oakland-crime-statistics analysis

2020 年 5 月 3 日

```
In [4]: import os
        import pandas as pd
        import matplotlib.pyplot as plt
        os.chdir("C:/Users/acer_pc/Downloads/oakland-crime-statistics-2011-to-2016")
        data = pd.read_csv("records-for-2011.csv")
```

读取数据各属性的基本信息。可看出非空元素个数

```
In [6]: data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 180016 entries, 0 to 180015
Data columns (total 10 columns):
Agency                       180015 non-null object
Create Time                  180015 non-null object
Location                     180016 non-null object
Area Id                      179112 non-null float64
Beat                         179496 non-null object
Priority                     180015 non-null float64
Incident Type Id             180015 non-null object
Incident Type Description    180015 non-null object
Event Number                 180015 non-null object
Closed Time                  180009 non-null object
dtypes: float64(2), object(8)
memory usage: 13.7+ MB
```

查看各项数据的独立元素个数

```
In [4]: data.nunique()
```

```
Out[4]: Agency                            1
        Create Time                  179451
```

```
Location                        32505
Area Id                             3
Beat                               58
Priority                            3
Incident Type Id                  263
Incident Type Description         265
Event Number                   180015
Closed Time                    179506
dtype: int64
```

打印数据前 3 行

```
In [8]: data.head(3)
```

```
Out[8]:   Agency                Create Time          Location  Area Id Beat  Priority  \
       0     OP  2011-01-01T00:00:00.000  ST&SAN PABLO AV      1.0  06X       1.0
       1     OP  2011-01-01T00:01:11.000    ST&HANNAH ST       1.0  07X       1.0
       2     OP  2011-01-01T00:01:25.000    ST&MARKET ST       1.0  10Y       2.0

         Incident Type Id Incident Type Description     Event Number  \
       0             PDOA      POSSIBLE DEAD PERSON  LOP110101000001
       1            415GS              415 GUNSHOTS  LOP110101000002
       2            415GS              415 GUNSHOTS  LOP110101000003

                      Closed Time
       0  2011-01-01T00:28:17.000
       1  2011-01-01T01:12:56.000
       2  2011-01-01T00:07:20.000
```

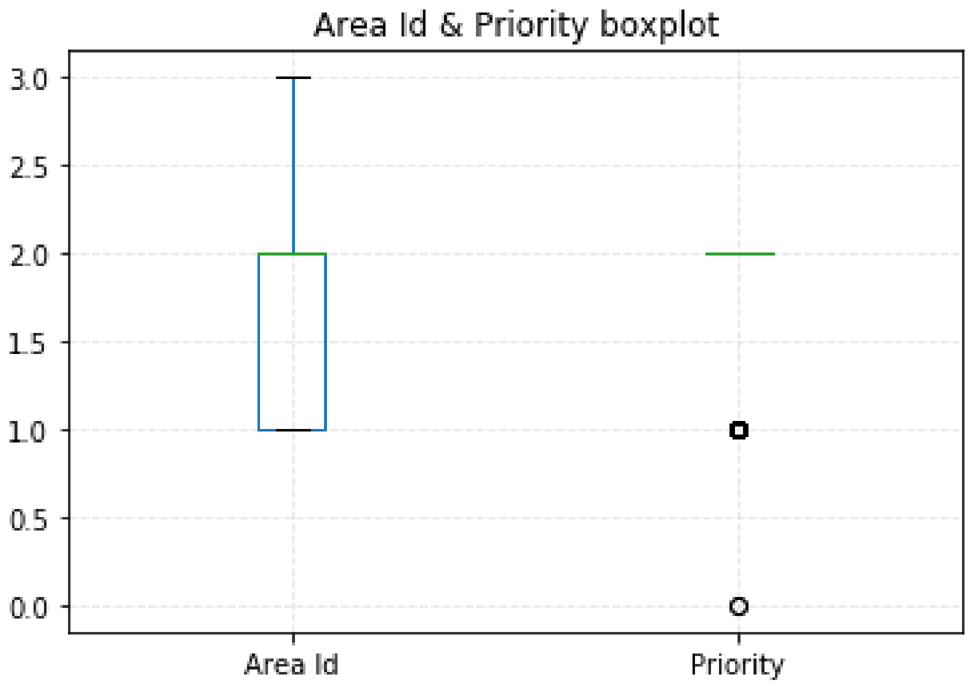
查看数值类型属性的五数概括

```
In [10]: data.describe()
```

