIGHTS	3.0	3.0	NaN
COLLEGE POINT	18.0	5.0	NaN
CORONA	92.0	1.0	NaN
EAST ELMHURST	35.0	6.0	NaN
ELMHURST	52.0	NaN	NaN
FAR ROCKAWAY	6.0	NaN	NaN
FLORAL PARK	NaN	NaN	NaN
FLUSHING	88.0	10.0	NaN
FOREST HILLS	14.0	NaN	NaN
FRESH MEADOWS	21.0	3.0	NaN
GLEN OAKS	NaN	1.0	NaN
HOLLIS	13.0	5.0	NaN
HOWARD BEACH	4.0	8.0	NaN
JACKSON HEIGHTS	21.0	NaN	NaN
JAMAICA	92.0	25.0	NaN
KEW GARDENS	11.0	1.0	NaN
LITTLE NECK	6.0	2.0	NaN
LONG ISLAND CITY	12.0	NaN	NaN
MASPETH	19.0	9.0	NaN
MIDDLE VILLAGE	6.0	9.0	NaN
NEW YORK	37.0	13.0	NaN
OAKLAND GARDENS	7.0	NaN	NaN
OZONE PARK	39.0	10.0	NaN

QUEENS VILLAGE	21.0	6.0	NaN
REGO PARK	19.0	3.0	NaN
RICHMOND HILL	29.0	1.0	NaN
RIDGEWOOD	52.0	7.0	NaN
ROCKAWAY PARK	4.0	NaN	NaN
ROSEDALE	6.0	5.0	NaN
SAINT ALBANS	10.0	3.0	NaN
SOUTH OZONE PARK	27.0	5.0	NaN
SOUTH RICHMOND HILL	48.0	2.0	NaN
SPRINGFIELD GARDENS	4.0	1.0	NaN
STATEN ISLAND	67.0	39.0	1.0
SUNNYSIDE	2.0	NaN	NaN
WHITESTONE	7.0	2.0	NaN
WOODHAVEN	31.0	5.0	NaN
WOODSIDE	37.0	9.0	NaN

Complaint Type City	Drinking	Graffiti	Homeless Encampment	Illegal Parking	\
ARVERNE	NaN	NaN	NaN	1.0	
ASTORIA	1.0	NaN	NaN	29.0	
BAYSIDE	NaN	NaN	NaN	11.0	
BELLEROSE	NaN	NaN	NaN	NaN	
BRONX	3.0	NaN	2.0	198.0	
BROOKLYN	5.0	1.0	16.0	608.0	
CAMBRIA HEIGHTS	NaN	NaN	NaN	NaN	
COLLEGE POINT	NaN	NaN	NaN	3.0	
CORONA	1.0	NaN	NaN	24.0	
EAST ELMHURST	NaN	NaN	NaN	19.0	
ELMHURST	1.0	NaN	1.0	20.0	
FAR ROCKAWAY	NaN	NaN	NaN	7.0	
FLORAL PARK	NaN	NaN	NaN	1.0	
FLUSHING	6.0	NaN	NaN	62.0	
FOREST HILLS	NaN	NaN	NaN	14.0	
FRESH MEADOWS	NaN	NaN	NaN	41.0	
GLEN OAKS	NaN	NaN	NaN	1.0	
HOLLIS	NaN	NaN	NaN	7.0	
HOWARD BEACH	NaN	NaN	NaN	17.0	
JACKSON HEIGHTS	NaN	NaN	1.0	6.0	
JAMAICA	NaN	NaN	2.0	32.0	
KEW GARDENS	NaN	NaN	NaN	5.0	
LITTLE NECK	NaN	NaN	NaN	6.0	
LONG ISLAND CITY	NaN	NaN	NaN	14.0	
MASPETH	NaN	NaN	NaN	24.0	
MIDDLE VILLAGE	NaN	NaN	NaN	23.0	
NEW YORK	3.0	1.0	65.0	249.0	
OAKLAND GARDENS	NaN	NaN	NaN	2.0	
OZONE PARK	NaN	NaN	1.0	11.0	
QUEENS VILLAGE	NaN	NaN	NaN	8.0	

