Oakland Crime Statistics 2011 to 2016

```
import numpy as np # linear algebra
import pandas as pd # data processing, CSV file I/O (e.g. pd.read_csv)
import seaborn as sns
import json
import ast
import datetime as dt
from dateutil import tz
from dateutil import parser
import matplotlib.pyplot as plt
import time

# Input data files are available in the "../input/" directory.
# For example, running this (by clicking run or pressing Shift+Enter) will list the files in the input directory

import os
print('\n'.join(os.listdir("./oakland-crime-statistics-2011-to-2016/")))
```

```
socrata_metadata_records-for-2011.json
socrata_metadata_records-for-2016.json
socrata_metadata_records-for-2014.json
socrata_metadata_records-for-2015.json
socrata_metadata_records-for-2012.json
records-for-2016.csv
records-for-2014.csv
records-for-2015.csv
records-for-2011.csv
records-for-2012.csv
socrata_metadata_records-for-2013.json
records-for-2013.csv
```

数据预处理

首先对数据进行预处理，将时间的换算成秒，将时间划分成几个时间段，并且将数据中的空值直接去除。

```
intervals = (
    ('weeks', 604800),  # 60 * 60 * 24 * 7
    ('days', 86400),    # 60 * 60 * 24
    ('hours', 3600),    # 60 * 60
    ('minutes', 60),
    ('seconds', 1),
    )


def get_nlargest_incident_id(n, df):
    return df.groupby(by="Incident Type Id",sort=True, as_index=False).count().nlargest(n, 'Create Time')["Incident Type Id"].values
def get_nlargest_area_id(n, df):
    return df.groupby(by="Area Id",sort=True, as_index=False).count().nlargest(n, 'Create Time')["Area Id"].values
def display_time(seconds, granularity=10):
    result = []

    for name, count in intervals:
        value = seconds // count
        if value:
            seconds -= value * count
            if value == 1:
                name = name.rstrip('s')
            result.append("{} {}".format(value, name))
    return ', '.join(result[:granularity])

def map_x(x):
    if x.hour < 6:
        return "00AM-6AM"
    if x.hour < 12 and x.hour > 6:
        return "6AM-12PM"
    if x.hour >= 12 and x.hour<18:
        return "12PM-6PM"
    if x.hour > 18:
        return "6PM-00AM"

def prep_data(df):
    df['Create Time'] = df['Create Time'].fillna(df['Closed Time'])
    df['Closed Time'] = df['Closed Time'].fillna(df['Create Time'])
    df["time_between_creation_and_closed_seconds"] = df.apply(lambda x: abs((parser.parse(x["Closed Time"]) - parser.parse(x["Create
    df["time_of_the_day"] = df["Create Time"].map(lambda x:map_x(parser.parse(x)))
    df.replace(r'', np.nan, regex=True, inplace=True)
    df["Area Id"].fillna(-1, inplace=True)
    df["Beat"].fillna("Unknown", inplace=True)
    df["Priority"].fillna("-1", inplace=True)
    df["Priority"].astype(int)
    df.drop(["Agency", "Event Number"], inplace=True, axis=1)
    df["day_of_the_month"] = df["Create Time"].apply(lambda x: parser.parse(x).day)
    df["day_of_the_week"] = df["day_of_the_month"].apply(lambda x: (x % 7) + 1)
    df["month_of_the_year"] = df["Create Time"].apply(lambda x: parser.parse(x).month)
    return df
```

```
# 五数分布
```

```
def fiveNumber(nums):
        # 五数概括 Minimum（最小值）、Q1、Median（中位数、）、Q3、Maximum（最大值）
    Minimum = min(nums)
    Maximum = max(nums)
    Q1 = np.percentile(nums, 25)
    Median = np.median(nums)
    Q3 = np.percentile(nums, 75)

    IQR = Q3-Q1
    lower_limit = Q1-1.5*IQR  # 下限值
    upper_limit = Q3+1.5*IQR  # 上限值

    return Minimum, Q1, Median, Q3, Maximum, lower_limit, upper_limit


def printfiveNumber(fivenumber):
    print("+++++++++++++++")
    print(f"Min = {fivenumber[0]}")
    print(f"Q1  = {fivenumber[1]}")
    print(f"Median = {fivenumber[2]}")
    print(f"Q3 = {fivenumber[3]}")
    print(f"Max = {fivenumber[4]}")
    print(f"lower_limit = {fivenumber[5]}")
    print(f"upper_limit = {fivenumber[6]}")
    print("+++++++++++++++")
```

导入数据

- 2011年数据

```
crimes_2011 = pd.read_csv("./oakland-crime-statistics-2011-to-2016/records-for-2011.csv")
crimes_2011.drop(index=[180015], inplace=True)
crimes_2011 = prep_data(crimes_2011)
crimes_2011.rename(index=str, columns={"Location": "address"}, inplace=True)
crimes_2011["Priority"].replace(0.0, 1.0, inplace=True)
crimes_2011["Priority"] = crimes_2011["Priority"].astype(int)
crimes_2011.head(2)
```

	Create Time	address	Area Id	Beat	Priority	Incident Type Id	Incident Type Description	Closed Time	time_between_creation_and_
0	2011-01-01T00:00:00.000	ST&SAN PABLO AV	1.0	06X	1	PDOA	POSSIBLE DEAD PERSON	2011-01-01T00:28:17.000	1697
1	2011-01-01T00:01:11.000	ST&HANNAH ST	1.0	07X	1	415GS	415 GUNSHOTS	2011-01-01T01:12:56.000	4305

- 2012年数据

```
crimes_2012 = pd.read_csv("./oakland-crime-statistics-2011-to-2016/records-for-2012.csv")
crimes_2012.dropna(thresh=9, inplace=True)
crimes_2012 = prep_data(crimes_2012)
crimes_2012.rename(index=str, columns={"Location ": "address"}, inplace=True)
crimes_2012["Area Id"] = crimes_2012["Area Id"].astype(int)
crimes_2012["Priority"].replace(0.0, 1.0, inplace=True)
crimes_2012["Priority"] = crimes_2012["Priority"].astype(int)
crimes_2012.head(2)
```

	Create Time	Area Id	Beat	Priority	Incident Type Id	Incident Type Description	Closed Time	Location 1	Zip Codes	time_betweer

	Create Time	Area Id	Beat	Priority	Incident Type Id	Incident Type Description	Closed Time	Location 1	Zip Codes	time_betweer
0	2012-01-01T00:00:25.000	2	32Y	2	415GS	415 GUNSHOTS	2012-01-01T00:40:27.000	{'human_address': '{"address": "OLIVE ST", "ci...	NaN	2402
1	2012-01-01T00:00:27.000	2	30Y	2	415GS	415 GUNSHOTS	2012-01-01T01:34:31.000	{'human_address': '{"address": "AV&MACARTHUR B...	NaN	5644

- 2013年数据

```
crimes_2013 = pd.read_csv("./oakland-crime-statistics-2011-to-2016/records-for-2013.csv")
crimes_2013.dropna(thresh=9, inplace=True)
crimes_2013 = prep_data(crimes_2013)
crimes_2013.rename(index=str, columns={"Location ": "address"}, inplace=True)
crimes_2013["Area Id"] = crimes_2013["Area Id"].astype(int)
crimes_2013["Priority"].replace(0.0, 1.0, inplace=True)
crimes_2013["Priority"] = crimes_2013["Priority"].astype(int)
crimes_2013.head(2)
```

