# Project_1: Customer Service Requests Analysis

**Proejct Descrription:-** You've been asked to perform data analysis of service request (311) calls from New York City. You've also been asked to utilize data wrangling techniques to understand the pattern in the data and visualize the major types of complaints.

In [22]:
```
#Importing required libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline
import seaborn as sns
```

# 1:Understand the dataset

In [23]:
```
#Load dataset from file "311_Service_Requests_from_2010_to_Present.csv"
dataset = pd.read_csv('311_Service_Requests_from_2010_to_Present.csv')
```

In [24]:
```
dataset.head()
```

Out[24]:

| | Unique Key | Created Date | Closed Date | Agency | Agency Name | Complaint Type | Descriptor | Location T |
|---|---|---|---|---|---|---|---|---|
| **0** | 32310363 | 12/31/2015 11:59:45 PM | 01/01/2016 12:55:15 AM | NYPD | New York City Police Department | Noise - Street/Sidewalk | Loud Music/Party | Street/Side |
| **1** | 32309934 | 12/31/2015 11:59:44 PM | 01/01/2016 01:26:57 AM | NYPD | New York City Police Department | Blocked Driveway | No Access | Street/Side |
| **2** | 32309159 | 12/31/2015 11:59:29 PM | 01/01/2016 04:51:03 AM | NYPD | New York City Police Department | Blocked Driveway | No Access | Street/Side |
| **3** | 32305098 | 12/31/2015 11:57:46 PM | 01/01/2016 07:43:13 AM | NYPD | New York City Police Department | Illegal Parking | Commercial Overnight Parking | Street/Side |
| **4** | 32306529 | 12/31/2015 11:56:58 PM | 01/01/2016 03:24:42 AM | NYPD | New York City Police Department | Illegal Parking | Blocked Sidewalk | Street/Side |

5 rows × 53 columns

### 1.1:Identify the shape of the dataset

In [25]:
```
#Identify the shape of the dataset
dataset.shape
```

Out[25]:
```
(364558, 53)
```

In [26]:
```
dataset.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 364558 entries, 0 to 364557
Data columns (total 53 columns):
 #   Column                          Non-Null Count   Dtype  
---  ------                          --------------   -----  
 0   Unique Key                      364558 non-null  int64  
 1   Created Date                    364558 non-null  object 
 2   Closed Date                     362177 non-null  object 
 3   Agency                          364558 non-null  object 
 4   Agency Name                     364558 non-null  object 
 5   Complaint Type                  364558 non-null  object 
 6   Descriptor                      358057 non-null  object 
 7   Location Type                   364425 non-null  object 
 8   Incident Zip                    361560 non-null  float64
 9   Incident Address                312859 non-null  object 
 10  Street Name                     312859 non-null  object 
 11  Cross Street 1                  307370 non-null  object 
 12  Cross Street 2                  306753 non-null  object 
 13  Intersection Street 1           51120 non-null   object 
 14  Intersection Street 2           50512 non-null   object 
 15  Address Type                    361306 non-null  object 
 16  City                            361561 non-null  object 
 17  Landmark                        375 non-null     object 
 18  Facility Type                   362169 non-null  object 
 19  Status                          364558 non-null  object 
 20  Due Date                        364555 non-null  object 
 21  Resolution Description          364558 non-null  object 
 22  Resolution Action Updated Date  362156 non-null  object 
 23  Community Board                 364558 non-null  object 
 24  Borough                         364558 non-null  object 
 25  X Coordinate (State Plane)      360528 non-null  float64
 26  Y Coordinate (State Plane)      360528 non-null  float64
 27  Park Facility Name              364558 non-null  object 
 28  Park Borough                    364558 non-null  object 
 29  School Name                     364558 non-null  object 
 30  School Number                   364558 non-null  object 
 31  School Region                   364557 non-null  object 
 32  School Code                     364557 non-null  object 
 33  School Phone Number             364558 non-null  object 
 34  School Address                  364558 non-null  object 
 35  School City                     364558 non-null  object 
 36  School State                    364558 non-null  object 
 37  School Zip                      364557 non-null  object 
 38  School Not Found                364558 non-null  object 
 39  School or Citywide Complaint    0 non-null       float64
 40  Vehicle Type                    0 non-null       float64
 41  Taxi Company Borough            0 non-null       float64
 42  Taxi Pick Up Location           0 non-null       float64
 43  Bridge Highway Name             297 non-null     object 
 44  Bridge Highway Direction        297 non-null     object 
 45  Road Ramp                       262 non-null     object 
 46  Bridge Highway Segment          262 non-null     object 
 47  Garage Lot Name                 0 non-null       float64
 48  Ferry Direction                 1 non-null       object 
 49  Ferry Terminal Name             2 non-null       object 
 50  Latitude                        360528 non-null  float64
 51  Longitude                       360528 non-null  float64
 52  Location                        360528 non-null  object 
dtypes: float64(10), int64(1), object(42)
memory usage: 147.4+ MB
```

**1.2:Identify variables with null values.**

In [27]:
```
#Identify variables with null values
dataset.isnull().sum()
```

Out[27]:
```
Unique Key                          0
Created Date                        0
Closed Date                      2381
Agency                              0
Agency Name                         0
Complaint Type                      0
Descriptor                       6501
Location Type                     133
Incident Zip                     2998
Incident Address                51699
Street Name                     51699
Cross Street 1                  57188
Cross Street 2                  57805
Intersection Street 1          313438
Intersection Street 2          314046
Address Type                     3252
City                             2997
Landmark                       364183
Facility Type                    2389
Status                              0
Due Date                            3
Resolution Description              0
Resolution Action Updated Date   2402
Community Board                     0
Borough                             0
X Coordinate (State Plane)       4030
Y Coordinate (State Plane)       4030
Park Facility Name                  0
Park Borough                        0
School Name                         0
School Number                       0
School Region                       1
School Code                         1
School Phone Number                 0
School Address                      0
School City                         0
School State                        0
School Zip                          1
School Not Found                    0
School or Citywide Complaint   364558
Vehicle Type                   364558
Taxi Company Borough           364558
Taxi Pick Up Location          364558
Bridge Highway Name            364261
Bridge Highway Direction       364261
Road Ramp                      364296
Bridge Highway Segment         364296
Garage Lot Name                364558
Ferry Direction                364557
Ferry Terminal Name            364556
Latitude                         4030
Longitude                        4030
Location                         4030
dtype: int64
```