REGO PARK	1.0	NaN	NaN	11.0
RICHMOND HILL	1.0	NaN	NaN	13.0
RIDGEWOOD	NaN	NaN	NaN	77.0
ROCKAWAY PARK	NaN	NaN	NaN	3.0
ROSEDALE	NaN	NaN	NaN	5.0
SAINT ALBANS	NaN	NaN	NaN	11.0
SOUTH OZONE PARK	NaN	NaN	NaN	10.0
SOUTH RICHMOND HILL	NaN	NaN	NaN	9.0
SPRINGFIELD GARDENS	NaN	NaN	NaN	4.0
STATEN ISLAND	8.0	NaN	3.0	117.0
SUNNYSIDE	NaN	NaN	NaN	NaN
WHITESTONE	NaN	NaN	NaN	15.0
WOODHAVEN	NaN	NaN	NaN	18.0
WOODSIDE	NaN	NaN	NaN	18.0

Complaint Type	Noise - Commercial	Noise - House of Worship	\
City			
ARVERNE	1.0	NaN	
ASTORIA	20.0	NaN	
BAYSIDE	NaN	NaN	
BELLEROSE	2.0	NaN	
BRONX	85.0	NaN	
BROOKLYN	249.0	4.0	
CAMBRIA HEIGHTS	NaN	NaN	
COLLEGE POINT	NaN	NaN	
CORONA	3.0	NaN	
EAST ELMHURST	2.0	1.0	
ELMHURST	4.0	NaN	
FAR ROCKAWAY	NaN	NaN	
FLORAL PARK	NaN	NaN	
FLUSHING	1.0	NaN	
FOREST HILLS	4.0	NaN	
FRESH MEADOWS	NaN	NaN	
GLEN OAKS	7.0	NaN	
HOLLIS	NaN	NaN	
HOWARD BEACH	1.0	NaN	
JACKSON HEIGHTS	12.0	1.0	
JAMAICA	15.0	NaN	
KEW GARDENS	2.0	NaN	
LITTLE NECK	NaN	NaN	
LONG ISLAND CITY	6.0	NaN	
MASPETH	2.0	NaN	
MIDDLE VILLAGE	NaN	NaN	
NEW YORK	301.0	3.0	
OAKLAND GARDENS	NaN	NaN	
OZONE PARK	1.0	NaN	
QUEENS VILLAGE	1.0	NaN	
REGO PARK	7.0	NaN	

RICHMOND HILL	5.0		NaN
RIDGEWOOD	13.0		NaN
ROCKAWAY PARK	NaN		NaN
ROSEDALE	NaN		NaN
SAINT ALBANS	NaN		NaN
SOUTH OZONE PARK	2.0		NaN
SOUTH RICHMOND HILL	11.0		NaN
SPRINGFIELD GARDENS	NaN		NaN
STATEN ISLAND	5.0		2.0
SUNNYSIDE	2.0		NaN
WHITESTONE	NaN		NaN
WOODHAVEN	1.0		1.0
WOODSIDE	3.0		NaN

Complaint Type	Noise - Park	Noise - Street/Sidewalk	Noise - Vehicle	\
City				
ARVERNE	NaN	NaN	NaN	
ASTORIA	NaN	5.0	5.0	
BAYSIDE	NaN	1.0	1.0	
BELLEROSE	NaN	1.0	NaN	
BRONX	4.0	106.0	35.0	
BROOKLYN	2.0	172.0	87.0	
CAMBRIA HEIGHTS	NaN	NaN	NaN	
COLLEGE POINT	NaN	1.0	NaN	
CORONA	NaN	3.0	1.0	
EAST ELMHURST	NaN	1.0	NaN	
ELMHURST	NaN	3.0	1.0	
FAR ROCKAWAY	NaN	2.0	3.0	
FLORAL PARK	NaN	NaN	NaN	
FLUSHING	NaN	4.0	2.0	
FOREST HILLS	NaN	1.0	4.0	
FRESH MEADOWS	NaN	1.0	2.0	
GLEN OAKS	NaN	NaN	NaN	
HOLLIS	NaN	NaN	1.0	
HOWARD BEACH	NaN	NaN	NaN	
JACKSON HEIGHTS	NaN	2.0	NaN	
JAMAICA	NaN	3.0	4.0	
KEW GARDENS	NaN	NaN	2.0	
LITTLE NECK	NaN	NaN	1.0	
LONG ISLAND CITY	NaN	2.0	NaN	
MASPETH	NaN	10.0	NaN	
MIDDLE VILLAGE	NaN	NaN	1.0	
NEW YORK	16.0	275.0	87.0	
OAKLAND GARDENS	NaN	NaN	1.0	
OZONE PARK	NaN	NaN	2.0	
QUEENS VILLAGE	NaN	NaN	2.0	
REGO PARK	1.0	NaN	1.0	
RICHMOND HILL	NaN	4.0	2.0	