	Create Time	address	Area Id	Beat	Priority	Incident Type Id	Incident Type Description	Closed Time	time_between_creation_and_clos
0	2013-01-01T00:00:00.000	D ST	2	33X	1	415GS	415 GUNSHOTS	2013-01-01T00:47:51.000	2871
1	2013-01-01T00:00:05.000	ARTHUR ST	2	30X	2	415GS	415 GUNSHOTS	2013-01-01T01:30:58.000	5453

- 2014年数据

```
crimes_2014 = pd.read_csv("./oakland-crime-statistics-2011-to-2016/records-for-2014.csv")
crimes_2014.dropna(thresh=9, inplace=True)
crimes_2014 = prep_data(crimes_2014)
crimes_2014.rename(index=str, columns={"Location ": "address"}, inplace=True)
crimes_2014["Area Id"] = crimes_2013["Area Id"].astype(int)
crimes_2014["Priority"].replace(0.0, 1.0, inplace=True)
crimes_2014["Priority"] = crimes_2013["Priority"].astype(int)
crimes_2014.head(2)
```

	Create Time	Area Id	Beat	Priority	Incident Type Id	Incident Type Description	Closed Time	Location 1	Zip Codes	time_betwe
0	2014-01-01T00:00:00.000	2.0	02X	1.0	415GS	415 GUNSHOTS	2014-01-01T03:22:08.000	{'human_address': '{"address": "LINDEN ST", "c...	NaN	12128
1	2014-01-01T00:00:00.000	2.0	26Y	2.0	415GS	415 GUNSHOTS	2014-01-01T02:56:31.000	{'human_address': '{"address": "AV&INTERNATION...	NaN	10591

- 2015年数据

```
crimes_2015 = pd.read_csv("./oakland-crime-statistics-2011-to-2016/records-for-2015.csv")
crimes_2015.dropna(thresh=9, inplace=True)
crimes_2015 = prep_data(crimes_2015)
crimes_2015.rename(index=str, columns={"Location ": "address"}, inplace=True)
crimes_2015["Area Id"] = crimes_2013["Area Id"].astype(int)
crimes_2015["Priority"].replace(0.0, 1.0, inplace=True)
crimes_2015["Priority"] = crimes_2013["Priority"].astype(int)
crimes_2015.head(2)
```

	Create Time	Location	Area Id	Beat	Priority	Incident Type Id	Incident Type Description	Closed Time	time_between_creation_and_
0	2015-01-01T00:01:59.000	S ELMHURST AV	2.0	31Y	1.0	415	DISTURBING THE PEACE	2015-01-01T06:23:08.000	22869
1	2015-01-01T00:02:02.000	AV&D ST	2.0	32X	2.0	415GS	415 GUNSHOTS	2015-01-01T01:44:40.000	6158

- 2016年数据

```
crimes_2016 = pd.read_csv("./oakland-crime-statistics-2011-to-2016/records-for-2016.csv")
crimes_2016.dropna(thresh=9, inplace=True)
crimes_2016 = prep_data(crimes_2016)
crimes_2016.rename(index=str, columns={"Location": "address"}, inplace=True)
crimes_2016["Priority"] = crimes_2016["Priority"].astype(int)
crimes_2016.head(2)
```

	Create Time	address	Area Id	Beat	Priority	Incident Type Id	Incident Type Description	Closed Time	time_between_creation_and
0	2016-01-01T00:00:57.000	ST&MARKET ST	P1	05X	2	415GS	415 GUNSHOTS	2016-01-01T00:32:30.000	1893
1	2016-01-01T00:01:25.000	AV&HAMILTON ST	P3	26Y	2	415GS	415 GUNSHOTS	2016-01-01T00:48:23.000	2818

数据可视化和摘要

犯罪持续时间五数分布

```
print("五数分析")
for i, crime_year in enumerate(crimes_list):
    five = fiveNumber(crime_year[crime_year["Priority"] == 1]["time_between_creation_and_closed_seconds"])
    print(str(2011+i)+"time_between_creation_and_closed_seconds")
    printfiveNumber(five)
```

五数分析
2011time_between_creation_and_closed_seconds
+++++++++++++++
Min = 0
Q1 = 1379.0
Median = 3393.0
Q3 = 7047.0
Max = 86241
lower_limit = -7123.0
upper_limit = 15549.0
+++++++++++++++
2012time_between_creation_and_closed_seconds
+++++++++++++++
Min = 0
Q1 = 1396.25
Median = 3890.0
Q3 = 8941.0
Max = 86343
lower_limit = -9920.875
upper_limit = 20258.125
+++++++++++++++
2013time_between_creation_and_closed_seconds
+++++++++++++++
Min = 0
Q1 = 1635.0
Median = 4024.0
Q3 = 8136.0
Max = 86388
lower_limit = -8116.5
upper_limit = 17887.5
+++++++++++++++
2014time_between_creation_and_closed_seconds
+++++++++++++++
Min = 0
Q1 = 1500.0
Median = 4304.0
Q3 = 10436.0
Max = 86399
lower_limit = -11904.0
upper_limit = 23840.0
+++++++++++++++
2015time_between_creation_and_closed_seconds
+++++++++++++++
Min = 0
Q1 = 1313.0
Median = 3976.5
Q3 = 9604.25
Max = 86399
lower_limit = -11123.875
upper_limit = 22041.125
+++++++++++++++
2016time_between_creation_and_closed_seconds
+++++++++++++++
Min = 0
Q1 = 1541.5
Median = 3830.0
Q3 = 8049.0
Max = 86399
lower_limit = -8219.75
upper_limit = 17810.25
+++++++++++++++

犯罪处理时间随时间的变化

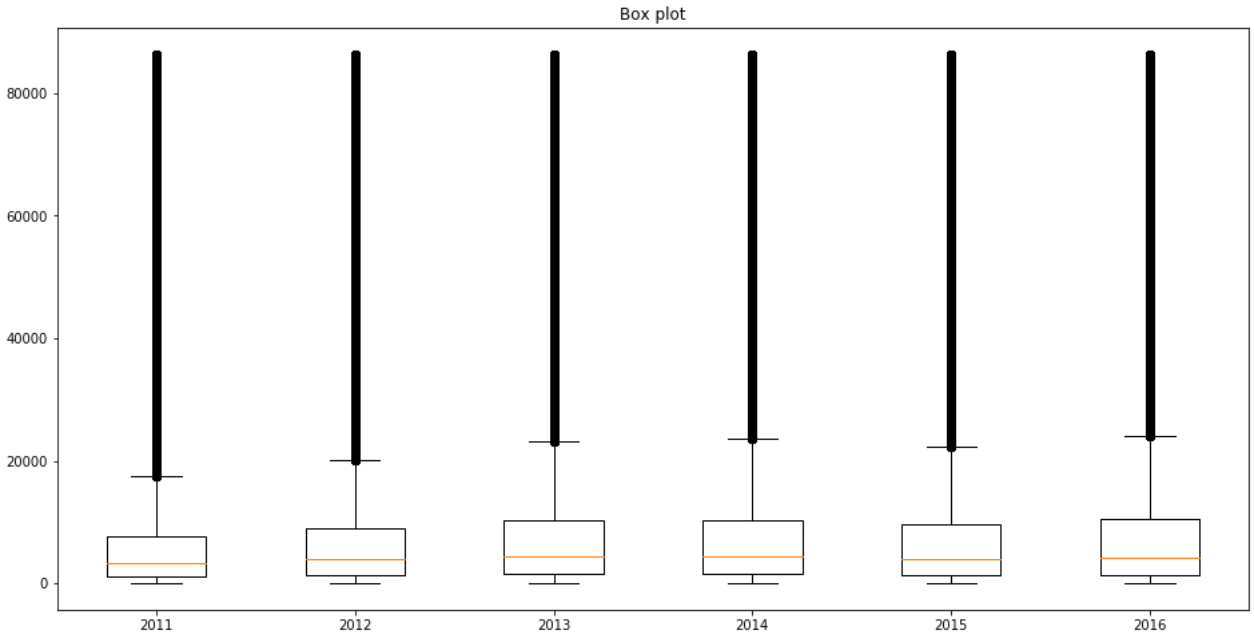
```
def box_plot(all_data):
#     all_data = np.array(all_data)
    fig = plt.figure(figsize=(16,8))

    plt.boxplot(all_data,notch=False, sym='o',vert=True)   # vertical box aligmnent  # vertical box aligmnent
    year_list = []
    for i in range(2011,2017):
        year_list.append(str(i))
    plt.xticks([i for i in range(1,7)],year_list)
#     plt.xlabel('measurement x')
    t = plt.title('Box plot')
    plt.show()
```