# 2. Perform basic data exploratory

# analysis

### 2.1:Utilize missing value treatment

In [28]:
```
#Imputation Method (Zero)
df_zero_imputed = dataset.fillna(0)
```

In [29]:
```
df_zero_imputed.isnull().sum()
```

Out[29]:
```
Unique Key                        0
Created Date                      0
Closed Date                       0
Agency                            0
Agency Name                       0
Complaint Type                    0
Descriptor                        0
Location Type                     0
Incident Zip                      0
Incident Address                  0
Street Name                       0
Cross Street 1                    0
Cross Street 2                    0
Intersection Street 1             0
Intersection Street 2             0
Address Type                      0
City                              0
Landmark                          0
Facility Type                     0
Status                            0
Due Date                          0
Resolution Description            0
Resolution Action Updated Date    0
Community Board                   0
Borough                           0
X Coordinate (State Plane)        0
Y Coordinate (State Plane)        0
Park Facility Name                0
Park Borough                      0
School Name                       0
School Number                     0
School Region                     0
School Code                       0
School Phone Number               0
School Address                    0
School City                       0
School State                      0
School Zip                        0
School Not Found                  0
School or Citywide Complaint      0
Vehicle Type                      0
Taxi Company Borough              0
Taxi Pick Up Location             0
Bridge Highway Name               0
Bridge Highway Direction          0
Road Ramp                         0
Bridge Highway Segment            0
Garage Lot Name                   0
Ferry Direction                   0
Ferry Terminal Name               0
Latitude                          0
Longitude                         0
Location                          0
dtype: int64
```

**2.2:Analyze the date column and remove the entries if it has an incorrect timelineUtilize**

In [30]:
```
#creat dataset for only date columns
data_date=dataset[["Created Date","Closed Date","Due Date"]]
data_date
```

Out[30]:

| | Created Date | Closed Date | Due Date |
|---|---|---|---|
| 0 | 12/31/2015 11:59:45 PM | 01/01/2016 12:55:15 AM | 01/01/2016 07:59:45 AM |
| 1 | 12/31/2015 11:59:44 PM | 01/01/2016 01:26:57 AM | 01/01/2016 07:59:44 AM |
| 2 | 12/31/2015 11:59:29 PM | 01/01/2016 04:51:03 AM | 01/01/2016 07:59:29 AM |
| 3 | 12/31/2015 11:57:46 PM | 01/01/2016 07:43:13 AM | 01/01/2016 07:57:46 AM |
| 4 | 12/31/2015 11:56:58 PM | 01/01/2016 03:24:42 AM | 01/01/2016 07:56:58 AM |
| ... | ... | ... | ... |
| 364553 | 01/01/2015 12:04:44 AM | 01/01/2015 10:22:31 AM | 01/01/2015 08:04:44 AM |
| 364554 | 01/01/2015 12:04:28 AM | 01/01/2015 02:25:02 AM | 01/01/2015 08:04:28 AM |
| 364555 | 01/01/2015 12:01:30 AM | 01/01/2015 12:20:33 AM | 01/01/2015 08:01:30 AM |
| 364556 | 01/01/2015 12:01:29 AM | 01/01/2015 02:42:22 AM | 01/01/2015 08:01:29 AM |
| 364557 | 01/01/2015 12:00:50 AM | 01/01/2015 02:47:50 AM | 01/01/2015 08:00:50 AM |

**364558 rows × 3 columns**

In [31]:
```
data_date.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 364558 entries, 0 to 364557
Data columns (total 3 columns):
 #   Column        Non-Null Count   Dtype 
---  ------        --------------   ----- 
 0   Created Date  364558 non-null  object
 1   Closed Date   362177 non-null  object
 2   Due Date      364555 non-null  object
dtypes: object(3)
memory usage: 8.3+ MB
```

In [32]:
```
data_date['Created Date']=pd.to_datetime(data_date['Created Date'])
data_date['Closed Date']=pd.to_datetime(data_date['Closed Date'])
data_date['Due Date']=pd.to_datetime(data_date['Due Date'])
data_date.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 364558 entries, 0 to 364557
Data columns (total 3 columns):
 #   Column        Non-Null Count   Dtype         
---  ------        --------------   -----         
 0   Created Date  364558 non-null  datetime64[ns]
 1   Closed Date   362177 non-null  datetime64[ns]
 2   Due Date      364555 non-null  datetime64[ns]
dtypes: datetime64[ns](3)
memory usage: 8.3 MB
```

In [33]:
```
data_date.head()
```

Out[33]:

| | Created Date | Closed Date | Due Date |
|---|---|---|---|
| 0 | 2015-12-31 23:59:45 | 2016-01-01 00:55:15 | 2016-01-01 07:59:45 |
| 1 | 2015-12-31 23:59:44 | 2016-01-01 01:26:57 | 2016-01-01 07:59:44 |
| 2 | 2015-12-31 23:59:29 | 2016-01-01 04:51:03 | 2016-01-01 07:59:29 |
| 3 | 2015-12-31 23:57:46 | 2016-01-01 07:43:13 | 2016-01-01 07:57:46 |
| 4 | 2015-12-31 23:56:58 | 2016-01-01 03:24:42 | 2016-01-01 07:56:58 |