RIDGEWOOD	NaN	3.0	1.0
ROCKAWAY PARK	NaN	1.0	NaN
ROSEDALE	NaN	NaN	1.0
SAINT ALBANS	NaN	NaN	NaN
SOUTH OZONE PARK	NaN	1.0	2.0
SOUTH RICHMOND HILL	NaN	2.0	NaN
SPRINGFIELD GARDENS	NaN	NaN	NaN
STATEN ISLAND	NaN	17.0	6.0
SUNNYSIDE	NaN	1.0	NaN
WHITESTONE	NaN	2.0	NaN
WOODHAVEN	NaN	1.0	1.0
WOODSIDE	NaN	3.0	NaN

Complaint Type	Panhandling	Posting Advertisement	Traffic
City			
ARVERNE	NaN	NaN	NaN
ASTORIA	NaN	NaN	NaN
BAYSIDE	NaN	NaN	NaN
BELLEROSE	NaN	NaN	NaN
BRONX	NaN	NaN	2.0
BROOKLYN	1.0	1.0	20.0
CAMBRIA HEIGHTS	NaN	NaN	NaN
COLLEGE POINT	NaN	NaN	NaN
CORONA	NaN	NaN	NaN
EAST ELMHURST	NaN	NaN	1.0
ELMHURST	NaN	NaN	1.0
FAR ROCKAWAY	NaN	NaN	NaN
FLORAL PARK	NaN	NaN	NaN
FLUSHING	NaN	NaN	2.0
FOREST HILLS	NaN	NaN	NaN
FRESH MEADOWS	NaN	NaN	1.0
GLEN OAKS	NaN	NaN	NaN
HOLLIS	NaN	NaN	NaN
HOWARD BEACH	NaN	NaN	NaN
JACKSON HEIGHTS	NaN	NaN	1.0
JAMAICA	NaN	NaN	6.0
KEW GARDENS	NaN	NaN	NaN
LITTLE NECK	NaN	NaN	1.0
LONG ISLAND CITY	NaN	NaN	NaN
MASPETH	NaN	NaN	NaN
MIDDLE VILLAGE	NaN	NaN	NaN
NEW YORK	6.0	NaN	13.0
OAKLAND GARDENS	NaN	NaN	NaN
OZONE PARK	NaN	NaN	NaN
QUEENS VILLAGE	NaN	NaN	NaN
REGO PARK	NaN	NaN	NaN
RICHMOND HILL	NaN	NaN	NaN
RIDGEWOOD	NaN	NaN	NaN