每年犯罪持续时间盒图

```
box = []
for crime_year in crimes_list:
    plt.subplots_adjust(left=0, right=2.5, top=3, bottom=1)
    box.append(crime_year["time_between_creation_and_closed_seconds"])
# box = box.transpose()
print(np.shape(box))
#         plt.boxplot(box,notch=False, sym='o',vert=True)   # vertical box aligmnent  # vertical box aligmnent
#         plot.show()

box_plot(box)
```

```
(6,)
```

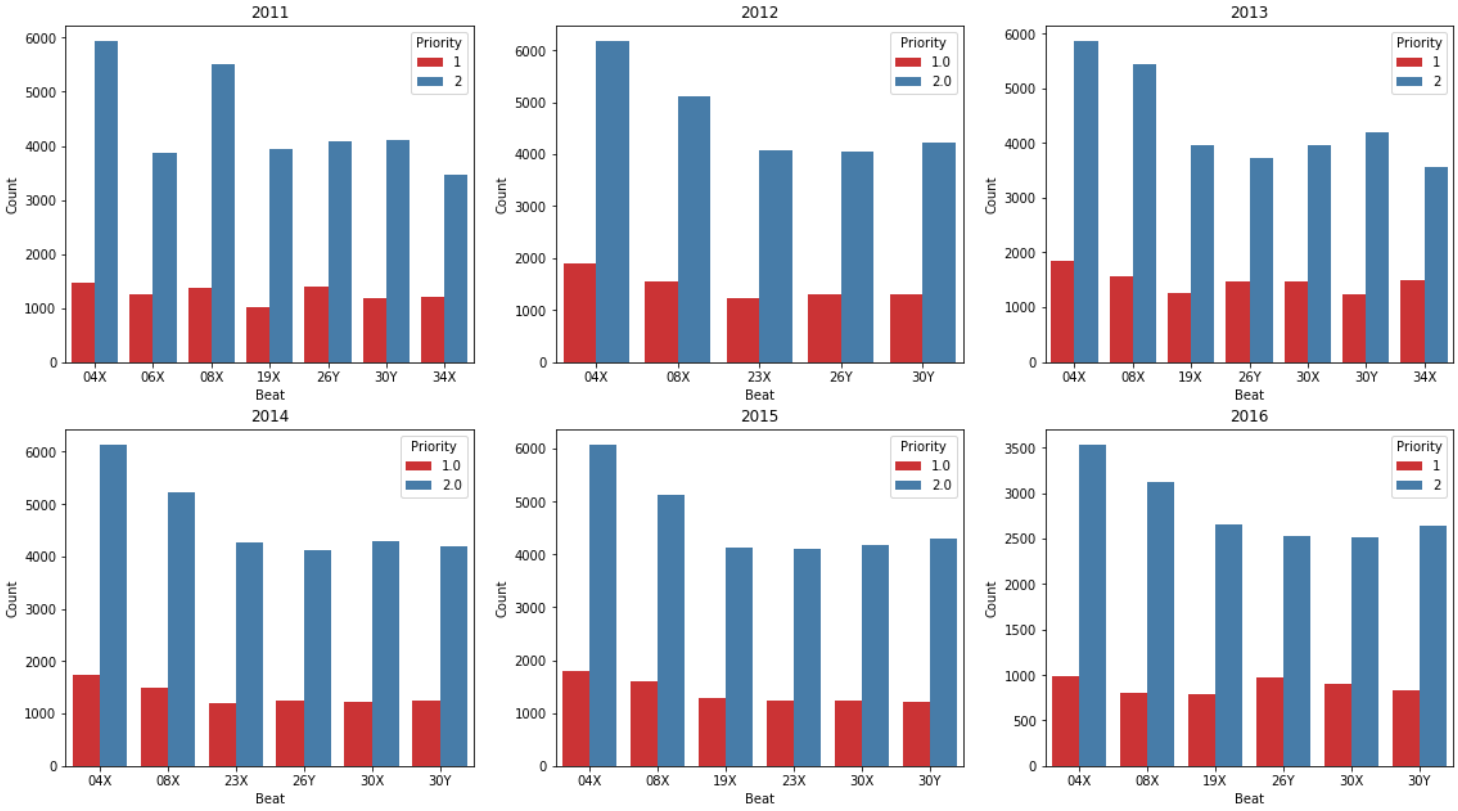
```
<Figure size 432x288 with 0 Axes>
```