### 2.3:Draw a frequency plot for city-wise complaints

In [34]:
```
dataset.groupby(["City"]).size()
```

Out[34]:

| City | |
|---|---|
| ARVERNE | 259 |
| ASTORIA | 7991 |
| Astoria | 906 |
| BAYSIDE | 1550 |
| BELLEROSE | 487 |
| BREEZY POINT | 31 |
| BRONX | 49171 |
| BROOKLYN | 118862 |
| CAMBRIA HEIGHTS | 617 |
| CENTRAL PARK | 110 |
| COLLEGE POINT | 1544 |
| CORONA | 5383 |
| EAST ELMHURST | 3558 |
| ELMHURST | 3438 |
| East Elmhurst | 30 |
| FAR ROCKAWAY | 1397 |
| FLORAL PARK | 196 |
| FLUSHING | 7487 |
| FOREST HILLS | 2122 |
| FRESH MEADOWS | 2453 |
| GLEN OAKS | 361 |
| HOLLIS | 1231 |
| HOWARD BEACH | 1144 |
| Howard Beach | 1 |
| JACKSON HEIGHTS | 2106 |
| JAMAICA | 8932 |
| KEW GARDENS | 1008 |
| LITTLE NECK | 712 |
| LONG ISLAND CITY | 3028 |
| Long Island City | 170 |
| MASPETH | 3118 |
| MIDDLE VILLAGE | 2291 |
| NEW HYDE PARK | 129 |
| NEW YORK | 77312 |
| OAKLAND GARDENS | 717 |
| OZONE PARK | 3446 |
| QUEENS | 37 |
| QUEENS VILLAGE | 2251 |
| REGO PARK | 1807 |
| RICHMOND HILL | 2335 |
| RIDGEWOOD | 6392 |
| ROCKAWAY PARK | 831 |
| ROSEDALE | 1091 |
| SAINT ALBANS | 1047 |
| SOUTH OZONE PARK | 2668 |
| SOUTH RICHMOND HILL | 3431 |
| SPRINGFIELD GARDENS | 1094 |
| STATEN ISLAND | 15340 |
| SUNNYSIDE | 944 |
| WHITESTONE | 1369 |
| WOODHAVEN | 3103 |
| WOODSIDE | 4357 |
| Woodside | 166 |

dtype: int64

In [35]:
```
#Calculate Frequcy for complaints in city
data_city=dataset.groupby(['City']).size().reset_index()
data_city=data_city.rename(columns={0:'count'})
```

In [36]:
```
data_city
```

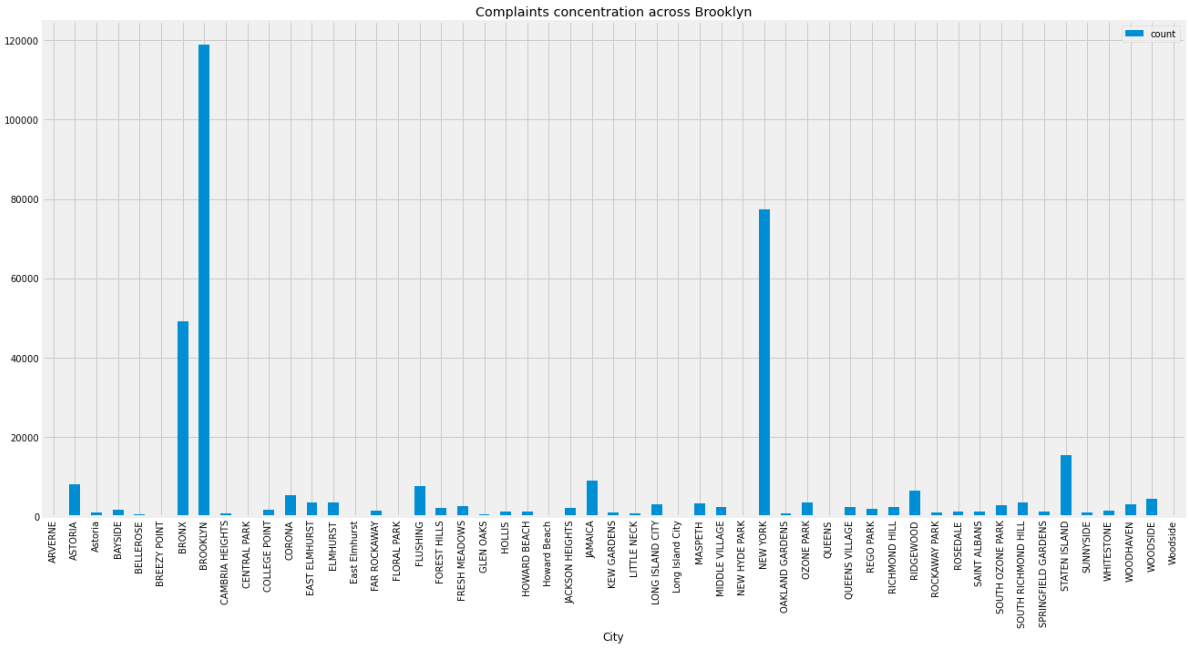
Out[36]:

| | City | count |
|---|---|---|
| 0 | ARVERNE | 259 |
| 1 | ASTORIA | 7991 |
| 2 | Astoria | 906 |
| 3 | BAYSIDE | 1550 |
| 4 | BELLEROSE | 487 |
| 5 | BREEZY POINT | 31 |
| 6 | BRONX | 49171 |
| 7 | BROOKLYN | 118862 |
| 8 | CAMBRIA HEIGHTS | 617 |
| 9 | CENTRAL PARK | 110 |
| 10 | COLLEGE POINT | 1544 |
| 11 | CORONA | 5383 |
| 12 | EAST ELMHURST | 3558 |
| 13 | ELMHURST | 3438 |
| 14 | East Elmhurst | 30 |
| 15 | FAR ROCKAWAY | 1397 |
| 16 | FLORAL PARK | 196 |
| 17 | FLUSHING | 7487 |
| 18 | FOREST HILLS | 2122 |
| 19 | FRESH MEADOWS | 2453 |
| 20 | GLEN OAKS | 361 |
| 21 | HOLLIS | 1231 |
| 22 | HOWARD BEACH | 1144 |
| 23 | Howard Beach | 1 |
| 24 | JACKSON HEIGHTS | 2106 |
| 25 | JAMAICA | 8932 |
| 26 | KEW GARDENS | 1008 |
| 27 | LITTLE NECK | 712 |
| 28 | LONG ISLAND CITY | 3028 |
| 29 | Long Island City | 170 |
| 30 | MASPETH | 3118 |
| 31 | MIDDLE VILLAGE | 2291 |
| 32 | NEW HYDE PARK | 129 |
| 33 | NEW YORK | 77312 |
| 34 | OAKLAND GARDENS | 717 |
| 35 | OZONE PARK | 3446 |

| | City | count |
|---|---|---|
| 36 | QUEENS | 37 |
| 37 | QUEENS VILLAGE | 2251 |
| 38 | REGO PARK | 1807 |
| 39 | RICHMOND HILL | 2335 |
| 40 | RIDGEWOOD | 6392 |
| 41 | ROCKAWAY PARK | 831 |
| 42 | ROSEDALE | 1091 |
| 43 | SAINT ALBANS | 1047 |
| 44 | SOUTH OZONE PARK | 2668 |
| 45 | SOUTH RICHMOND HILL | 3431 |
| 46 | SPRINGFIELD GARDENS | 1094 |
| 47 | STATEN ISLAND | 15340 |
| 48 | SUNNYSIDE | 944 |
| 49 | WHITESTONE | 1369 |
| 50 | WOODHAVEN | 3103 |
| 51 | WOODSIDE | 4357 |
| 52 | Woodside | 166 |

In [37]:
```
data_city.plot(x="City",y="count",kind="bar",figsize=(20,10),title = 'Complaints c
```

Out[37]:
```
<AxesSubplot:title={'center':'Complaints concentration across Brooklyn'}, xlabel
='City'>
```




## 2.4:Draw scatter and hexbin plots for complaint concentration across Brooklyn

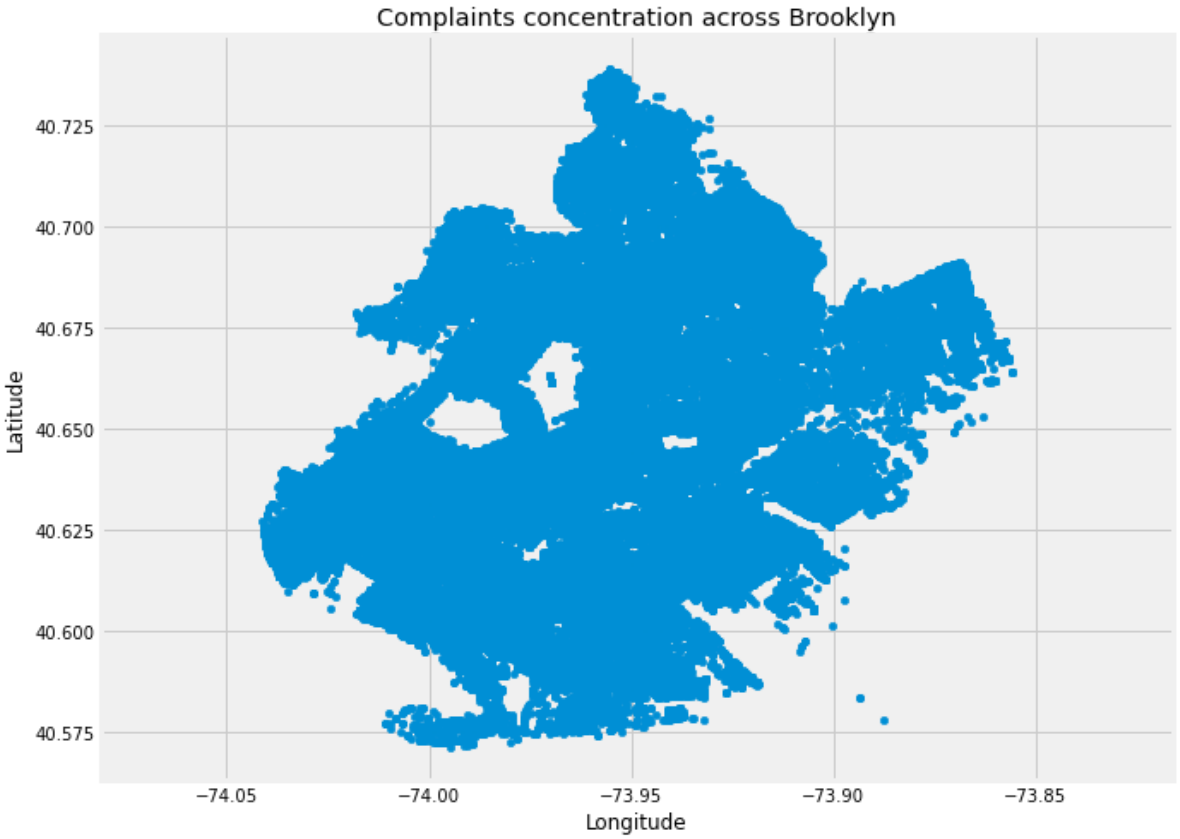
In [40]:
```
df_Brooklyn = dataset[dataset['Borough']=='BROOKLYN']
```

In [41]:
```
df_Brooklyn.shape
```

Out[41]: (118864, 53)

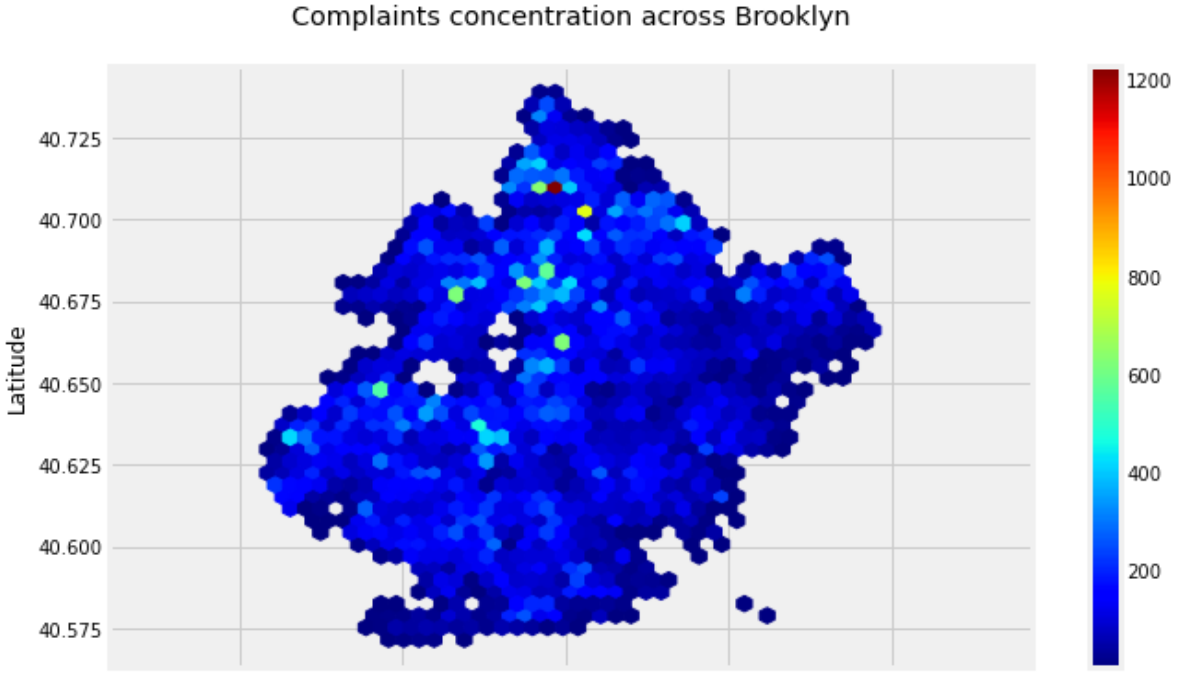
In [42]:
```
df_Brooklyn[['Longitude', 'Latitude']].plot(kind='scatter',
    x='Longitude', y='Latitude', figsize=(10,8),title = 'Complaints concentration a
```

Out[42]: (-74.05061403028367, -73.84647934348564, 40.563150823850876, 40.74729501421672)




In [43]:
```
df_Brooklyn.plot(kind='hexbin', x='Longitude', y='Latitude', gridsize=40,
    colormap = 'jet',mincnt=1,title = 'Complaints concentration across Brooklyn\n'
```

Out[43]: (-74.05061403048781, -73.8464793432815, 40.563150823850876, 40.74729501421672)

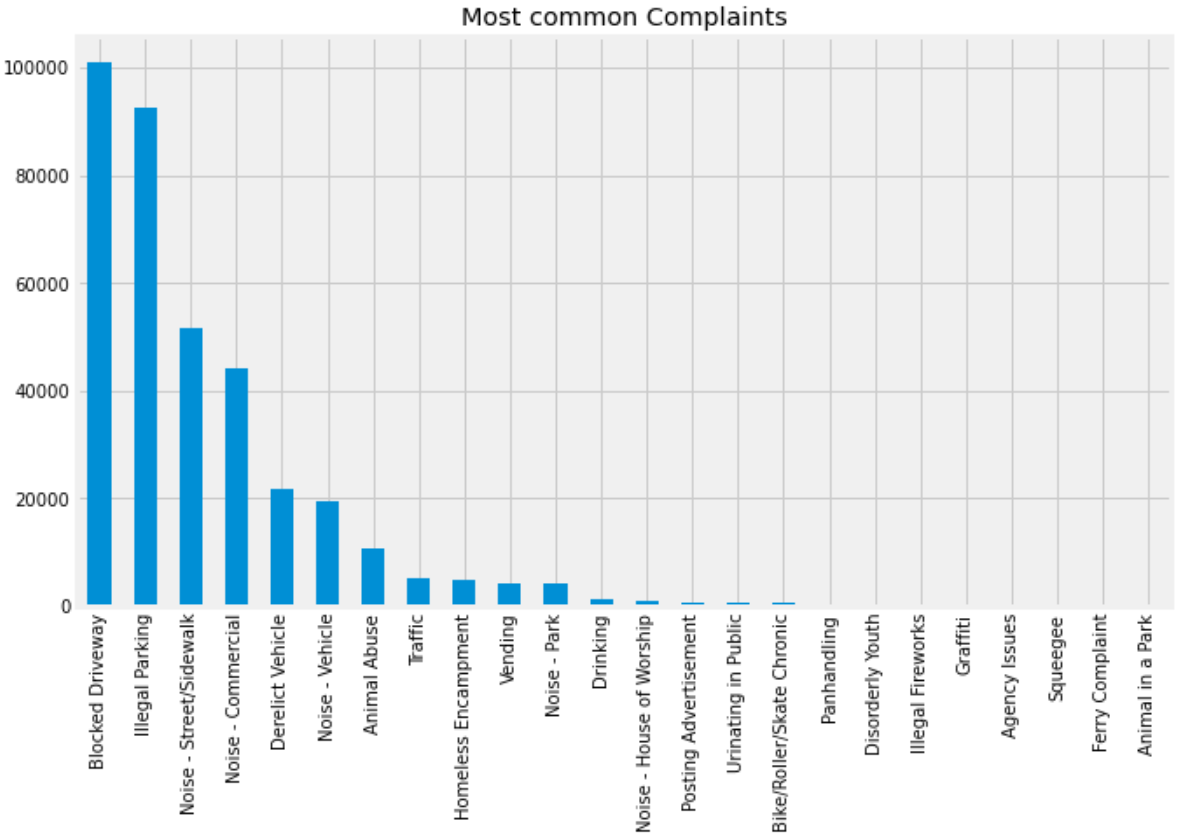



# 3. Find major types of complaints:

### 3.1: Plot a bar graph of count vs. complaint types

In [45]:
```
(dataset['Complaint Type'].value_counts()).head(24).plot(kind='bar',
                    figsize=(10,6), title = 'Most common Complaints')
```

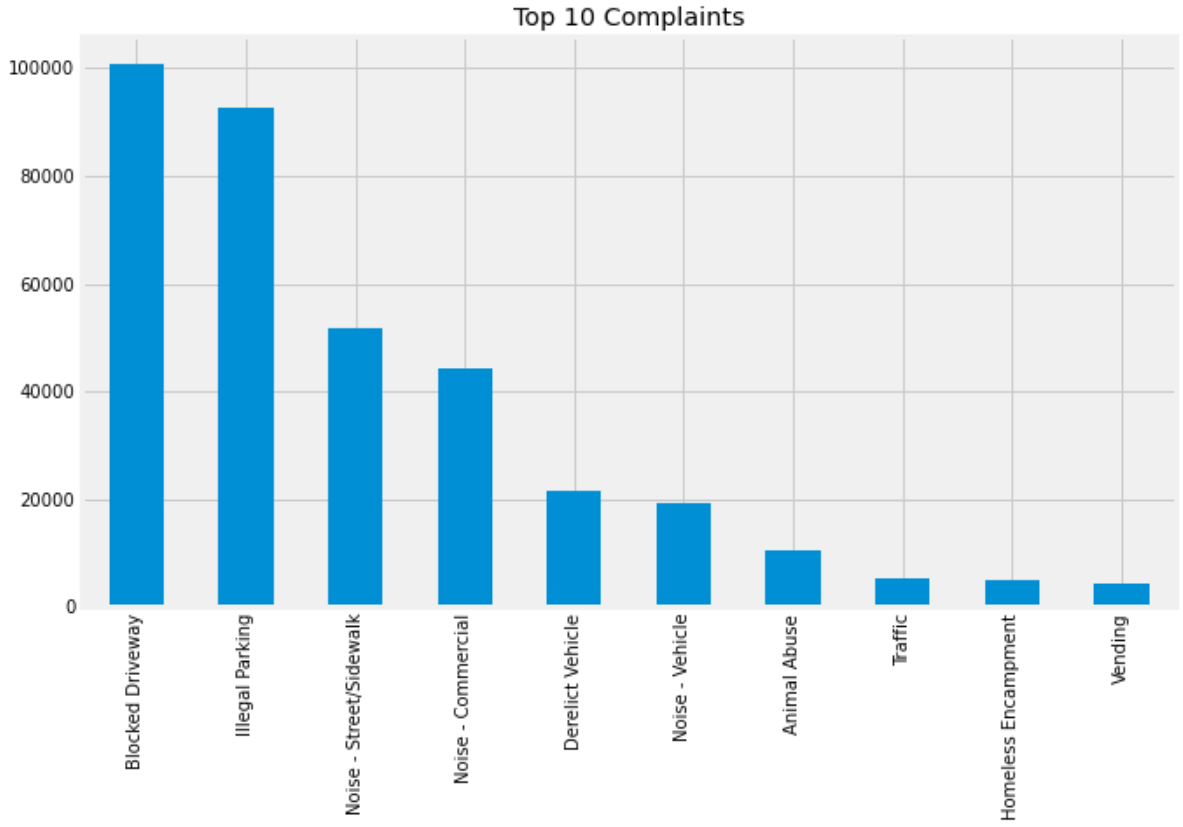
Out[45]:
```
<AxesSubplot:title={'center':'Most common Complaints'}>
```




### 3.2:Find the top 10 types of complaints

In [49]:
```
(dataset['Complaint Type'].value_counts()).head(10).plot(kind='bar',
                    figsize=(10,6), title = 'Top 10 Complaints')
```

Out[49]:
```
<AxesSubplot:title={'center':'Top 10 Complaints'}>
```




### 3.3Display the types of complaints in each city in a separate dataset

In [53]:
```
dataset.columns
```

Out[53]:
```
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')
```

In [54]:
```
dataset['Complaint Type'].unique()
```

Out[54]:
```
array(['Noise - Street/Sidewalk', 'Blocked Driveway', 'Illegal Parking',
       'Derelict Vehicle', 'Noise - Commercial',
       'Noise - House of Worship', 'Posting Advertisement',
       'Noise - Vehicle', 'Animal Abuse', 'Vending', 'Traffic',
       'Drinking', 'Bike/Roller/Skate Chronic', 'Panhandling',
       'Noise - Park', 'Homeless Encampment', 'Urinating in Public',
       'Graffiti', 'Disorderly Youth', 'Illegal Fireworks',
       'Ferry Complaint', 'Agency Issues', 'Squeegee', 'Animal in a Park'],
      dtype=object)
```

In [55]:
```
dataset['Descriptor'].unique()
```

Out[55]:
```
array(['Loud Music/Party', 'No Access', 'Commercial Overnight Parking',
       'Blocked Sidewalk', 'Posted Parking Sign Violation',
       'Blocked Hydrant', 'With License Plate', 'Partial Access',
       'Unauthorized Bus Layover', 'Double Parked Blocking Vehicle',
       'Double Parked Blocking Traffic', 'Vehicle', 'Loud Talking',
       'Banging/Pounding', 'Car/Truck Music', 'Tortured',
       'In Prohibited Area', 'Congestion/Gridlock', 'Neglected',
       'Car/Truck Horn', 'In Public', 'Other (complaint details)', nan,
       'No Shelter', 'Truck Route Violation', 'Unlicensed',
       'Overnight Commercial Storage', 'Engine Idling',
       'After Hours - Licensed Est', 'Detached Trailer',
       'Underage - Licensed Est', 'Chronic Stoplight Violation',
       'Loud Television', 'Chained', 'Building', 'In Car',
       'Police Report Requested', 'Chronic Speeding',
       'Playing in Unsuitable Place', 'Drag Racing',
       'Police Report Not Requested', 'Nuisance/Truant', 'Homeless Issue',
       'Language Access Complaint', 'Disruptive Passenger',
       'Animal Waste'], dtype=object)
```

In [52]:
```
complaintTypecity = pd.DataFrame({'count':dataset.groupby(['Complaint Type','City'
complaintTypecity
```

Out[52]:

| | Complaint Type | City | count |
|---|---|---|---|
| 0 | Animal Abuse | ARVERNE | 46 |
| 1 | Animal Abuse | ASTORIA | 170 |
| 2 | Animal Abuse | BAYSIDE | 53 |
| 3 | Animal Abuse | BELLEROSE | 15 |
| 4 | Animal Abuse | BREEZY POINT | 2 |
| ... | ... | ... | ... |
| 772 | Vending | STATEN ISLAND | 25 |
| 773 | Vending | SUNNYSIDE | 15 |
| 774 | Vending | WHITESTONE | 1 |
| 775 | Vending | WOODHAVEN | 6 |
| 776 | Vending | WOODSIDE | 15 |

**777 rows × 3 columns**

In [57]:
```
dataset.groupby(['Borough','Complaint Type','Descriptor']).size()
```

Out[57]:
```
Borough       Complaint Type         Descriptor
BRONX         Animal Abuse           Chained                      166
                                     In Car                        41
                                     Neglected                    951
                                     No Shelter                   165
                                     Other (complaint details)    412
                                                                  ...
Unspecified   Noise - Vehicle        Engine Idling                 13
              Posting Advertisement  Vehicle                        1
              Traffic                Truck Route Violation          1
              Vending                In Prohibited Area             2
                                     Unlicensed                     5
Length: 290, dtype: int64
```

# 4.Visualize the major types of complaints in each city

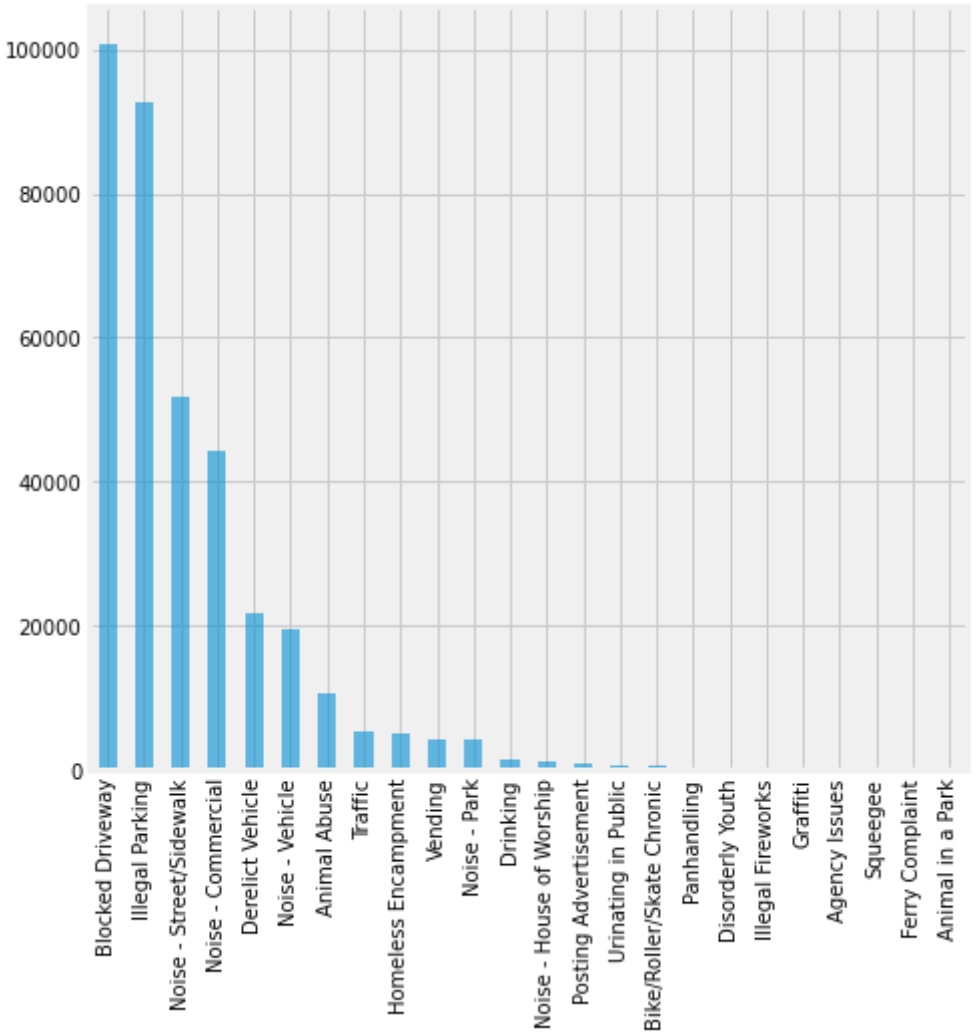
In [59]:
```
complaintTypecity = pd.DataFrame({'count':dataset.groupby(['City','Complaint Type']
complaintTypecity
```

Out[59]:

| | City | Complaint Type | count |
|---|---|---|---|
| 0 | ARVERNE | Animal Abuse | 46 |
| 1 | ARVERNE | Blocked Driveway | 50 |
| 2 | ARVERNE | Derelict Vehicle | 32 |
| 3 | ARVERNE | Disorderly Youth | 2 |
| 4 | ARVERNE | Drinking | 1 |
| ... | ... | ... | ... |
| 772 | Woodside | Blocked Driveway | 27 |
| 773 | Woodside | Derelict Vehicle | 8 |
| 774 | Woodside | Illegal Parking | 124 |
| 775 | Woodside | Noise - Commercial | 2 |
| 776 | Woodside | Noise - Street/Sidewalk | 5 |

777 rows × 3 columns

In [58]:
```
dataset['Complaint Type'].value_counts().plot(kind='bar',alpha=0.6,figsize=(7,7))
plt.show()
```




In [ ]:

# 5. Check if the average response time across various types of complaints

In [76]:
```
data_date
```

Out[76]:

| | Created Date | Closed Date | Due Date |
|---|---|---|---|
| 0 | 2015-12-31 23:59:45 | 2016-01-01 00:55:15 | 2016-01-01 07:59:45 |
| 1 | 2015-12-31 23:59:44 | 2016-01-01 01:26:57 | 2016-01-01 07:59:44 |
| 2 | 2015-12-31 23:59:29 | 2016-01-01 04:51:03 | 2016-01-01 07:59:29 |
| 3 | 2015-12-31 23:57:46 | 2016-01-01 07:43:13 | 2016-01-01 07:57:46 |
| 4 | 2015-12-31 23:56:58 | 2016-01-01 03:24:42 | 2016-01-01 07:56:58 |
| ... | ... | ... | ... |
| 364553 | 2015-01-01 00:04:44 | 2015-01-01 10:22:31 | 2015-01-01 08:04:44 |
| 364554 | 2015-01-01 00:04:28 | 2015-01-01 02:25:02 | 2015-01-01 08:04:28 |
| 364555 | 2015-01-01 00:01:30 | 2015-01-01 00:20:33 | 2015-01-01 08:01:30 |
| 364556 | 2015-01-01 00:01:29 | 2015-01-01 02:42:22 | 2015-01-01 08:01:29 |
| 364557 | 2015-01-01 00:00:50 | 2015-01-01 02:47:50 | 2015-01-01 08:00:50 |

**364558 rows × 3 columns**

In [77]:
```
data_date['Request_Closing_Time'] =data_date['Closed Date'] -data_date['Created Dat

data_date['Request_Closing_Time'].head()
```

Out[77]:
```
0   0 days 00:55:30
1   0 days 01:27:13
2   0 days 04:51:34
3   0 days 07:45:27
4   0 days 03:27:44
Name: Request_Closing_Time, dtype: timedelta64[ns]
```

In [78]:
```
data_date
```

Out[78]:

| | Created Date | Closed Date | Due Date | Request_Closing_Time |
|---|---|---|---|---|
| 0 | 2015-12-31 23:59:45 | 2016-01-01 00:55:15 | 2016-01-01 07:59:45 | 0 days 00:55:30 |
| 1 | 2015-12-31 23:59:44 | 2016-01-01 01:26:57 | 2016-01-01 07:59:44 | 0 days 01:27:13 |
| 2 | 2015-12-31 23:59:29 | 2016-01-01 04:51:03 | 2016-01-01 07:59:29 | 0 days 04:51:34 |
| 3 | 2015-12-31 23:57:46 | 2016-01-01 07:43:13 | 2016-01-01 07:57:46 | 0 days 07:45:27 |
| 4 | 2015-12-31 23:56:58 | 2016-01-01 03:24:42 | 2016-01-01 07:56:58 | 0 days 03:27:44 |
| ... | ... | ... | ... | ... |
| 364553 | 2015-01-01 00:04:44 | 2015-01-01 10:22:31 | 2015-01-01 08:04:44 | 0 days 10:17:47 |
| 364554 | 2015-01-01 00:04:28 | 2015-01-01 02:25:02 | 2015-01-01 08:04:28 | 0 days 02:20:34 |
| 364555 | 2015-01-01 00:01:30 | 2015-01-01 00:20:33 | 2015-01-01 08:01:30 | 0 days 00:19:03 |
| 364556 | 2015-01-01 00:01:29 | 2015-01-01 02:42:22 | 2015-01-01 08:01:29 | 0 days 02:40:53 |
| 364557 | 2015-01-01 00:00:50 | 2015-01-01 02:47:50 | 2015-01-01 08:00:50 | 0 days 02:47:00 |

**364558 rows × 4 columns**

In [81]:
```
Request_Closing_Time = data_date['Request_Closing_Time']
Request_Closing_Time.describe()
```

Out[81]:
```
count                        362177
mean     0 days 04:11:53.299632500
std      0 days 05:51:42.547519569
min                0 days 00:01:01
25%                0 days 01:15:33
50%                0 days 02:40:16
75%                0 days 05:14:38
max               24 days 16:52:22
Name: Request_Closing_Time, dtype: object
```

**4 hr 11min is average response time across various types of complaints**

In [ ]: