In [1]:
```
import pandas as pd
import numpy as np
import matplotlib as mpl
from matplotlib import pyplot as plt
%matplotlib inline
plt.rcParams['figure.facecolor']='white'
mpl.rcParams['lines.linewidth'] = 3
import warnings
warnings.filterwarnings("ignore")
```

In [2]:
```
df = pd.read_csv('311_Service_Requests_from_2010_to_Present.csv', header=0,
     sep=',', parse_dates={'Created Date', 'Closed Date', 'Resolution Action Updated Date'},i
ndex_col='Unique Key')
```

Calculating Request_Closing_Time in terms of hrs

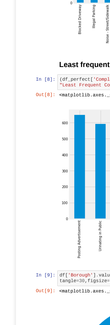
In [5]:
```
def prepareRdata(df):
    df['Request_Closing_Time'] = (df['Closed Date'] - df['Created Date']).dt.seconds/60/60
    df_clean=df[['Request_Closing_Time']].notnull()]
    df_perfect = df_clean['Closed Date'] >= df_clean['Created Date']]
    return df_perfect
```

In [6]:
```
df_perfect=prepareRdata(df)
```

Most Common Complain in NYC

In [7]:
```
(df_perfect['Complaint Type'].value_counts()).head(15).plot(kind='bar',figsize=(10,6),title=
"Most Common Complaints")
```

Out[7]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x141bf450>
```



Least frequent complain in NYC

In [8]:
```
(df_perfect['Complaint Type'].value_counts()).tail(15).plot(kind='bar',figsize=(10,6),title=
"Least Frequent Complaints")
```

Out[8]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x17bf5790>
```

In [9]:
```
df['Borough'].value_counts().plot(kind='pie',autopct='%1.1f%%',explode=(0.15,0,0,0,0),star
tangle=30,figsize=(15,8))
```

Out[9]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x17dd31b0>
```

AS we see from above pie chart the most of the complain are requested from the Brooklyn

In [12]:
```
var = df_perfect.groupby('Complaint Type').Request_Closing_Time.mean()
frequent = df_perfect['Complaint Type'].value_counts()
var = var.ix[frequent.index]
fig = plt.figure(figsize=(15,12))
ax1 = fig.add_subplot(1,1,1)
ax1.set_xlabel('Complaint_Type')
ax1.set_ylabel('Average Response Time')
ax1.set_title("Average Response time of Complain")
var.head(20).plot(kind='bar')
```

Out[12]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x159e7710>
```

Here we can see that the Derlict Vechicle and Graffiti complain take a long response time

In [13]:
```
df_perfect['Location Type'].value_counts().plot(kind='bar',figsize=(15,8),title='Location ty
pe Vs Complain')
```

Out[13]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x1193ddf0>
```

Here we can see that the most of the complian are registered from the StreetSidewalk

In [14]:
```
#Order the complaint types based on the average 'Request_Closing_Time', grouping them for di
fferent locations.
```

In [15]:
```
groupedby_complaintype= df_perfect.sort_values(['Request_Closing_Time']).groupby(['Location
Type','Complaint Type'])['Request_Closing_Time'].mean()
```

In [16]:
```
dataFrameByLocationType = pd.DataFrame(groupedby_complaintype)
```

In [17]:
```
dataFrameByLocationType
```

Out[17]:

Location Type	Complaint Type	Request_Closing_Time
Bridge	Homeless Encampment	3.833306
Club/Bar/Restaurant	Drinking	4.019785
	Noise - Commercial	2.881485
	Urinating in Public	3.451429
Commercial	Animal Abuse	4.568571
Highway	Derelict Vehicle	4.503397
	Homeless Encampment	3.271167
	Traffic	3.318645
House and Store	Animal Abuse	4.497133
House of Worship	Noise - House of Worship	2.964212
Park	Animal in a Park	3.834722
Park/Playground	Animal Abuse	3.309051
	Drinking	3.441329
	Homeless Encampment	3.787853
	Illegal Fireworks	5.003056
	Noise - Park	3.253613
	Panhandling	3.219857
	Urinating in Public	2.962493
	Vending	3.487124
Parking Lot	Animal Abuse	4.449490
	Posting Advertisement	2.110764
Residential Building	Animal Abuse	4.395258
Residential Building/House	Animal Abuse	4.851594
	Bike/Roller/Skate Chronic	3.611300
	Disorderly Youth	3.854477
	Drinking	3.599216
	Graffiti	3.021657
	Homeless Encampment	4.582294
	Illegal Fireworks	3.336714
	Panhandling	5.165556
...	...	...
Store/Commercial	Drinking	3.252696
	Graffiti	5.560642
	Homeless Encampment	4.002366
	Illegal Fireworks	1.924167
	Noise - Commercial	3.082607
	Panhandling	4.346343
	Posting Advertisement	2.365167
	Urinating in Public	3.076107
	Vending	3.962727
Street/Sidewalk	Animal Abuse	4.233870
	Bike/Roller/Skate Chronic	3.500316
	Blocked Driveway	4.384645
	Derelict Vehicle	5.596804
	Disorderly Youth	3.354450
	Drinking	3.408614
	Graffiti	7.237522
	Homeless Encampment	3.965461
	Illegal Fireworks	2.349864
	Illegal Parking	4.142549
	Noise - Street/Sidewalk	3.221731
	Noise - Vehicle	3.376236
	Panhandling	3.544873
	Posting Advertisement	1.777614
	Squeegee	4.646625
	Traffic	3.201574
	Urinating in Public	3.206283
	Vending	3.791013
Subway Station	Animal Abuse	3.059606
	Urinating in Public	3.152130
Vacant Lot	Derelict Vehicle	4.340354

69 rows × 1 columns

- Whether the average response time across complaint types is similar or not (overall)
- Are the type of complaint or service requested and location related?

In [18]:
```
df_complain_and_average = df_perfect.groupby('Complaint Type').Request_Closing_Time.mean()
```

In [19]:
```
df_complain_and_average = pd.DataFrame(df_complain_and_average)
```

In [20]:
```
average_response_time = df_perfect['Request_Closing_Time'].mean()
```

In [21]:
```
average_response_time
```

Out[21]:
```
3.9293661186253539
```

In [22]:
```
df_perfect.shape
```

Out[22]:
```
(298534, 53)
```

In [23]:
```
sample_data = df_perfect.sample(n=2000)
```

In [24]:
```
Hnull = "Response time accross the complain type is not similar"
Halt = "Response time accross the complain type is similar"
```

In [25]:
```
from scipy.stats import ttest_1samp
```

In [26]:
```
ttest_pvalue = ttest_1samp(sample_data['Request_Closing_Time'],average_response_time)
```

In [27]:
```
if pvalue<0.055:
    print("Reject the null hypothesis i.e",end=' ')
    print(Halt)
else
    print("Reject the null hypothesis i.e",end=' ')
    print(Halt)
```

accept the null hypothesis i.e Response time accross the complain type is not similar

In [28]:
```
#Are the type of complaint or service requested and location related
```

In [30]:
```
Hnull="there is no relation between the Complain and Location"
Halt = "there is relation between the complain and location"
```

In [32]:
```
datatable = pd.crosstab(df_perfect['Complaint Type'],df_perfect['Location Type'])
```

In [34]:
```
datatable.head()
```

Out[34]:

Location Type	Bridge	Club/Bar/Restaurant	Commercial	Highway	House and Store	House of Worship	Park	Park/Playground	Parking Lot	Residential Building
Complaint Type										
Animal Abuse	0	0	62	0	93	0	0	122	110	1
Animal in a Park	0	0	0	0	0	0	1	0	0	0
Bike/Roller/Skate Chronic	0	0	0	0	0	0	0	0	0	0
Blocked Driveway	0	0	0	0	0	0	0	0	0	0
Derelict Vehicle	0	0	0	13	0	0	0	0	0	0

In [35]:
```
observed_values = datatable.values
```

In [38]:
```
from scipy import stats
```

In [39]:
```
val = stats.chi2_contingency(datatable)
```

In [60]:
```
pvalue = val[1]
```

In [61]:
```
alpha = 0.05
```

In [62]:
```
if pvalue<alpha:
    print("Reject the null Hypothesis i.e ",end=' ')
    print(Halt)
else
    print("Accept the null Hypothesis i.e",end=' ')
    print(Hnull)
```

Reject the null Hypothesis i.e

there is relation between the complain and location

In [ ]:
```
```