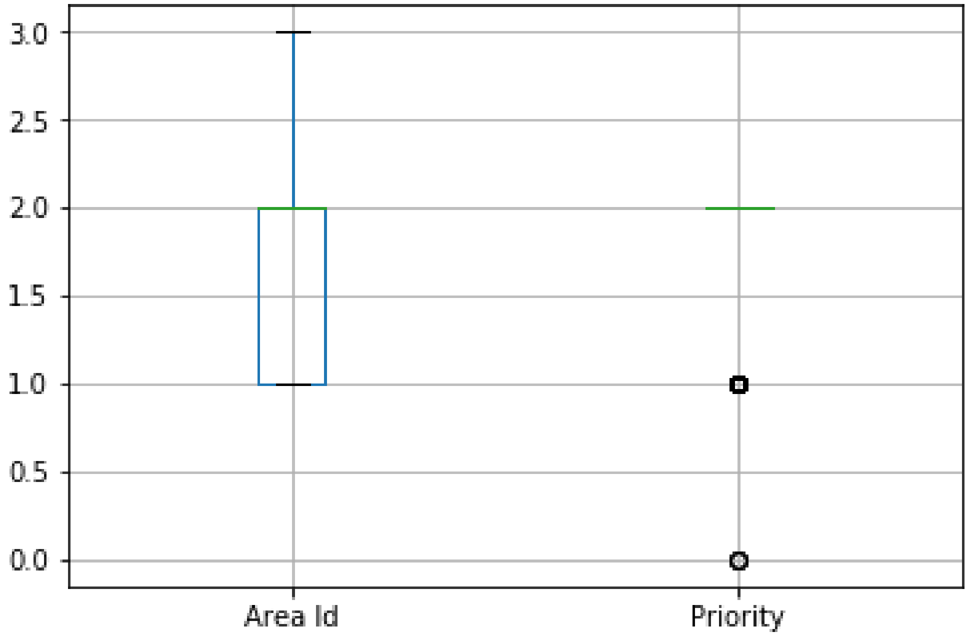
```
Out[10]:              Area Id       Priority
         count  179112.000000  180015.000000
         mean        1.740648       1.796111
         std         0.746468       0.402916
         min         1.000000       0.000000
         25%         1.000000       2.000000
         50%         2.000000       2.000000
         75%         2.000000       2.000000
         max         3.000000       2.000000
```

盒图

```
In [15]: df = pd.DataFrame(data)
         df.plot.box(title="Area Id & Priority boxplot")

         plt.grid(linestyle="--", alpha=0.3)
         plt.show()
```

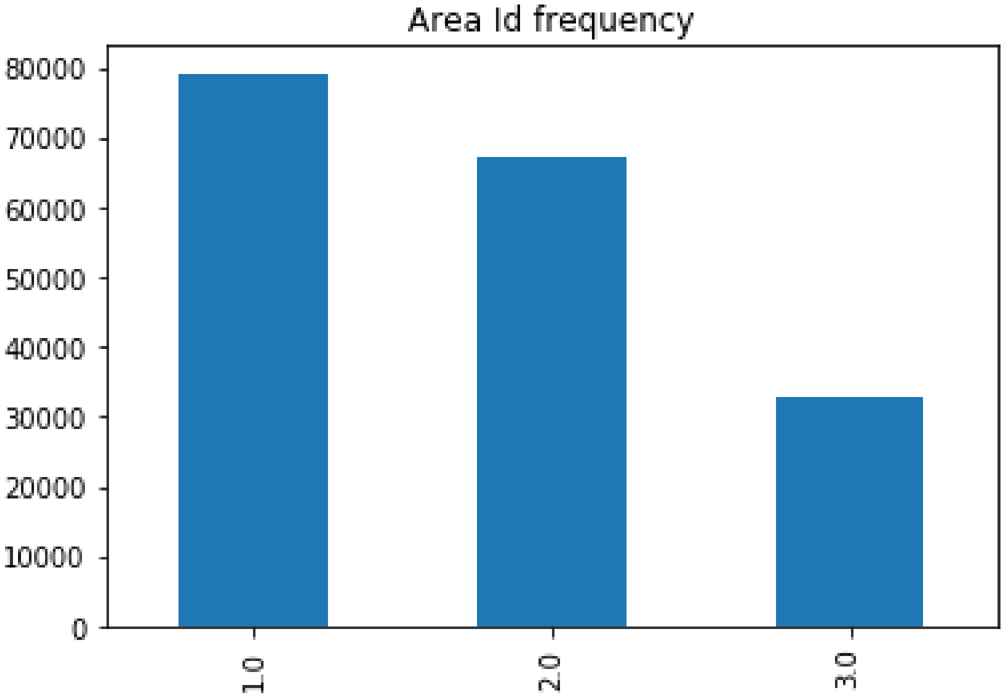


```
In [18]: p = data.boxplot(return_type='dict')
         x = p['fliers'][0].get_xdata()
         y = p['fliers'][0].get_ydata()
         y.sort()


         for i in range(len(x)):
           if i > 0:
             plt.annotate(y[i], xy = (x[i],y[i]), xytext=(x[i]+0.05 -0.8/(y[i]-y[i-1]),y[i]))
           else:
             plt.annotate(y[i], xy = (x[i],y[i]), xytext=(x[i]+0.08,y[i]))

         plt.show()
```

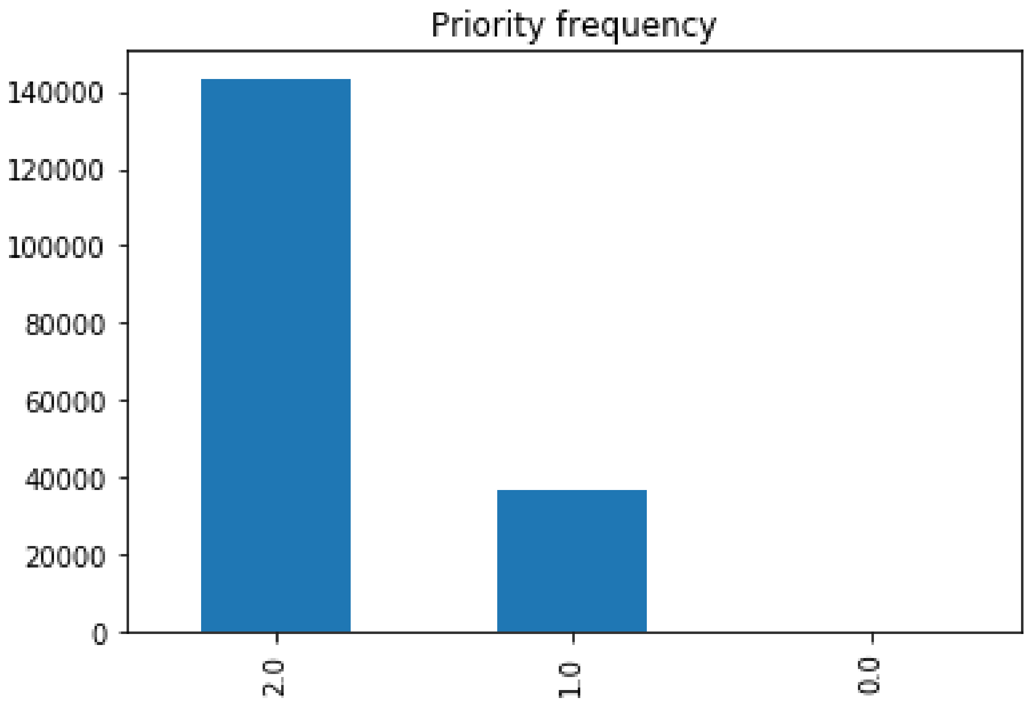


数据可视化（柱状图）

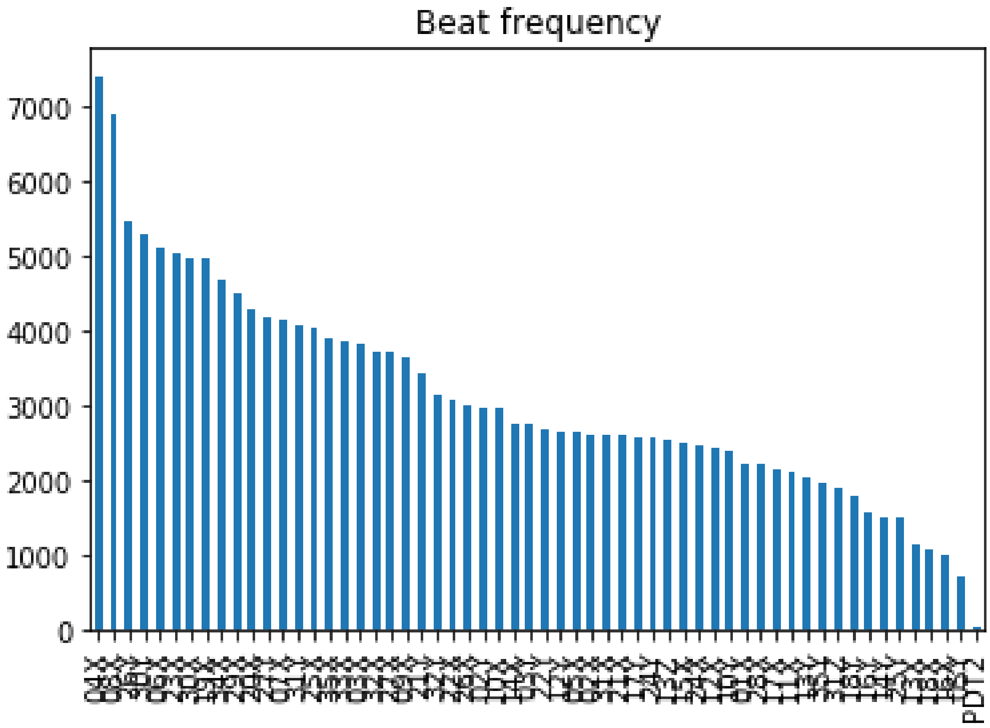
```
In [18]: df['Area Id'].value_counts().plot.bar()
         plt.title("Area Id frequency")
         plt.show()
```



```
In [19]: df['Priority'].value_counts().plot.bar()
         plt.title("Priority frequency")
         plt.show()
```



```
In [16]: # Non-numerical data <Beat>
         df['Beat'].value_counts().plot.bar()
         plt.title("Beat frequency")
         plt.show()
```



分别对缺失数据进行丢弃、众数填补、基于属性间相关度填补、基于属性内信息填补

```
In [39]: # NaN data processing
         p1 = df.dropna() #drop
         Pri_mode = df['Priority'].value_counts().index.tolist()[0]
         Area_mode = df['Area Id'].value_counts().index.tolist()[0]
         Beat_mode = df['Beat'].value_counts().index.tolist()[0]
         modes = {'Area Id':Area_mode,'Priority':Pri_mode,'Beat':Beat_mode }
         p2 = df.fillna(value=modes)
```

```
{'Area Id': 1.0, 'Priority': 2.0, 'Beat': '04X'}
```

```
In [75]: p3 = df.copy()
         null_pos = df['Area Id'][df['Area Id'].isnull().values==True].index.tolist()
         for idx in null_pos[:-1]:
             location = df['Location'].tolist()[idx]
             values = df['Area Id'][df.Location==location].value_counts().index.tolist()
             if values==[]:
                 value = 0
             else:
```

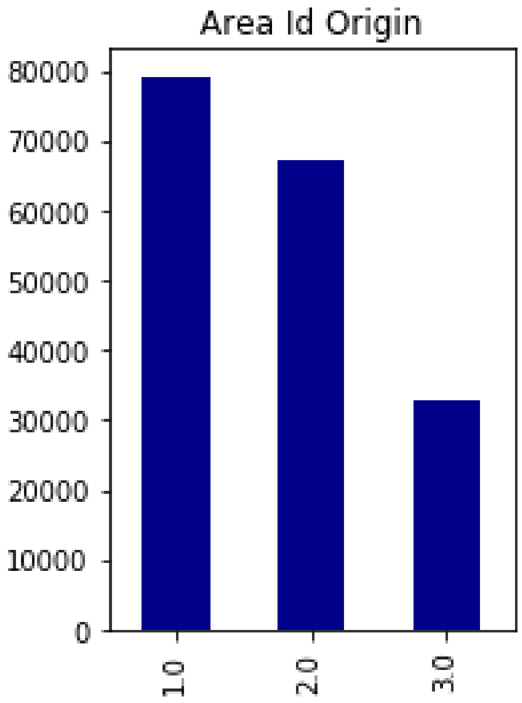
```
        value = values[0]
    p3['Area Id'][idx] = value
```

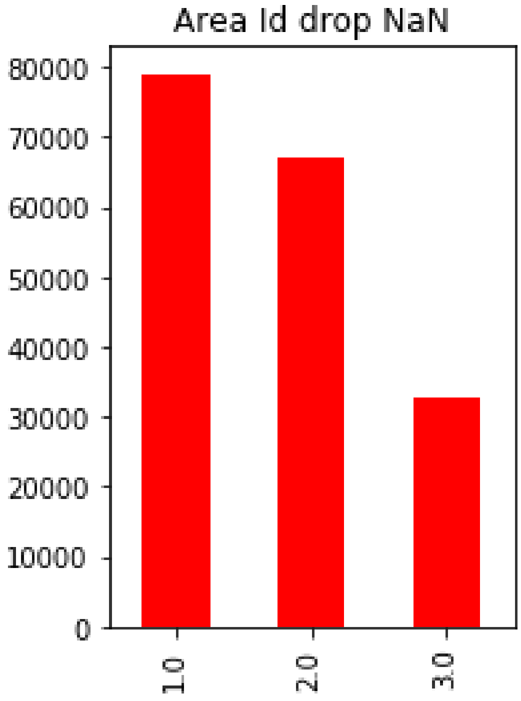
```
D:\anaconda3\lib\site-packages\ipykernel_launcher.py:10: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: http://pandas.pydata.org/pandas-docs/stable/indexing.html#in
  # Remove the CWD from sys.path while we load stuff.
```

```
In [76]: p3['Beat'] = p3['Beat'].fillna(method="ffill")
```

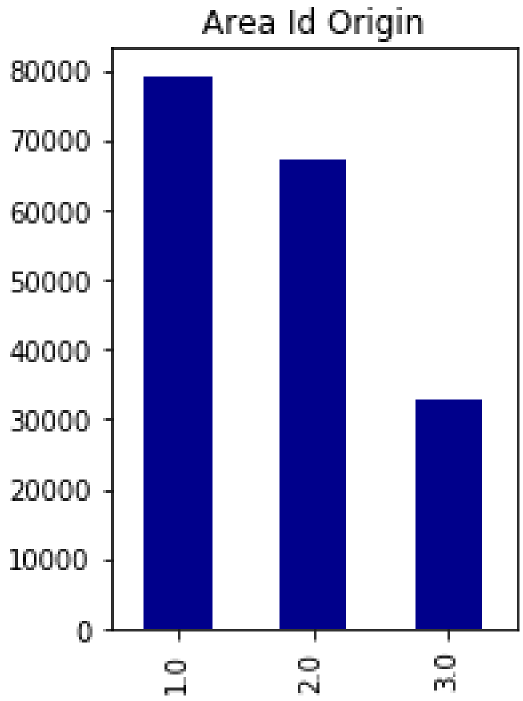
缺失数据处理结果与原始数据可视化对比

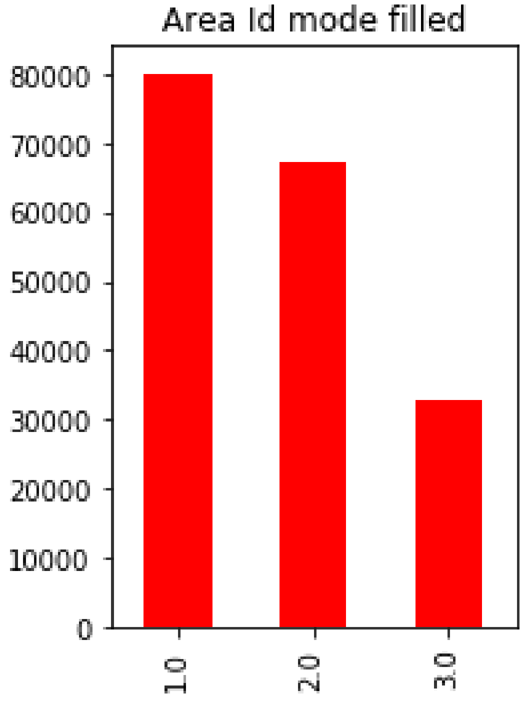
```
In [130]: # compare1
          plt.subplot(121)
          ax=df['Area Id'].value_counts().plot.bar(color='DarkBlue')
          plt.title("Area Id Origin")
          plt.show()

          plt.subplot(122)
          bx = p1['Area Id'].value_counts().plot.bar(color='Red')
          plt.title("Area Id drop NaN")
          plt.show()
```



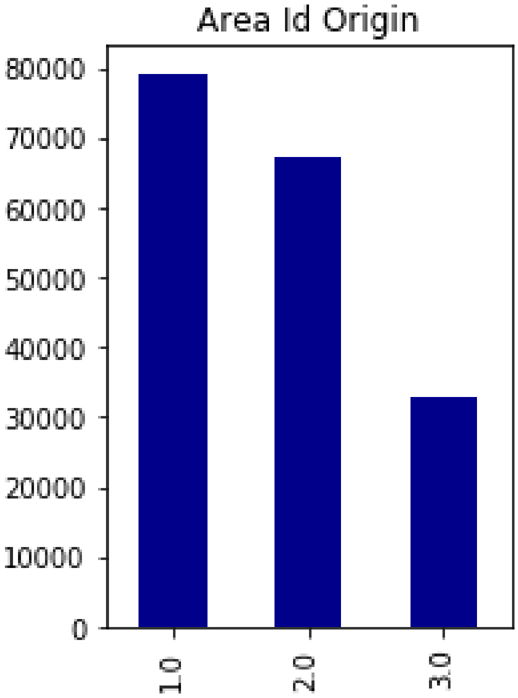


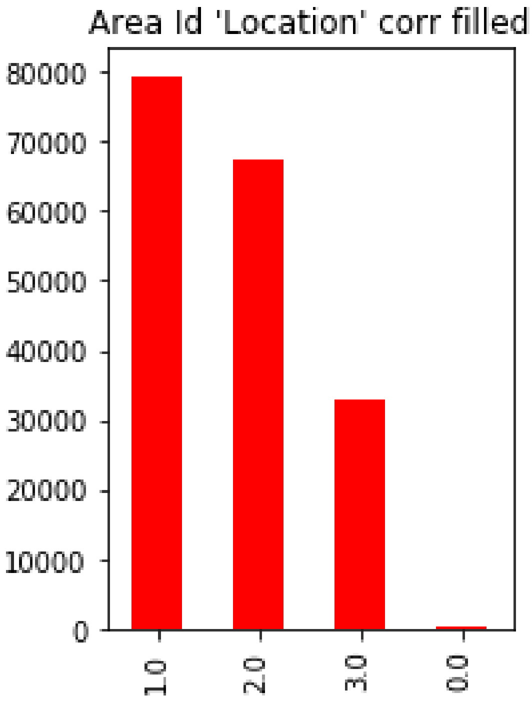
```
In [125]: # compare2
          plt.subplot(121)
          ax=df['Area Id'].value_counts().plot.bar(color='DarkBlue')
          plt.title("Area Id Origin")
          plt.show()

          plt.subplot(122)
          bx = p2['Area Id'].value_counts().plot.bar(color='Red')
          plt.title("Area Id mode filled")
          plt.show()
```


Area Id Origin
80000
70000
60000
50000
40000
30000
20000
10000
0
1.0
2.0
3.0

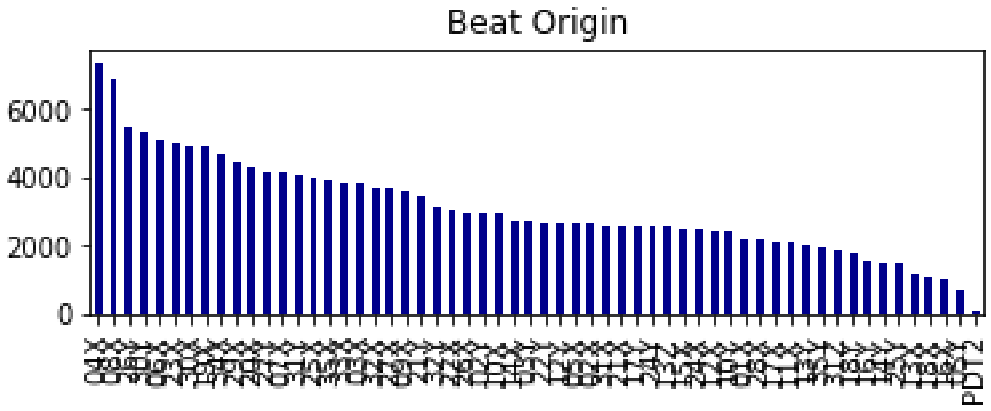

Area Id mode filled
80000
70000
60000
50000
40000
30000
20000
10000
0
1.0
2.0
3.0

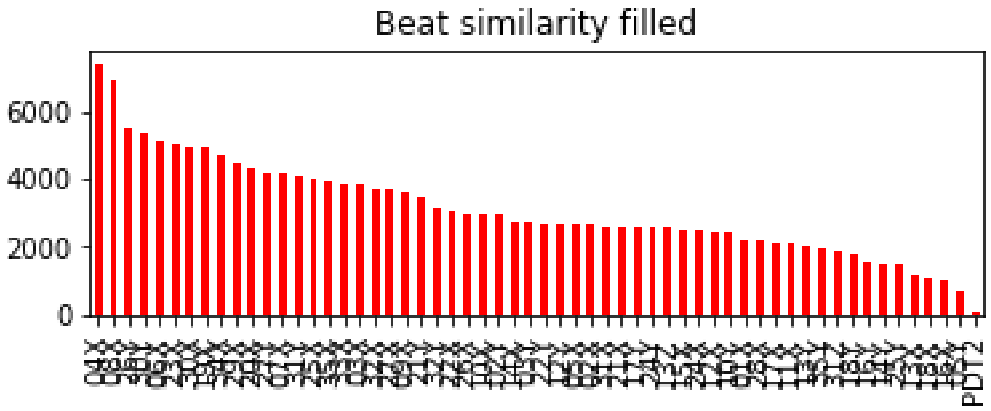
```
In [126]: # compare3
          plt.subplot(121)
          ax=df['Area Id'].value_counts().plot.bar(color='DarkBlue')
          plt.title("Area Id Origin")
          plt.show()

          plt.subplot(122)
          bx = p3['Area Id'].value_counts().plot.bar(color='Red')
          plt.title("Area Id 'Location' corr filled")
          plt.show()
```





```
In [129]: # compare4
          plt.subplot(211)
          ax=df['Beat'].value_counts().plot.bar(color='DarkBlue')
          plt.title("Beat Origin")
          plt.show()

          plt.subplot(212)
          bx = p3['Beat'].value_counts().plot.bar(color='Red')
          plt.title("Beat similarity filled")
          plt.show()
```




Beat similarity filled
6000
4000
2000
0
PDT2