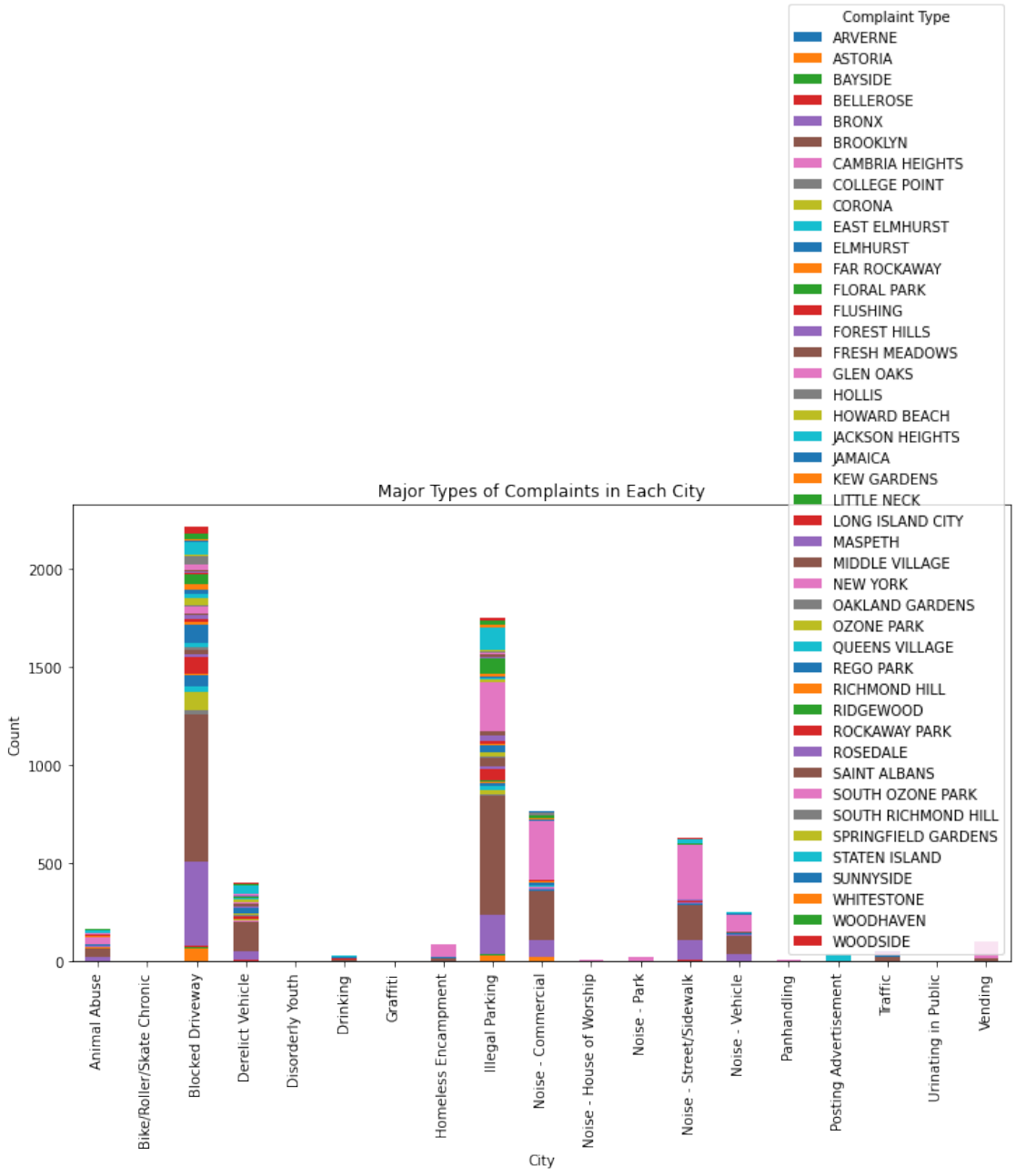
ROCKAWAY PARK	NaN	NaN	NaN
ROSEDALE	NaN	NaN	4.0
SAINT ALBANS	NaN	NaN	NaN
SOUTH OZONE PARK	NaN	NaN	NaN
SOUTH RICHMOND HILL	NaN	NaN	NaN
SPRINGFIELD GARDENS	NaN	NaN	NaN
STATEN ISLAND	NaN	40.0	NaN
SUNNYSIDE	NaN	NaN	NaN
WHITESTONE	NaN	NaN	NaN
WOODHAVEN	NaN	NaN	NaN
WOODSIDE	NaN	NaN	NaN

Complaint Type	Urinating in Public	Vending
City		
ARVERNE	NaN	NaN
ASTORIA	NaN	NaN
BAYSIDE	NaN	NaN
BELLEROSE	NaN	NaN
BRONX	NaN	2.0
BROOKLYN	NaN	14.0
CAMBRIA HEIGHTS	NaN	NaN
COLLEGE POINT	NaN	NaN
CORONA	1.0	1.0
EAST ELMHURST	NaN	NaN
ELMHURST	NaN	NaN
FAR ROCKAWAY	NaN	NaN
FLORAL PARK	NaN	NaN
FLUSHING	NaN	2.0
FOREST HILLS	NaN	NaN
FRESH MEADOWS	NaN	NaN
GLEN OAKS	NaN	NaN
HOLLIS	NaN	NaN
HOWARD BEACH	NaN	NaN
JACKSON HEIGHTS	NaN	NaN
JAMAICA	1.0	1.0
KEW GARDENS	NaN	NaN
LITTLE NECK	NaN	NaN
LONG ISLAND CITY	NaN	NaN
MASPETH	1.0	NaN
MIDDLE VILLAGE	NaN	NaN
NEW YORK	2.0	84.0
OAKLAND GARDENS	NaN	NaN
OZONE PARK	NaN	NaN
QUEENS VILLAGE	NaN	NaN
REGO PARK	NaN	NaN
RICHMOND HILL	NaN	NaN
RIDGEWOOD	NaN	NaN
ROCKAWAY PARK	NaN	NaN

```
ROSEDALE                          NaN      NaN
SAINT ALBANS                      NaN      NaN
SOUTH OZONE PARK                  NaN      NaN
SOUTH RICHMOND HILL               NaN      1.0
SPRINGFIELD GARDENS               NaN      NaN
STATEN ISLAND                     NaN      NaN
SUNNYSIDE                         NaN      NaN
WHITESTONE                        NaN      NaN
WOODHAVEN                         NaN      NaN
WOODSIDE                          NaN      1.0
```