beats的频数统计

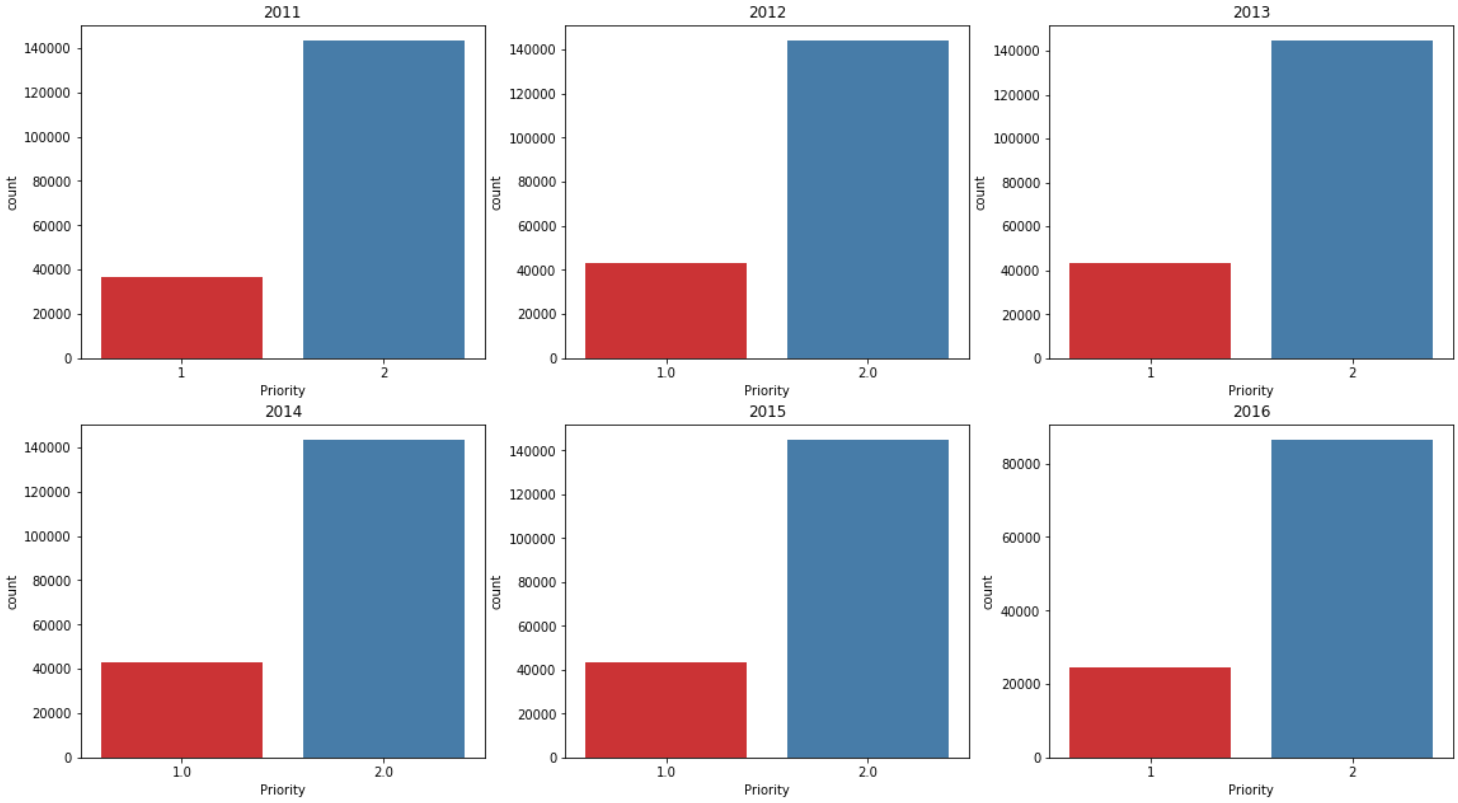
```
fig, ax = plt.subplots(nrows=2, ncols=3)
plt.subplots_adjust(left=0, right=2.5, top=3, bottom=1)
i = 0
for row in ax:
    for col in row:
        col.set_title(str(2011 + i))
        #sns.countplot(data=crimes_list[i].loc[crimes_list[i]['Incident Type Id'].isin(nlargest[i])], x="Incident Type Id", hue="Pric
        temp = crimes_list[i].groupby(by=["Beat", "Priority"],sort=True, as_index=False).count().rename(index=str, columns={"Create T
        beats_prio_1 = list(temp[temp["Priority"] == 1].nlargest(5, "Count")["Beat"].values)
        beats_prio_2 = list(temp[temp["Priority"] == 2].nlargest(5, "Count")["Beat"].values)
        print("Year " + str(2011 +i ) +":\n")
        print("The Beats With the Most Reports (Priority 1, Decending Order): {} \nThe Beats With the Most Reports (Priority 2, Decer
        print("Common Beats: {}".format(str(list(set(beats_prio_1) & set(beats_prio_2)))))
        sns.barplot(data=temp[temp["Beat"].isin(beats_prio_1 + beats_prio_2)], x="Beat", y="Count", hue="Priority",palette="Set1", ax
        print("==========================================================================================\n")
        i += 1
```

```
Year 2011:

The Beats With the Most Reports (Priority 1, Decending Order): ['04X', '26Y', '08X', '06X', '34X']
The Beats With the Most Reports (Priority 2, Decending Order): ['04X', '08X', '30Y', '26Y', '19X']
Unique Beats: ['04X', '26Y', '30Y', '19X', '06X', '34X', '08X']
Common Beats: ['04X', '08X', '26Y']
==========================================================================================

Year 2012:

The Beats With the Most Reports (Priority 1, Decending Order): ['04X', '08X', '26Y', '30Y', '23X']
The Beats With the Most Reports (Priority 2, Decending Order): ['04X', '08X', '30Y', '23X', '26Y']
Unique Beats: ['04X', '26Y', '30Y', '23X', '08X']
Common Beats: ['04X', '30Y', '26Y', '23X', '08X']
==========================================================================================

Year 2013:

The Beats With the Most Reports (Priority 1, Decending Order): ['04X', '08X', '34X', '26Y', '30X']
The Beats With the Most Reports (Priority 2, Decending Order): ['04X', '08X', '30Y', '30X', '19X']
Unique Beats: ['04X', '30X', '26Y', '30Y', '19X', '34X', '08X']
Common Beats: ['04X', '30X', '08X']
==========================================================================================

Year 2014:

The Beats With the Most Reports (Priority 1, Decending Order): ['04X', '08X', '30Y', '26Y', '30X']
The Beats With the Most Reports (Priority 2, Decending Order): ['04X', '08X', '30X', '23X', '30Y']
Unique Beats: ['04X', '30X', '30Y', '26Y', '23X', '08X']
Common Beats: ['04X', '30X', '08X', '30Y']
==========================================================================================

Year 2015:

The Beats With the Most Reports (Priority 1, Decending Order): ['04X', '08X', '19X', '23X', '30X']
The Beats With the Most Reports (Priority 2, Decending Order): ['04X', '08X', '30Y', '30X', '19X']
Unique Beats: ['04X', '30X', '30Y', '19X', '23X', '08X']
Common Beats: ['04X', '30X', '08X', '19X']
==========================================================================================

Year 2016:

The Beats With the Most Reports (Priority 1, Decending Order): ['04X', '26Y', '30X', '30Y', '08X']
The Beats With the Most Reports (Priority 2, Decending Order): ['04X', '08X', '19X', '30Y', '26Y']
Unique Beats: ['04X', '30X', '26Y', '30Y', '19X', '08X']
Common Beats: ['04X', '08X', '30Y', '26Y']
==========================================================================================
```



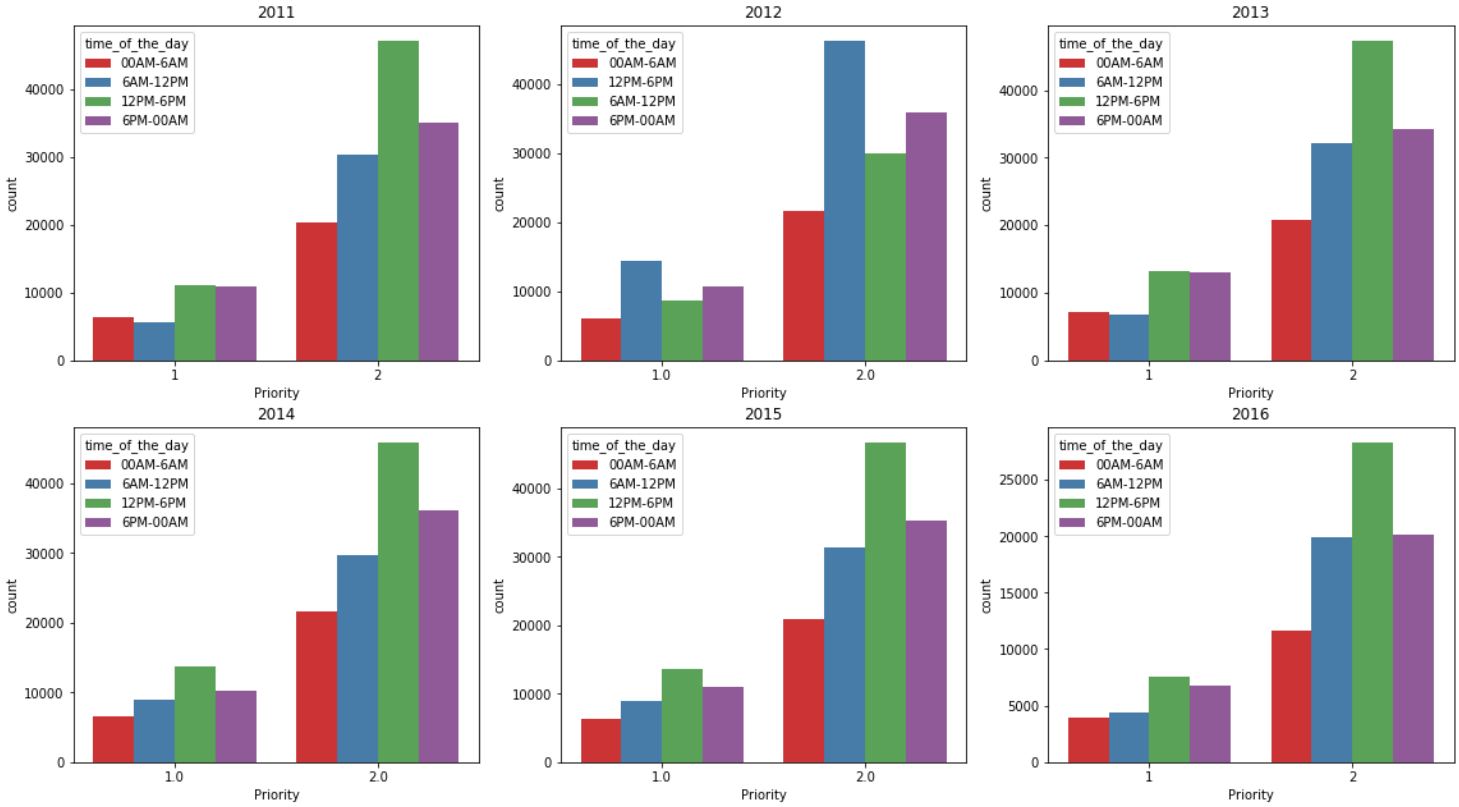
每年的报警数量

```
fig, ax = plt.subplots(nrows=2, ncols=3)
plt.subplots_adjust(left=0, right=2.5, top=3, bottom=1)
crimes_list = [crimes_2011, crimes_2012, crimes_2013, crimes_2014, crimes_2015, crimes_2016]
i = 0
for row in ax:
    for col in row:
        col.set_title(str(2011 + i))
        sns.countplot(data=crimes_list[i], x="Priority", ax=col, palette="Set1")
        i+=1
```



每年报警的时间段分布

```
fig, ax = plt.subplots(nrows=2, ncols=3)
plt.subplots_adjust(left=0, right=2.5, top=3, bottom=1)
i = 0
for row in ax:
    for col in row:
        col.set_title(str(2011 + i))
        sns.countplot(data=crimes_list[i], x="Priority", hue="time_of_the_day", palette="Set1", ax=col)
        i+=1
```



从上述的图中可以看出优先级为1的案件少，优先级为2的案件多，案件的高发时间段为12PM-6PM

缺失数据的处理

```
crimes_2011_miss = pd.read_csv("./oakland-crime-statistics-2011-to-2016/records-for-2011.csv", keep_default_na=False)
crimes_2011_miss.head(2)
```

```
/Users/zhangbo/Library/Python/3.7/lib/python/site-packages/IPython/core/interactiveshell.py:3058: DtypeWarning: Columns (5) have mixe
  interactivity=interactivity, compiler=compiler, result=result)
```

	Agency	Create Time	Location	Area Id	Beat	Priority	Incident Type Id	Incident Type Description	Event Number	Closed Time
0	OP	2011-01-01T00:00:00.000	ST&SAN PABLO AV	1	06X	1	PDOA	POSSIBLE DEAD PERSON	LOP110101000001	2011-01-01T00:28:17.000
1	OP	2011-01-01T00:01:11.000	ST&HANNAH ST	1	07X	1	415GS	415 GUNSHOTS	LOP110101000002	2011-01-01T01:12:56.000

```
crimes_2012_miss = pd.read_csv("./oakland-crime-statistics-2011-to-2016/records-for-2012.csv", keep_default_na=False)
crimes_2012_miss.head(2)
```

```
/Users/zhangbo/Library/Python/3.7/lib/python/site-packages/IPython/core/interactiveshell.py:3058: DtypeWarning: Columns (4) have mixe
  interactivity=interactivity, compiler=compiler, result=result)
```

	Agency	Create Time	Area Id	Beat	Priority	Incident Type Id	Incident Type Description	Event Number	Closed Time	Loca
0	OP	2012-01-01T00:00:25.000	2	32Y	2	415GS	415 GUNSHOTS	LOP120101000004	2012-01-01T00:40:27.000	{'human_add '{"address": "OLIVE ST", '

	Agency	Create Time	Area Id	Beat	Priority	Incident Type Id	Incident Type Description	Event Number	Closed Time	Loca
1	OP	2012-01-01T00:00:27.000	2	30Y	2	415GS	415 GUNSHOTS	LOP120101000003	2012-01-01T01:34:31.000	{'human_add '{"address": "AV&MACAR B...

```
crimes_2013_miss = pd.read_csv("./oakland-crime-statistics-2011-to-2016/records-for-2013.csv", keep_default_na=False)
crimes_2013_miss.head(2)
```

	Agency	Create Time	Location	Area Id	Beat	Priority	Incident Type Id	Incident Type Description	Event Number	Closed Time
0	OP	2013-01-01T00:00:00.000	D ST	2	33X	1	415GS	415 GUNSHOTS	LOP130101000002	2013-01-01T00:47:51.000
1	OP	2013-01-01T00:00:05.000	ARTHUR ST	2	30X	2	415GS	415 GUNSHOTS	LOP130101000004	2013-01-01T01:30:58.000

```
crimes_2014_miss = pd.read_csv("./oakland-crime-statistics-2011-to-2016/records-for-2014.csv", keep_default_na=False)
crimes_2014_miss.head(2)
```

	Agency	Create Time	Area Id	Beat	Priority	Incident Type Id	Incident Type Description	Event Number	Closed Time	Loc
0	OP	2014-01-01T00:00:00.000	1	02X	2	415GS	415 GUNSHOTS	LOP140101000001	2014-01-01T03:22:08.000	{'human_add '{"address": "LINDEN ST"
1	OP	2014-01-01T00:00:00.000	2	26Y	2	415GS	415 GUNSHOTS	LOP140101000002	2014-01-01T02:56:31.000	{'human_add '{"address": "AV&INTERN

```
crimes_2015_miss = pd.read_csv("./oakland-crime-statistics-2011-to-2016/records-for-2015.csv", keep_default_na=False)
crimes_2015_miss.head(2)
```

	Agency	Create Time	Location	Area Id	Beat	Priority	Incident Type Id	Incident Type Description	Event Number	Closed Time
0	OP	2015-01-01T00:01:59.000	S ELMHURST AV	P3	31Y	2	415	DISTURBING THE PEACE	LOP150101000003	2015-01-01T06:23:08.000
1	OP	2015-01-01T00:02:02.000	AV&D ST	P3	32X	2	415GS	415 GUNSHOTS	LOP150101000007	2015-01-01T01:44:40.000

```
crimes_2016_miss = pd.read_csv("./oakland-crime-statistics-2011-to-2016/records-for-2016.csv", keep_default_na=False)
crimes_2016_miss.head(2)
```

	Agency	Create Time	Location	Area Id	Beat	Priority	Incident Type Id	Incident Type Description	Event Number	Closed Tin
0	OP	2016-01-01T00:00:57.000	ST&MARKET ST	P1	05X	2	415GS	415 GUNSHOTS	LOP160101000003	2016-01-01T00:32:30.0

	Agency	Create Time	Location	Area Id	Beat	Priority	Incident Type Id	Incident Type Description	Event Number	Closed Tim
1	OP	2016-01-01T00:01:25.000	AV&HAMILTON ST	P3	26Y	2	415GS	415 GUNSHOTS	LOP160101000005	2016-01-01T00:48:23.0(

```
def loaddata():
    crimes_2011_miss = pd.read_csv("./oakland-crime-statistics-2011-to-2016/records-for-2011.csv", keep_default_na=False)

    crimes_2012_miss = pd.read_csv("./oakland-crime-statistics-2011-to-2016/records-for-2012.csv", keep_default_na=False)

    crimes_2013_miss = pd.read_csv("./oakland-crime-statistics-2011-to-2016/records-for-2013.csv", keep_default_na=False)

    crimes_2014_miss = pd.read_csv("./oakland-crime-statistics-2011-to-2016/records-for-2014.csv", keep_default_na=False)

    crimes_2015_miss = pd.read_csv("./oakland-crime-statistics-2011-to-2016/records-for-2015.csv", keep_default_na=False)

    crimes_2016_miss = pd.read_csv("./oakland-crime-statistics-2011-to-2016/records-for-2016.csv", keep_default_na=False)

    miss_list = [crimes_2011_miss,crimes_2012_miss,crimes_2013_miss,crimes_2014_miss,crimes_2015_miss,crimes_2016_miss]

    return miss_list
def countbeat():
    fig, ax = plt.subplots(nrows=2, ncols=3)
    plt.subplots_adjust(left=0, right=2.5, top=3, bottom=1)
    i = 0
    for row in ax:
        for col in row:
            col.set_title(str(2011 + i))
            sns.countplot(x="Beat", data=miss_list[i],ax=col, palette="Set1")
            i+=1


def count_ana(pd,col):
    countana = 0
    for i in pd[col]:
        if i == '':
            countana += 1
    return countana


miss_list = [crimes_2011_miss,crimes_2012_miss,crimes_2013_miss,crimes_2014_miss,crimes_2015_miss,crimes_2016_miss]
for dataset in miss_list:
    count = count_ana(dataset,"Priority")
    print(count)
# count_priority


1
1
1
0
0
1
```

Priority字段几乎无缺失值

```
for dataset in miss_list:
    count = count_ana(dataset,"Incident Type Id")
    print(count)


1
1
1
0
0
1
```

Incident Type Id字段也无缺失

```
for dataset in miss_list:
    count = count_ana(dataset,"Beat")
    print(count)
```

```
520
984
1178
1217
1325
581
```

我们选择对“Beat”进行缺失值的填充

直接将缺失的数值剔除

在数据上部分的数据预处理过程中，已经将缺失的数据删除

```
crimes_list = [crimes_2011, crimes_2012, crimes_2013, crimes_2014, crimes_2015, crimes_2016]

for dataset in crimes_list:
    count = count_ana(dataset,"Beat")
    print(count)
```

```
0
0
0
0
0
0
```

用频数最大的值进行填充

```
maxcount = []
for pd in crimes_list:
    count = pd["Beat"].value_counts()
#     maxcount.append(count)
    print(count.iloc[:1])
# print(maxcount)
```

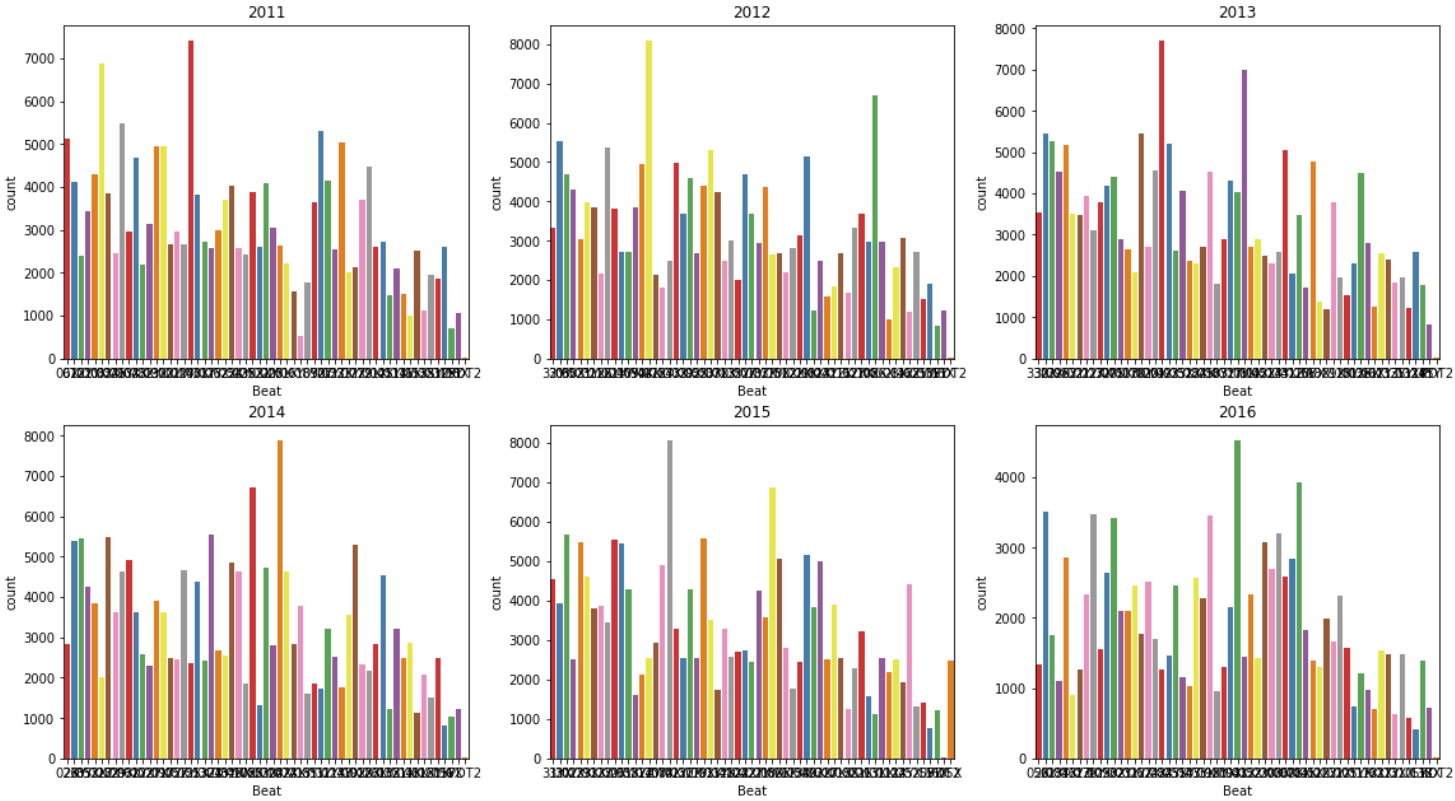
```
04X    7410
Name: Beat, dtype: int64
04X    8088
Name: Beat, dtype: int64
04X    7697
Name: Beat, dtype: int64
04X    7866
Name: Beat, dtype: int64
04X    8048
Name: Beat, dtype: int64
04X    4515
Name: Beat, dtype: int64
```

我们发现每年的数据中出现频率最高的是04X，所以用04X进行填充

```
miss_list = loaddata()
print(len(miss_list))
for dataset in miss_list:
    count = count_ana(dataset,"Beat")
    print(count)
```

```
6
520
984
1178
1217
1325
581
```

countbeat()



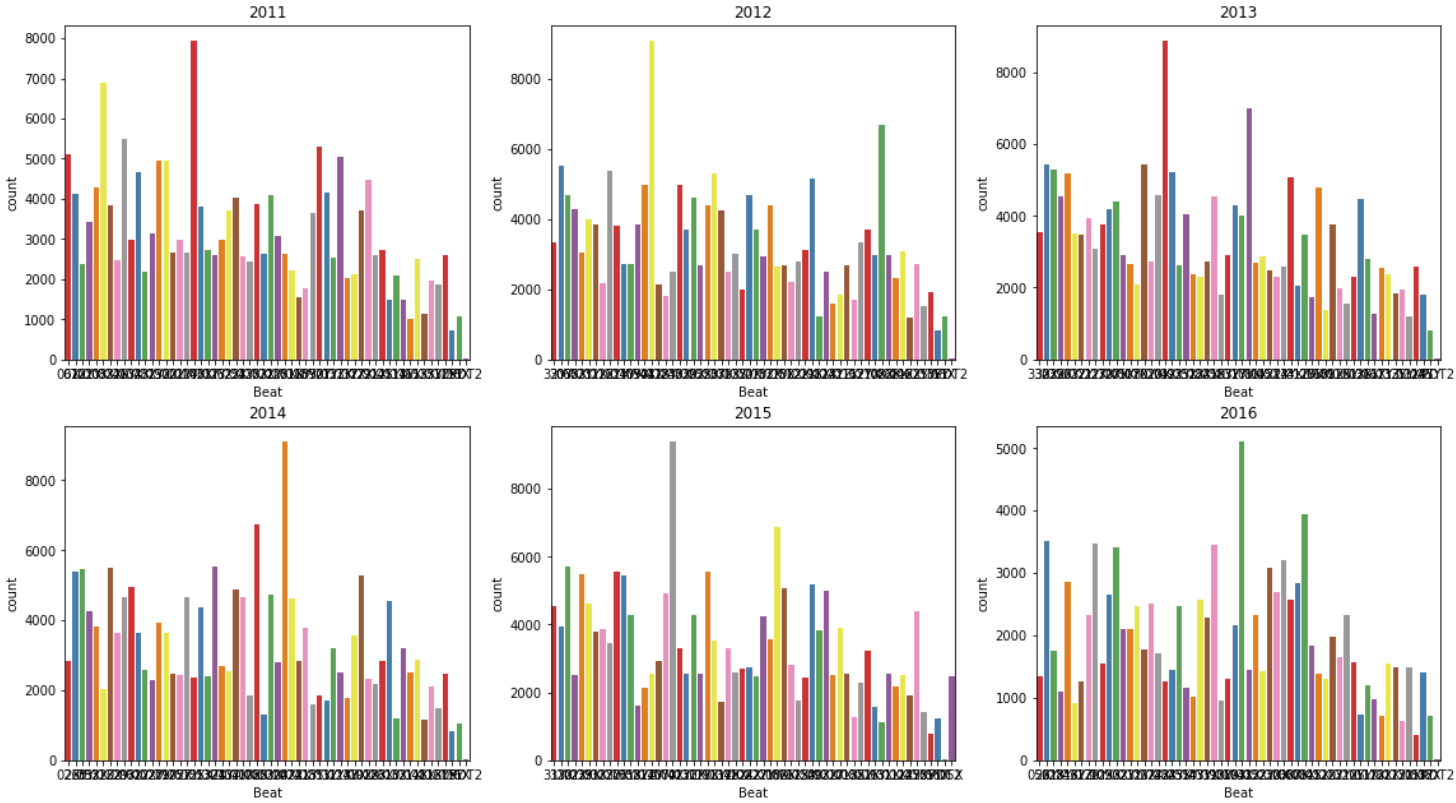

```
for dataset in miss_list:
    for i in range(len(dataset["Beat"])):
        if dataset["Beat"][i] == '':
            dataset["Beat"][i] = "04X"
```

```
/Users/zhangbo/Library/Python/3.7/lib/python/site-packages/ipykernel_launcher.py:4: 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/user_guide/indexing.html#returning-a-view-versus-a-
  after removing the cwd from sys.path.
```

```
for dataset in miss_list:
    count = count_ana(dataset,"Beat")
    print(count)
```

```
0
0
0
0
0
0
```

countbeat()



使用与空缺值相邻的值进行填充

```
miss_list = loaddata()
for dataset in miss_list:
    count = count_ana(dataset,"Beat")
    print(count)
```

```
520
984
1178
1217
1325
581
```

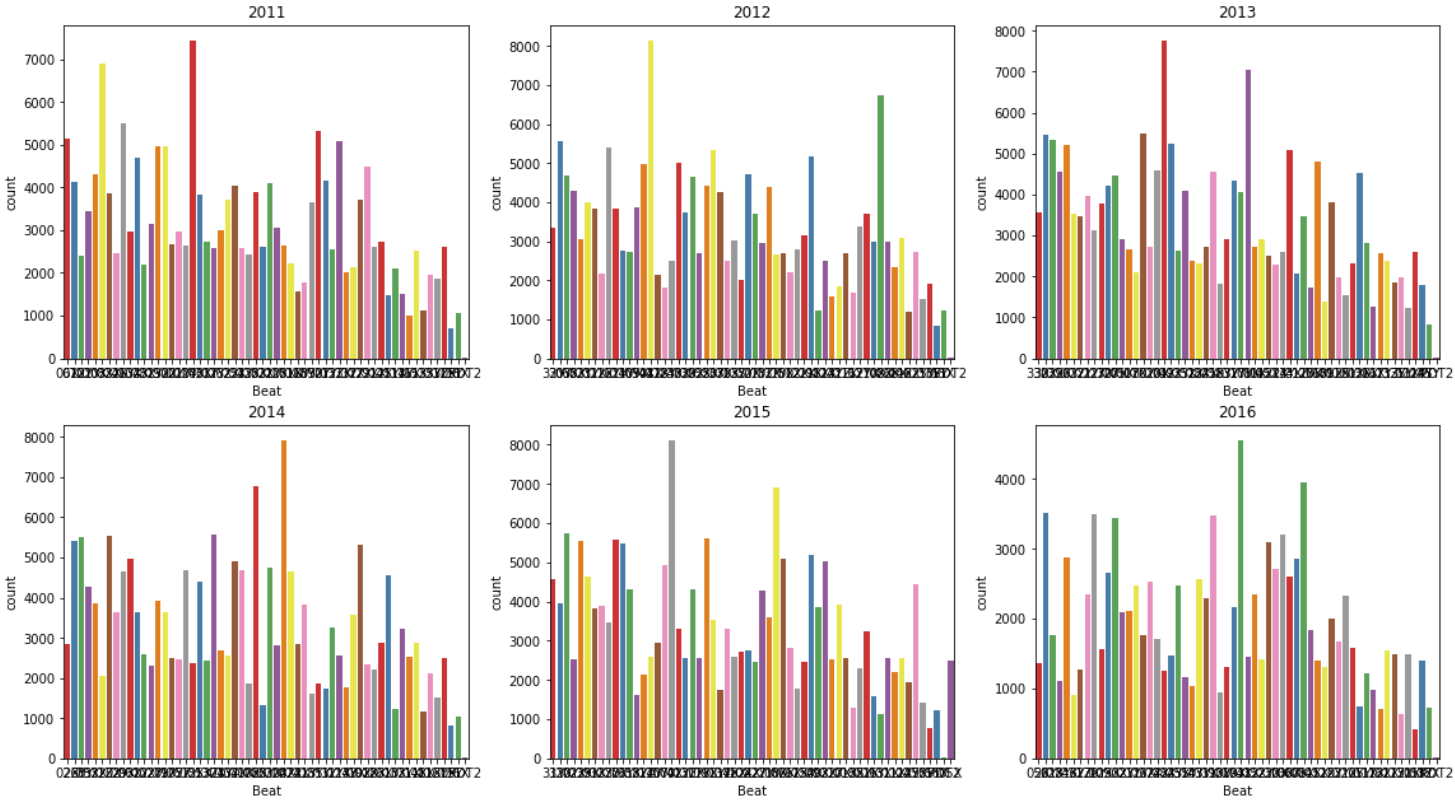
```
for dataset in miss_list:
    for i in range(len(dataset["Beat"])):
        if dataset["Beat"][i] == '':
            for j in range(5):
                if dataset["Beat"][i-j] != '':
                    dataset["Beat"][i] = dataset["Beat"][i-j]
```

```
/Users/zhangbo/Library/Python/3.7/lib/python/site-packages/ipykernel_launcher.py:6: 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/user_guide/indexing.html#returning-a-view-versus-a-
```

```
for dataset in miss_list:
    count = count_ana(dataset,"Beat")
    print(count)
```

```
0
0
0
0
0
0
```

```
countbeat()
```



通过数据对象之间的相似性来填补缺失值

```
miss_list = loaddata()
for dataset in miss_list:
    count = count_ana(dataset,"Beat")
    print(count)
```

```
520
984
1178
1217
1325
581
```

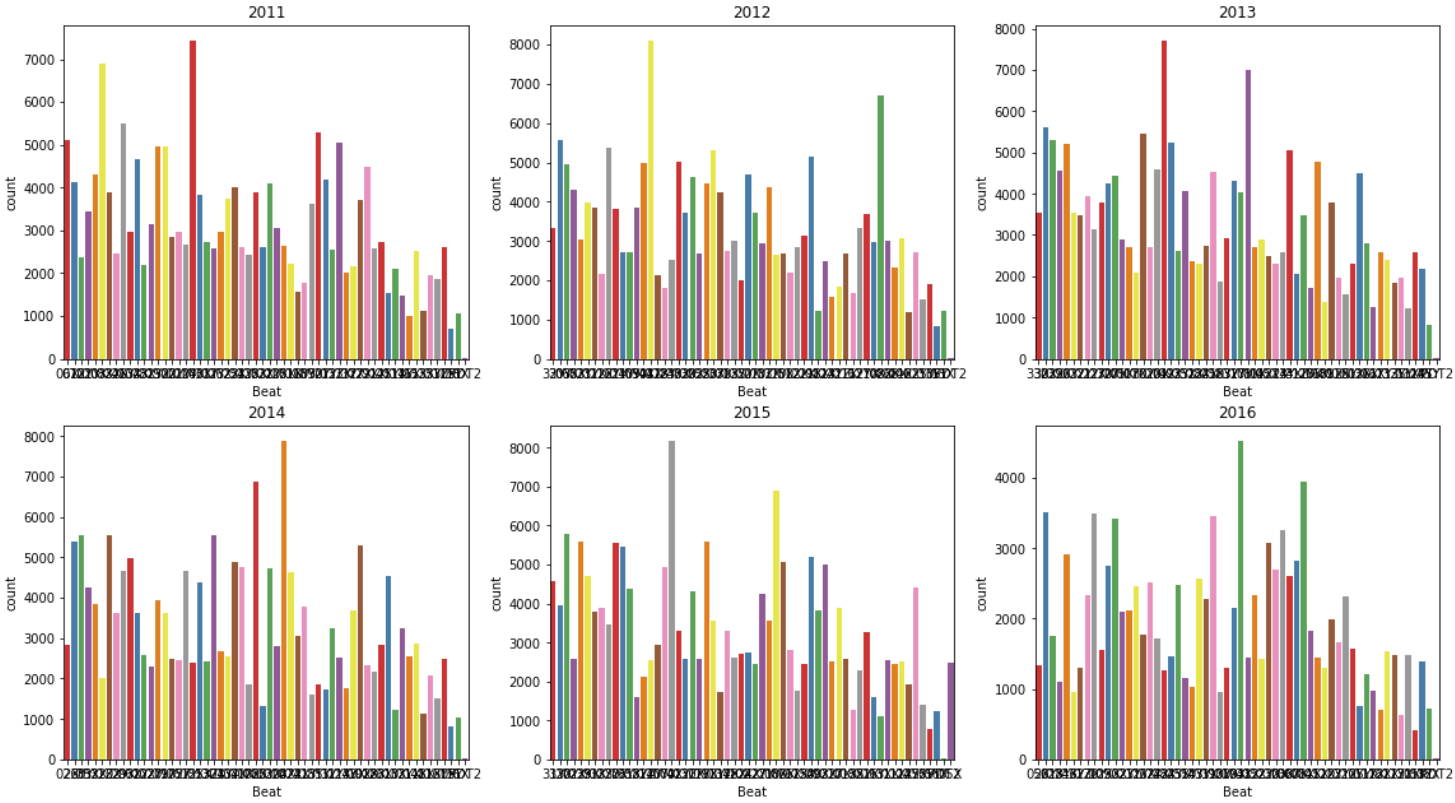
```
for dataset in miss_list:
    beatdataset = dataset["Beat"]
    typedataset = dataset["Incident Type Id"]
    dir_type_beat = {}
    for i in range(len(beatdataset)):
        if beatdataset[i] != '':
            dir_type_beat[typedataset[i]] =  beatdataset[i]
    for i in range(len(beatdataset)):
        if beatdataset[i] == '':
            if typedataset[i] not in dir_type_beat.keys():
                beatdataset[i] = "04X"
            else:
                beatdataset[i] = dir_type_beat[typedataset[i]]
```

```
/Users/zhangbo/Library/Python/3.7/lib/python/site-packages/ipykernel_launcher.py:13: 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/user_guide/indexing.html#returning-a-view-versus-a-
  del sys.path[0]
/Users/zhangbo/Library/Python/3.7/lib/python/site-packages/ipykernel_launcher.py:11: 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/user_guide/indexing.html#returning-a-view-versus-a-
  # This is added back by InteractiveShellApp.init_path()
```

```
for dataset in miss_list:
    count = count_ana(dataset,"Beat")
    print(count)
```

```
0
0
0
0
0
0
```

```
countbeat()
```



由于缺失的值只占很少的部分所以对于频数分布来说并没有什么很大的变化