[15]:
```
df_new = complaints_by_city.transpose()
```

[16]:
```
#Task-4
df_new.plot(kind='bar', stacked=True, figsize=(12, 6))
plt.title('Major Types of Complaints in Each City')
plt.xlabel('City')
plt.ylabel('Count')
plt.legend(title='Complaint Type')
plt.show()
```

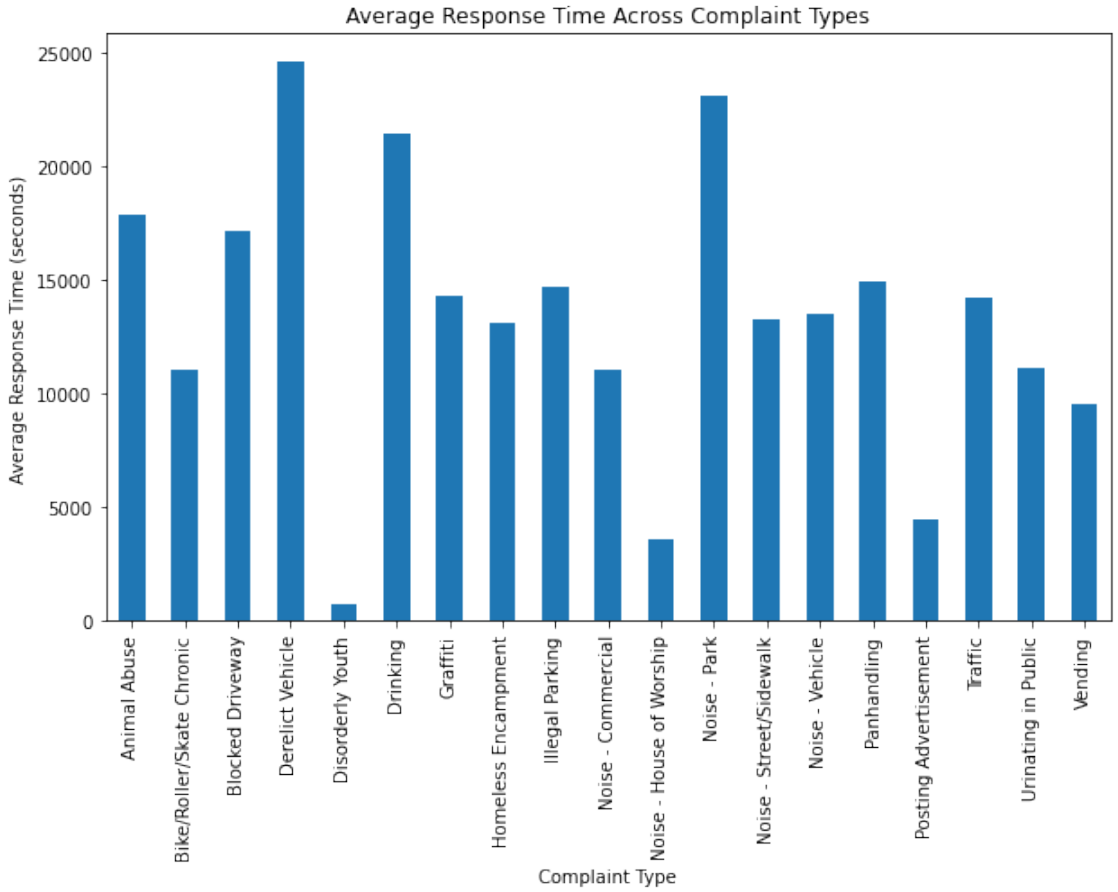


[17]:
```
avg_response_time = df.groupby('Complaint Type')['Time Elapsed'].mean().
  ↪sort_values(ascending=False)
print(avg_response_time)
```

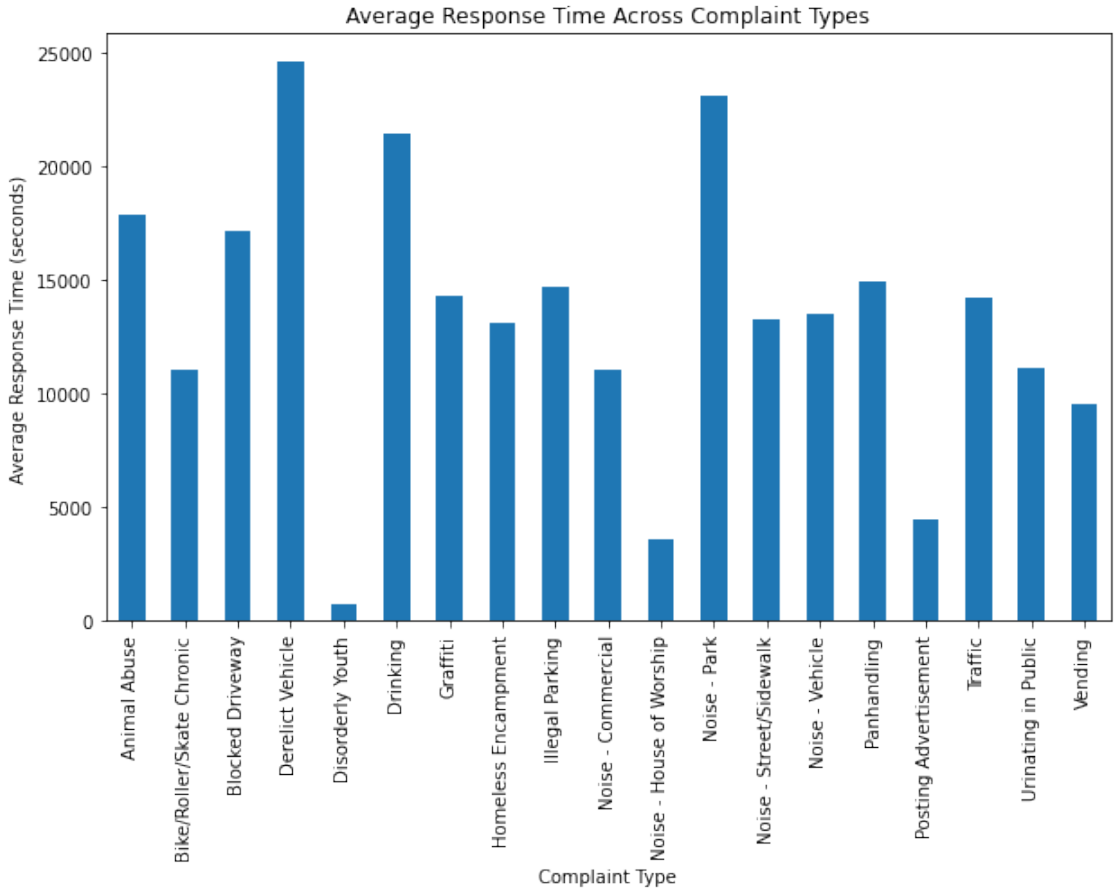
```
Complaint Type
Derelict Vehicle            24620.071429
Noise - Park                23128.913043
Drinking                    21462.700000
```

```
Animal Abuse                 17840.052941
Blocked Driveway             17130.899504
Panhandling                  14943.000000
Illegal Parking              14729.856086
Graffiti                     14291.500000
Traffic                      14245.230769
Noise - Vehicle              13488.164062
Noise - Street/Sidewalk      13271.373609
Homeless Encampment          13149.373626
Urinating in Public          11143.200000
Noise - Commercial           11036.980545
Bike/Roller/Skate Chronic    11019.000000
Vending                       9572.367925
Posting Advertisement         4445.024390
Noise - House of Worship      3580.416667
Disorderly Youth               713.000000
Name: Time Elapsed, dtype: float64
```

[18]:
```python
#Task5
plt.figure(figsize=(10, 6))
df.groupby('Complaint Type')['Time Elapsed'].mean().plot(kind='bar')
plt.title('Average Response Time Across Complaint Types')
plt.xlabel('Complaint Type')
plt.ylabel('Average Response Time (seconds)')
plt.show()
```



[19]:
```
#Task-6
plt.figure(figsize=(10, 6))
df.groupby('Complaint Type')['Time Elapsed'].mean().plot(kind='bar')
plt.title('Average Response Time Across Complaint Types')
plt.xlabel('Complaint Type')
plt.ylabel('Average Response Time (seconds)')
plt.show()
```



[21]:
```
#Task-7
import scipy.stats as stats

# Perform a t-test between response time and a categorical variable (e.g.,␣
 ↪borough)
boroughs = df['Borough'].unique()
significant_vars = []

for borough in boroughs:
    data_borough = df[df['Borough'] == borough]['Time Elapsed']
    data_not_borough = df[df['Borough'] != borough]['Time Elapsed']
    p_value = stats.ttest_ind(data_borough, data_not_borough).pvalue

    if p_value < 0.05:  # Significance threshold
        significant_vars.append((borough, p_value))

print("Significant Variables:")
for var, p_value in significant_vars:
    print(f"{var}: p-value = {p_value}")
```

```
Significant Variables:
MANHATTAN: p-value = 3.053693629767561e-16
QUEENS: p-value = 0.016747191053007374
BRONX: p-value = 1.089158979210717e-42
Unspecified: p-value = 6.487443837802156e-05
STATEN ISLAND: p-value = 0.0003855618717995725
```

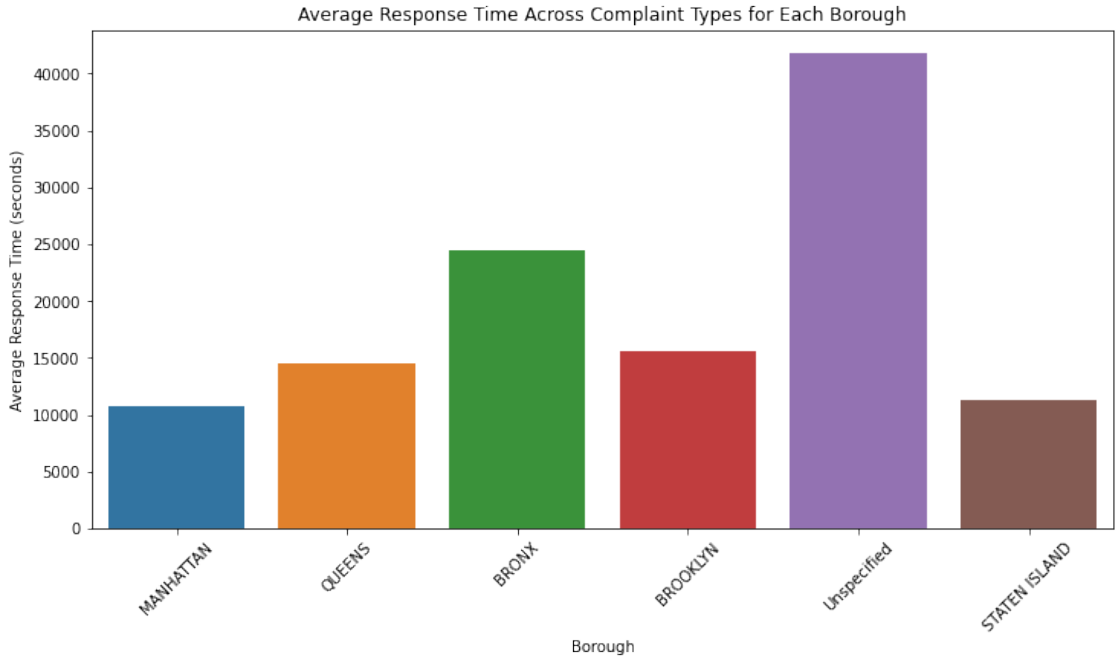
[22]:
```python
#Task-8
import seaborn as sns

# Create a bar plot to show average response time across complaint types for each borough
plt.figure(figsize=(12, 6))
sns.barplot(x='Borough', y='Time Elapsed', data=df, ci=None)
plt.title('Average Response Time Across Complaint Types for Each Borough')
plt.xlabel('Borough')
plt.ylabel('Average Response Time (seconds)')
plt.xticks(rotation=45)
plt.show()
```

```
/tmp/ipykernel_70/3163342239.py:6: FutureWarning:

The `ci` parameter is deprecated. Use `errorbar=None` for the same effect.

  sns.barplot(x='Borough', y='Time Elapsed', data=df, ci=None)
```



[ ]: