01-911 Calls Data Capstone Project

March 23, 2019

1 A detail descriptive Analyses of 911 Calls Project in Python - A capstone Project - Phase 1

For this capstone project we will be analyzing some 911 call data from Kaggle. The data contains the following fields:

- lat : String variable, Latitude
- lng: String variable, Longitude
- desc: String variable, Description of the Emergency Call
- zip: String variable, Zipcode
- title: String variable, Title
- timeStamp: String variable, YYYY-MM-DD HH:MM:SS
- twp: String variable, Township
- addr: String variable, Address
- e: String variable, Dummy variable (always 1)

Tools Used: Jupyter Notebook

2 Initial Setup of Libraries such as numpy, Pandas, Matplotlib and Seaborn

---

** Import numpy and pandas **

```
In [1]: import numpy as np
        import pandas as pd
```

** Import visualization libraries and set %matplotlib inline. **

```
In [2]: import matplotlib.pyplot as plt
        import seaborn as sns
        %matplotlib inline
```

** Read in the csv file as a dataframe called df **

```
In [3]: df = pd.read_csv("911.csv")
```

** Check the info() of the df variable and see the column types and number of values associated with it **

```
In [4]: df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 99492 entries, 0 to 99491
Data columns (total 9 columns):
lat          99492 non-null float64
lng          99492 non-null float64
desc         99492 non-null object
zip          86637 non-null float64
title        99492 non-null object
timeStamp    99492 non-null object
twp          99449 non-null object
addr         98973 non-null object
e            99492 non-null int64
dtypes: float64(3), int64(1), object(5)
memory usage: 6.8+ MB
```

** Check the head of df **

```
In [5]: df.head(50)
```

Out[5]:

	lat	lng	desc
0	40.297876	-75.581294	REINDEER CT & DEAD END; NEW HANOVER; Station ...
1	40.258061	-75.264680	BRIAR PATH & WHITEMARSH LN; HATFIELD TOWNSHIP...
2	40.121182	-75.351975	HAWS AVE; NORRISTOWN; 2015-12-10 @ 14:39:21-St...
3	40.116153	-75.343513	AIRY ST & SWEDE ST; NORRISTOWN; Station 308A;...
4	40.251492	-75.603350	CHERRYWOOD CT & DEAD END; LOWER POTTSGROVE; S...
5	40.253473	-75.283245	CANNON AVE & W 9TH ST; LANSDALE; Station 345;...
6	40.182111	-75.127795	LAUREL AVE & OAKDALE AVE; HORSHAM; Station 35...
7	40.217286	-75.405182	COLLEGEVILLE RD & LYWISKI RD; SKIPPACK; Stati...
8	40.289027	-75.399590	MAIN ST & OLD SUMNEYTOWN PIKE; LOWER SALFORD;...
9	40.102398	-75.291458	BLUEROUTE & RAMP I476 NB TO CHEMICAL RD; PLYM...
10	40.231990	-75.251891	RT202 PKWY & KNAPP RD; MONTGOMERY; 2015-12-10 ...
11	40.084161	-75.308386	BROOK RD & COLWELL LN; PLYMOUTH; 2015-12-10 @ ...
12	40.174131	-75.098491	BYBERRY AVE & S WARMINSTER RD; UPPER MORELAND;...
13	40.062974	-75.135914	OLD YORK RD & VALLEY RD; CHELTENHAM; 2015-12-1...
14	40.097222	-75.376195	SCHUYLKILL EXPY & CROTON RD UNDERPASS; UPPER M...
15	40.223778	-75.235399	STUMP RD & WITCHWOOD DR; MONTGOMERY; 2015-12-1...
16	40.243258	-75.286552	SUSQUEHANNA AVE & W MAIN ST; LANSDALE; Statio...
17	40.312181	-75.574260	CHARLOTTE ST & MILES RD; NEW HANOVER; Station...
18	40.114239	-75.338508	PENN ST & ARCH ST; NORRISTOWN; Station 308A; ...
19	40.209337	-75.135266	COUNTY LINE RD & WILLOW DR; HORSHAM; 2015-12-1...
20	40.114239	-75.338508	PENN ST & ARCH ST; NORRISTOWN; 2015-12-10 @ 17...
21	40.117948	-75.209848	CHURCH RD & REDCOAT DR; WHITEMARSH; 2015-12-10...
22	40.199006	-75.300058	LILAC CT & PRIMROSE DR; UPPER GWYNEDD; 2015-12...

```
23  40.143326 -75.422819  RT422  & PAWLINGS RD OVERPASS; LOWER PROVIDENC...
24  40.153268 -75.189558  SUMMIT AVE & RT309 UNDERPASS; UPPER DUBLIN; 20...
25  40.133037 -75.408463  SHANNONDELL DR & SHANNONDELL BLVD;  LOWER PROV...
26  40.155283 -75.264230  PENLLYN BLUE BELL PIKE & VILLAGE CIR;  WHITPAI...
27  40.028903 -75.351822  EDENTON PL & DURHAM DR; DELAWARE COUNTY; 2015-...
28  40.097222 -75.376195  SCHUYLKILL EXPY & WEADLEY RD OVERPASS; UPPER M...
29  40.209337 -75.135266  COUNTY LINE RD & WILLOW DR; HORSHAM; 2015-12-1...
30  40.097222 -75.376195  SCHUYLKILL EXPY & WEADLEY RD OVERPASS; UPPER M...
31  40.300736 -75.331973  CORNWALL TER & LIONS GATE CIR;  FRANCONIA; Sta...
32  40.129398 -75.332213  PINE ST & W ROBERTS ST;  NORRISTOWN; Station 3...
33  40.297876 -75.581294              ; NEW HANOVER; 2015-12-10 @ 18:20:28;
34  40.081260 -75.137025               ; CHELTENHAM; 2015-12-10 @ 18:20:28;
35  40.099362 -75.150035  E GLENSIDE AVE & S KESWICK AVE; CHELTENHAM; 20...
36  40.221227 -75.288737  MORRIS RD & MUHLENBURG DR; UPPER GWYNEDD; 2015...
37  40.073864 -75.316797  MOOREHEAD AVE & FRONT ST; WEST CONSHOHOCKEN; 2...
38  40.161732 -75.151055  DRESHER RD & WELSH RD; HORSHAM; 2015-12-10 @ 1...
39  40.066718 -75.307176  CONSHOHOCKEN STATE RD;  WEST CONSHOHOCKEN; Sta...
40  40.065530 -75.307828  CONSHOHOCKEN STATE RD & MERION HILL LN; WEST C...
41  40.104206 -75.367665  HAMPTON RD & BELMONT RD; UPPER MERION; 2015-12...
42  40.122780 -75.267241  SPARANGO LN & MELISSA WAY;  PLYMOUTH; Station ...
43  40.091055 -75.384365  ALLENDALE RD & WILLS BLVD; UPPER MERION; 2015-...
44  40.024967 -75.282905  ROSEMONT AVE & DEAD END;  LOWER MERION; Statio...
45  40.125739 -75.339822  W WOOD ST & MARKLEY ST; NORRISTOWN; 2015-12-10...
46  40.224923 -75.528045  LINFIELD TRAPPE RD;  LIMERICK; Station 324A; 2...
47  40.224923 -75.528045  LINFIELD TRAPPE RD; LIMERICK; 2015-12-10 @ 18:...
48  40.224923 -75.528045  AUTO PARK BLVD & LINFIELD TRAPPE RD; LIMERICK;...
49  40.230934 -75.522125  LINFIELD TRAPPE RD & RAMP N LEWIS RD TO RT422 ...

        zip                            title            timeStamp  \
0   19525.0          EMS: BACK PAINS/INJURY  2015-12-10 17:40:00
1   19446.0         EMS: DIABETIC EMERGENCY  2015-12-10 17:40:00
2   19401.0            Fire: GAS-ODOR/LEAK  2015-12-10 17:40:00
3   19401.0          EMS: CARDIAC EMERGENCY  2015-12-10 17:40:01
4       NaN                 EMS: DIZZINESS  2015-12-10 17:40:01
5   19446.0               EMS: HEAD INJURY  2015-12-10 17:40:01
6   19044.0            EMS: NAUSEA/VOMITING  2015-12-10 17:40:01
7   19426.0      EMS: RESPIRATORY EMERGENCY  2015-12-10 17:40:01
8   19438.0           EMS: SYNCOPAL EPISODE  2015-12-10 17:40:01
9   19462.0     Traffic: VEHICLE ACCIDENT -  2015-12-10 17:40:01
10      NaN     Traffic: VEHICLE ACCIDENT -  2015-12-10 17:40:01
11  19428.0     Traffic: VEHICLE ACCIDENT -  2015-12-10 17:40:02
12  19040.0     Traffic: VEHICLE ACCIDENT -  2015-12-10 17:40:02
13  19027.0     Traffic: VEHICLE ACCIDENT -  2015-12-10 17:40:02
14      NaN     Traffic: VEHICLE ACCIDENT -  2015-12-10 17:40:02
15  18936.0     Traffic: VEHICLE ACCIDENT -  2015-12-10 17:40:02
16  19446.0      EMS: RESPIRATORY EMERGENCY  2015-12-10 17:46:01
17  19525.0                 EMS: DIZZINESS  2015-12-10 17:47:01
18  19401.0           EMS: VEHICLE ACCIDENT  2015-12-10 17:47:01
```

19	18974.0	Traffic: DISABLED VEHICLE -	2015-12-10 17:47:02
20	19401.0	Traffic: VEHICLE ACCIDENT -	2015-12-10 17:47:02
21	19031.0	Traffic: DISABLED VEHICLE -	2015-12-10 17:57:02
22	19446.0	Fire: APPLIANCE FIRE	2015-12-10 18:02:01
23	NaN	Traffic: DISABLED VEHICLE -	2015-12-10 18:02:02
24	NaN	Traffic: VEHICLE ACCIDENT -	2015-12-10 18:02:02
25	19403.0	EMS: GENERAL WEAKNESS	2015-12-10 18:06:25
26	19422.0	EMS: HEAD INJURY	2015-12-10 18:06:25
27	19085.0	Fire: CARBON MONOXIDE DETECTOR	2015-12-10 18:06:25
28	NaN	Traffic: VEHICLE ACCIDENT -	2015-12-10 18:06:26
29	18974.0	Traffic: DISABLED VEHICLE -	2015-12-10 18:11:01
30	NaN	Traffic: VEHICLE ACCIDENT -	2015-12-10 18:11:01
31	18964.0	EMS: RESPIRATORY EMERGENCY	2015-12-10 18:12:01
32	19401.0	EMS: UNKNOWN MEDICAL EMERGENCY	2015-12-10 18:22:00
33	19525.0	Traffic: DISABLED VEHICLE -	2015-12-10 18:22:01
34	NaN	Traffic: DISABLED VEHICLE -	2015-12-10 18:26:02
35	19038.0	Traffic: VEHICLE ACCIDENT -	2015-12-10 18:26:02
36	NaN	Traffic: DISABLED VEHICLE -	2015-12-10 18:27:01
37	19428.0	Traffic: DISABLED VEHICLE -	2015-12-10 18:27:02
38	19044.0	Traffic: VEHICLE ACCIDENT -	2015-12-10 18:27:02
39	NaN	EMS: VEHICLE ACCIDENT	2015-12-10 18:32:02
40	19428.0	Traffic: VEHICLE ACCIDENT -	2015-12-10 18:32:02
41	19406.0	Fire: GAS-ODOR/LEAK	2015-12-10 18:37:01
42	19462.0	EMS: UNRESPONSIVE SUBJECT	2015-12-10 18:42:00
43	19406.0	Traffic: VEHICLE ACCIDENT -	2015-12-10 18:42:01
44	NaN	EMS: CARDIAC EMERGENCY	2015-12-10 18:47:01
45	19401.0	Traffic: VEHICLE ACCIDENT -	2015-12-10 18:51:01
46	19468.0	EMS: VEHICLE ACCIDENT	2015-12-10 18:52:00
47	19468.0	Fire: VEHICLE ACCIDENT	2015-12-10 18:52:00
48	19468.0	Traffic: VEHICLE ACCIDENT -	2015-12-10 18:56:02
49	19468.0	Traffic: VEHICLE ACCIDENT -	2015-12-10 18:56:02

	twp	addr	e
0	NEW HANOVER	REINDEER CT & DEAD END	1
1	HATFIELD TOWNSHIP	BRIAR PATH & WHITEMARSH LN	1
2	NORRISTOWN	HAWS AVE	1
3	NORRISTOWN	AIRY ST & SWEDE ST	1
4	LOWER POTTSGROVE	CHERRYWOOD CT & DEAD END	1
5	LANSDALE	CANNON AVE & W 9TH ST	1
6	HORSHAM	LAUREL AVE & OAKDALE AVE	1
7	SKIPPACK	COLLEGEVILLE RD & LYWISKI RD	1
8	LOWER SALFORD	MAIN ST & OLD SUMNEYTOWN PIKE	1
9	PLYMOUTH	BLUEROUTE & RAMP I476 NB TO CHEMICAL RD	1
10	MONTGOMERY	RT202 PKWY & KNAPP RD	1
11	PLYMOUTH	BROOK RD & COLWELL LN	1
12	UPPER MORELAND	BYBERRY AVE & S WARMINSTER RD	1
13	CHELTENHAM	OLD YORK RD & VALLEY RD	1
14	UPPER MERION	SCHUYLKILL EXPY & CROTON RD UNDERPASS	1

15	MONTGOMERY	STUMP RD & WITCHWOOD DR	1
16	LANSDALE	SUSQUEHANNA AVE & W MAIN ST	1
17	NEW HANOVER	CHARLOTTE ST & MILES RD	1
18	NORRISTOWN	PENN ST & ARCH ST	1
19	HORSHAM	COUNTY LINE RD & WILLOW DR	1
20	NORRISTOWN	PENN ST & ARCH ST	1
21	WHITEMARSH	CHURCH RD & REDCOAT DR	1
22	UPPER GWYNEDD	LILAC CT & PRIMROSE DR	1
23	LOWER PROVIDENCE	RT422 & PAWLINGS RD OVERPASS	1
24	UPPER DUBLIN	SUMMIT AVE & RT309 UNDERPASS	1
25	LOWER PROVIDENCE	SHANNONDELL DR & SHANNONDELL BLVD	1
26	WHITPAIN	PENLLYN BLUE BELL PIKE & VILLAGE CIR	1
27	DELAWARE COUNTY	EDENTON PL & DURHAM DR	1
28	UPPER MERION	SCHUYLKILL EXPY & WEADLEY RD OVERPASS	1
29	HORSHAM	COUNTY LINE RD & WILLOW DR	1
30	UPPER MERION	SCHUYLKILL EXPY & WEADLEY RD OVERPASS	1
31	FRANCONIA	CORNWALL TER & LIONS GATE CIR	1
32	NORRISTOWN	PINE ST & W ROBERTS ST	1
33	NEW HANOVER	NaN	1
34	CHELTENHAM	NaN	1
35	CHELTENHAM	E GLENSIDE AVE & S KESWICK AVE	1
36	UPPER GWYNEDD	MORRIS RD & MUHLENBURG DR	1
37	WEST CONSHOHOCKEN	MOOREHEAD AVE & FRONT ST	1
38	HORSHAM	DRESHER RD & WELSH RD	1
39	WEST CONSHOHOCKEN	CONSHOHOCKEN STATE RD	1
40	WEST CONSHOHOCKEN	CONSHOHOCKEN STATE RD & MERION HILL LN	1
41	UPPER MERION	HAMPTON RD & BELMONT RD	1
42	PLYMOUTH	SPARANGO LN & MELISSA WAY	1
43	UPPER MERION	ALLENDALE RD & WILLS BLVD	1
44	LOWER MERION	ROSEMONT AVE & DEAD END	1
45	NORRISTOWN	W WOOD ST & MARKLEY ST	1
46	LIMERICK	LINFIELD TRAPPE RD	1
47	LIMERICK	LINFIELD TRAPPE RD	1
48	LIMERICK	AUTO PARK BLVD & LINFIELD TRAPPE RD	1
49	LIMERICK	LINFIELD TRAPPE RD & RAMP N LEWIS RD TO RT422 EB	1

2.1 Handling Basic Questions of descriptive analyses

** What are the top 5 zipcodes for 911 calls? **

```
In [6]: df['zip'].value_counts().head(5)
```

```
Out[6]: 19401.0    6979
        19464.0    6643
        19403.0    4854
        19446.0    4748
        19406.0    3174
        Name: zip, dtype: int64
```

** What are the top 5 townships (twp) for 911 calls? **

```
In [7]: df['twp'].value_counts().head(5)
```

```
Out[7]: LOWER MERION    8443
        ABINGTON        5977
        NORRISTOWN      5890
        UPPER MERION    5227
        CHELTENHAM      4575
        Name: twp, dtype: int64
```

** Take a look at the 'title' column, how many unique title codes are there? **

```
In [33]: c_reason=df['title'].nunique()
         c_reason
```

```
Out[33]: 110
```

2.2 Now, lets expand the hidden information by Creating new features

** In the titles column there are "Reasons/Departments" specified before the title code. These are EMS, Fire, and Traffic. We will use apply() function and use lambda expression to short our function and create a new feature named 'Reasons' for which a call was made to 911.**

For example, if the title column value is EMS: BACK PAINS/INJURY , the Reason column value would be EMS.

```
In [9]: df['Reason'] = df['title'].apply(lambda title: title.split(':')[0])
```

** What is the most common Reason for a 911 call based off of this new column? **

```
In [10]: df['Reason'].value_counts()
```

```
Out[10]: EMS        48877
         Traffic    35695
         Fire       14920
         Name: Reason, dtype: int64
```

** Now we will use seaborn, plotly to create a countplot of 911 calls by Reason. **

```
In [39]: #plotly
         from plotly import __version__

         #clufflinks
         import cufflinks as cf

         #importing Iplot and other important libraries in plotly
         from plotly.offline import download_plotlyjs, init_notebook_mode, plot,iplot

         init_notebook_mode(connected=True)
         cf.go_offline()
         c_reason = df['Reason'].nunique()
         c_reason
```

```
IOPub data rate exceeded.
The notebook server will temporarily stop sending output
to the client in order to avoid crashing it.
To change this limit, set the config variable
`--NotebookApp.iopub_data_rate_limit`.
```

Out[39]: 3

** Now let us begin to focus on time information. What is the data type of the objects in the timeStamp column? **

```
In [12]: type(df['timeStamp'].iloc[0])
```

Out[12]: str

```
In [40]: ## Data Wrangling
```

** You should have seen that these timestamps are still strings. We will use pd.to_datetime() to convert the column from strings to DateTime objects. We will do some data wrangling here **

```
In [13]: df['timeStamp'] =pd.to_datetime(df['timeStamp'])
         time = df['timeStamp'].iloc[0]
         time.hour
```

Out[13]: 17

** You can now grab specific attributes from a Datetime object by calling them and extracting Hour, Month and Day of week from the timestamp; We will use apply() to create 3 new columns called Hour, Month, and Day of Week. **

```
In [14]: df['Hour'] = df['timeStamp'].apply(lambda time: time.hour)
         df['Month'] = df['timeStamp'].apply(lambda time: time.month)
         df['Day of Week'] = df['timeStamp'].apply(lambda time: time.dayofweek)
```

** Notice how the Day of Week is an integer 0-6. We will use the .map() with this dictionary to map the actual string names to the day of the week: **

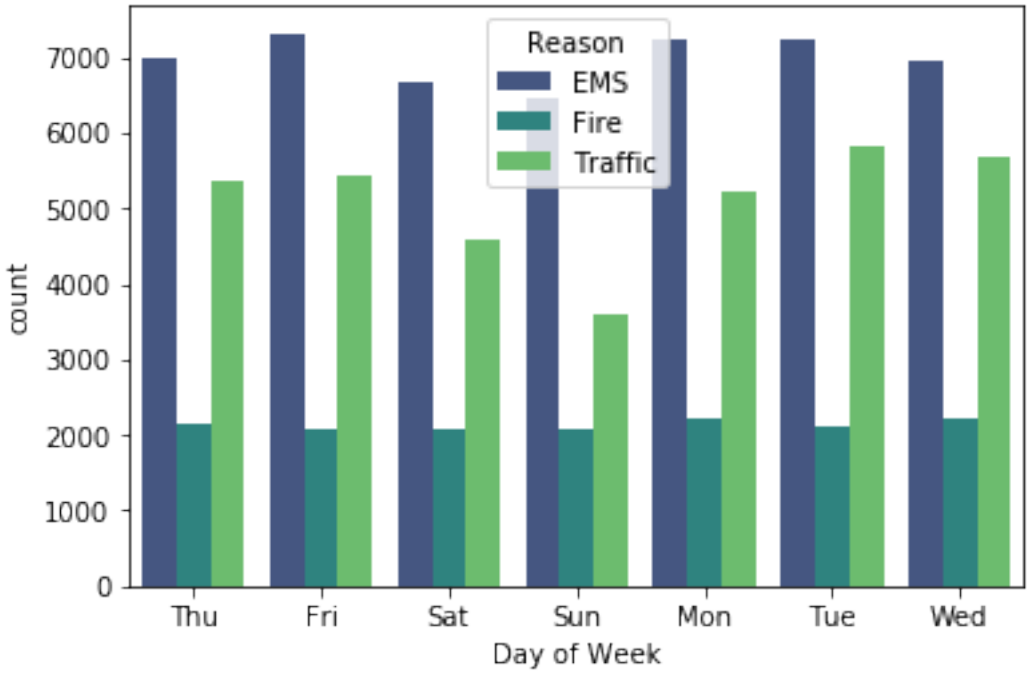
```
dmap = {0:'Mon',1:'Tue',2:'Wed',3:'Thu',4:'Fri',5:'Sat',6:'Sun'}
```

```
In [15]:  dmap = {0:'Mon',1:'Tue',2:'Wed',3:'Thu',4:'Fri',5:'Sat',6:'Sun'}
```

```
In [16]:   df['Day of Week']= df['Day of Week'].map(dmap)
```

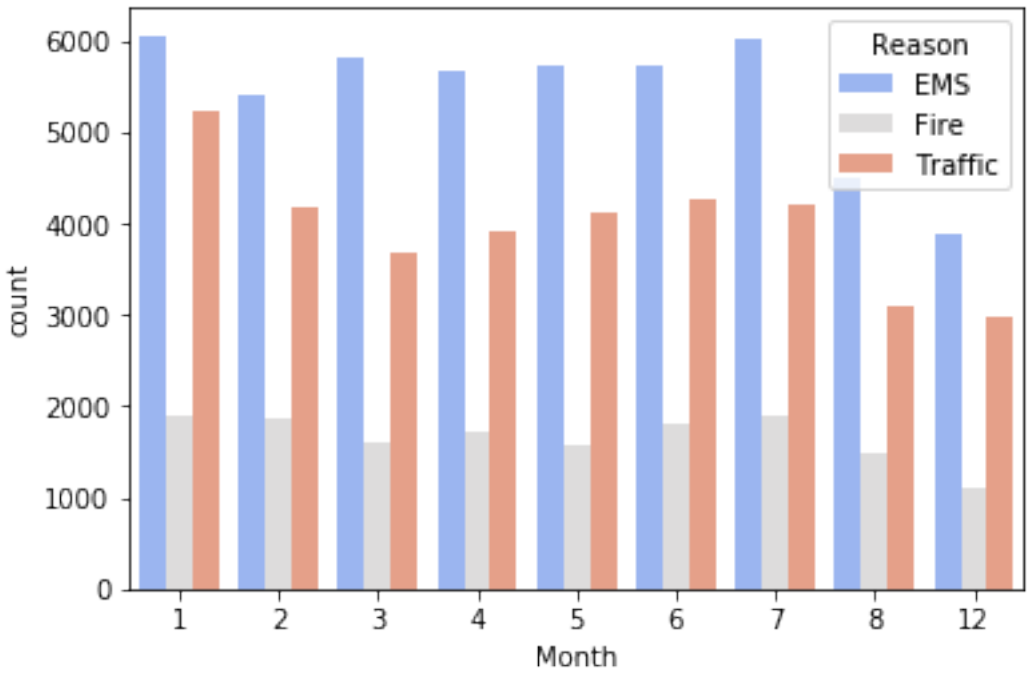
** Now we will use seaborn to create a countplot of the Day of Week column with the hue based off of the Reason column. Here, we can see that EMS is the biggest reasons for most of the 911 calls, followed by Traffic and Fire**

```
In [17]: sns.countplot(x='Day of Week',data=df,hue='Reason',palette='viridis')

Out[17]: <matplotlib.axes._subplots.AxesSubplot at 0x2a907bb1048>
```



Now lets analyse reasons for the months

```
In [18]: sns.countplot(x='Month',data=df,hue='Reason',palette='coolwarm')

Out[18]: <matplotlib.axes._subplots.AxesSubplot at 0x2a9098d1e48>
```



Did you notice something strange about the Plot?

** You should have noticed it was missing some Months, let's plot a simple line plot to get the missing months data. **

** Now create a groupby object called byMonth, where you group the DataFrame by the month column and use the count() method for aggregation. Use the head() method on this returned DataFrame. **

```
In [19]: byMonth = df.groupby('Month').count()
         byMonth
```

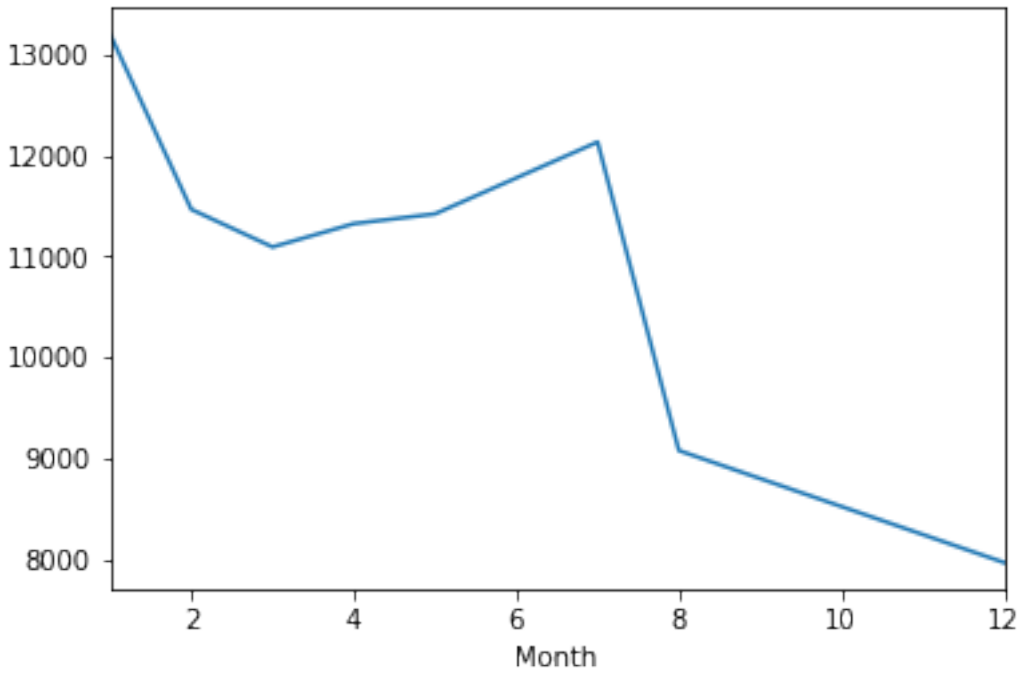
```
Out[19]:          lat    lng   desc    zip  title  timeStamp    twp   addr      e  \
         Month
         1      13205  13205  13205  11527  13205      13205  13203  13096  13205
         2      11467  11467  11467   9930  11467      11467  11465  11396  11467
         3      11101  11101  11101   9755  11101      11101  11092  11059  11101
         4      11326  11326  11326   9895  11326      11326  11323  11283  11326
         5      11423  11423  11423   9946  11423      11423  11420  11378  11423
         6      11786  11786  11786  10212  11786      11786  11777  11732  11786
         7      12137  12137  12137  10633  12137      12137  12133  12088  12137
         8       9078   9078   9078   7832   9078       9078   9073   9025   9078
         12      7969   7969   7969   6907   7969       7969   7963   7916   7969

                Reason   Hour  Day of Week
```

```
Month
1        13205  13205         13205
2        11467  11467         11467
3        11101  11101         11101
4        11326  11326         11326
5        11423  11423         11423
6        11786  11786         11786
7        12137  12137         12137
8         9078   9078          9078
12        7969   7969          7969
```

** Now create a simple plot off of the dataframe indicating the count of calls per month here we can see the missing 9th and 10th month are also being plotted which shows a decreasing trend for September and October. Also, we can see that January and July notices increased numbe of 911 cases **

```
In [20]: byMonth['twp'].plot()
```

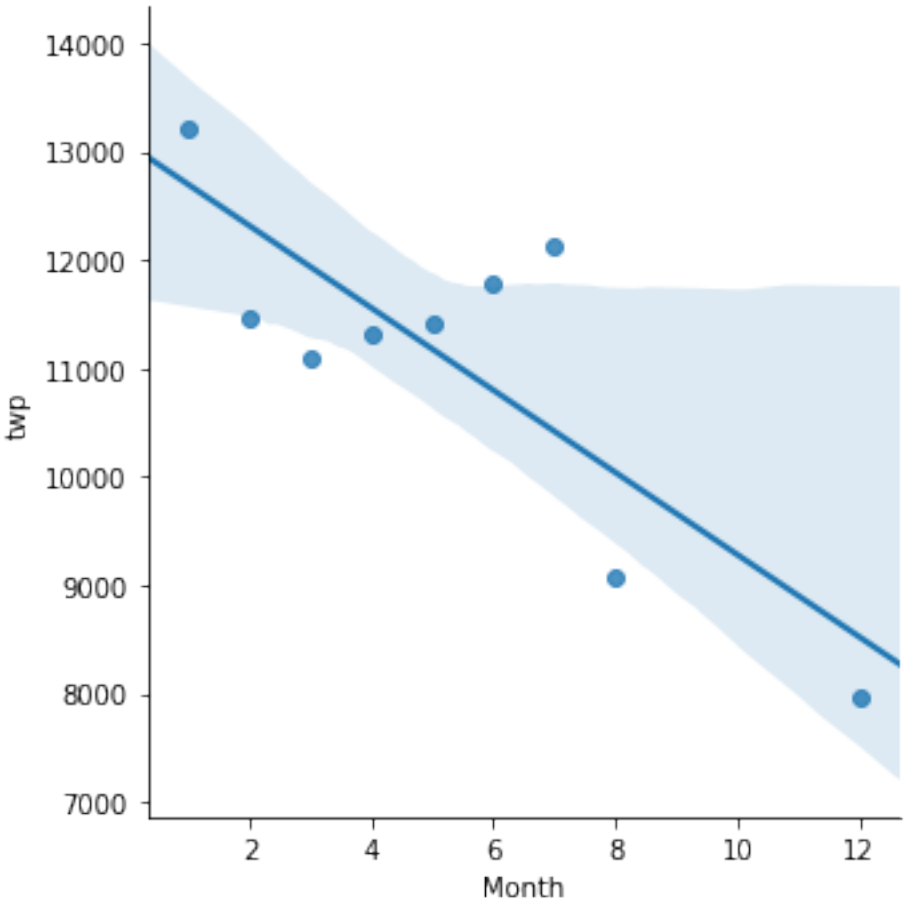
```
Out[20]: <matplotlib.axes._subplots.AxesSubplot at 0x2a909859ac8>
```



** Now see if you can use seaborn's lmplot() to create a linear fit on the number of calls per month and as our month is one of the index, we will reset it by using reset_index() **

```
In [21]: sns.lmplot(x='Month',y='twp',data=byMonth.reset_index())
```

```
Out[21]: <seaborn.axisgrid.FacetGrid at 0x2a909e6ca20>
```

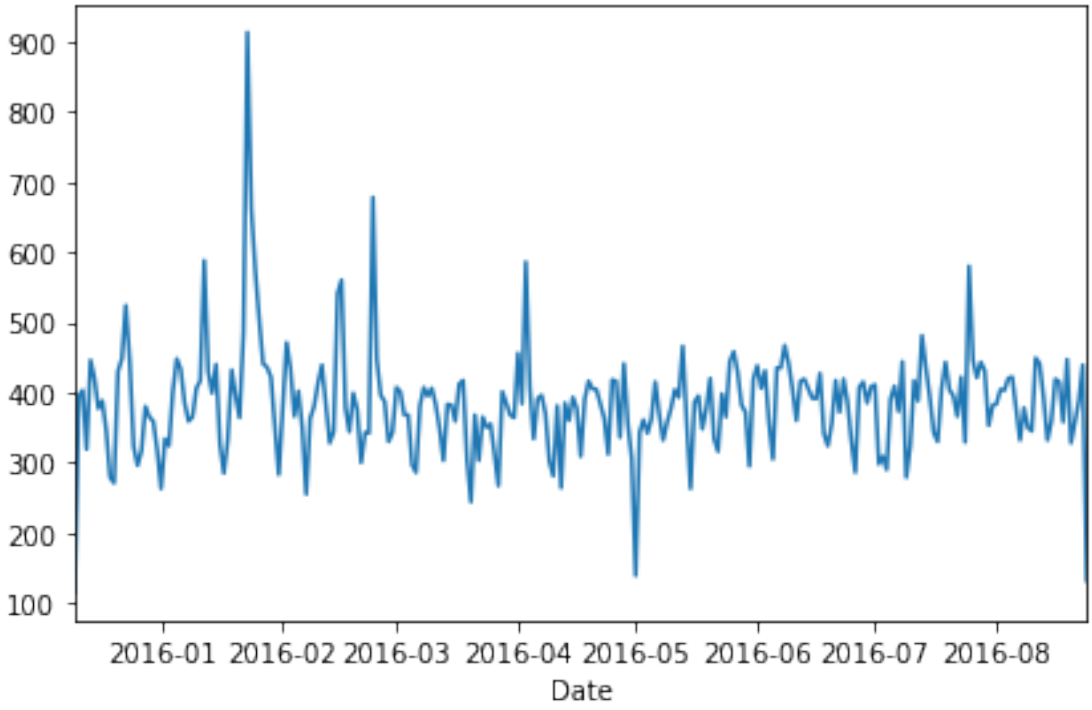


Create a new column called 'Date' that contains the date from the timeStamp column. You'll need to use apply along with the .date() method.

```
In [22]: df['Date']=df['timeStamp'].apply(lambda t: t.date())
```

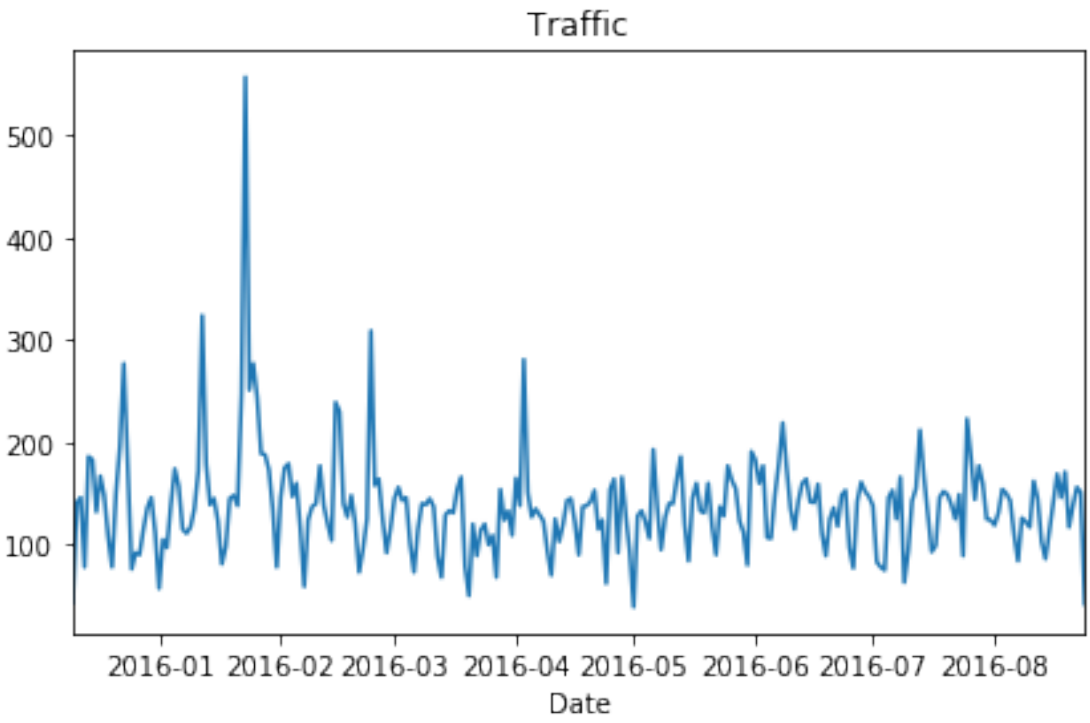
** Now groupby this Date column with the count() aggregate and create a plot of counts of 911 calls.**

```
In [23]: df.groupby('Date').count()['twp'].plot()
         plt.tight_layout()
```

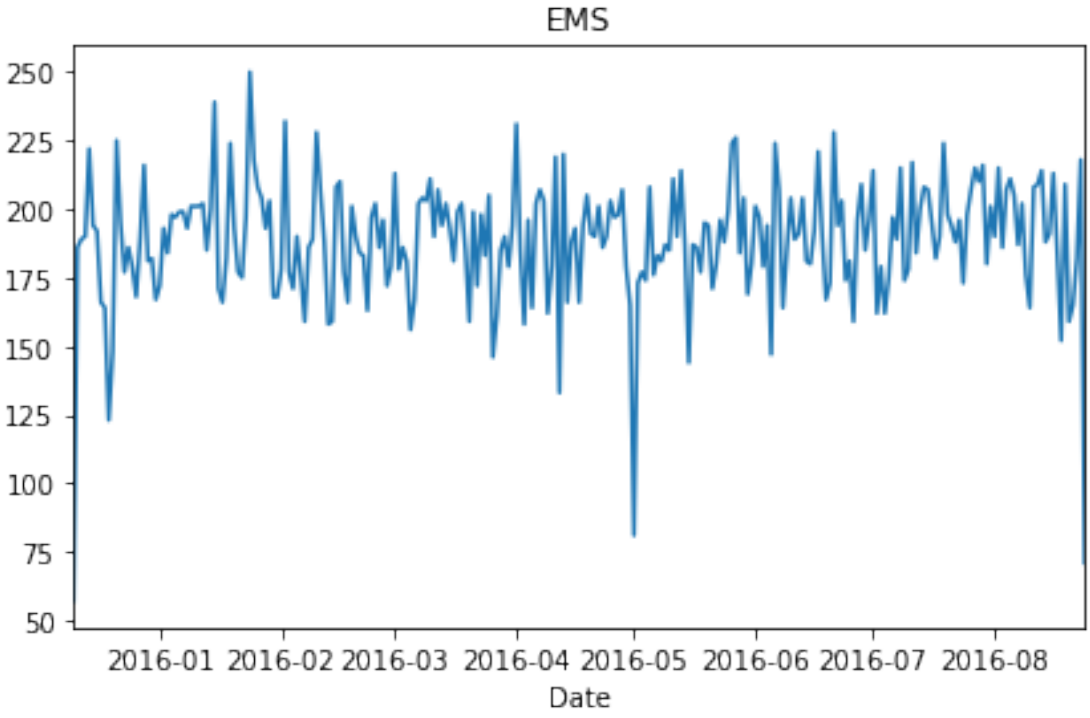


** Now lets recreate this plot but create 3 separate plots with each plot representing a Reason for the 911 call**

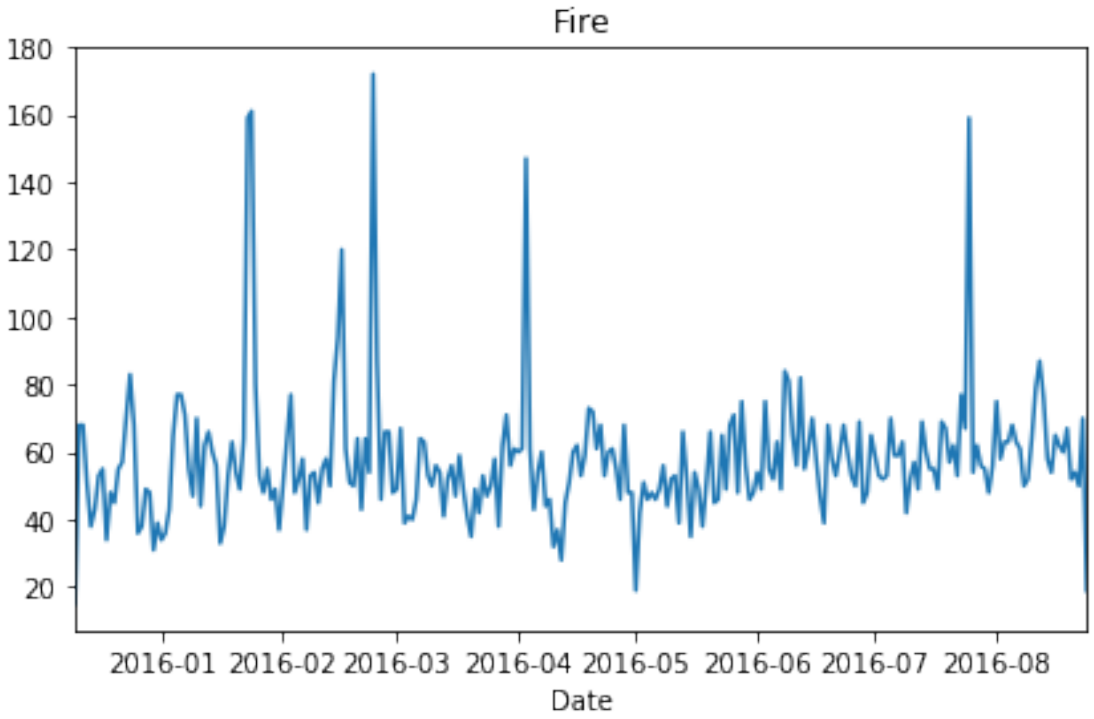
```
In [24]: df[df['Reason']=='Traffic'].groupby('Date').count()['twp'].plot()
         plt.title('Traffic')
         plt.tight_layout()
```




```
In [25]: df[df['Reason']=='EMS'].groupby('Date').count()['twp'].plot()
         plt.title('EMS')
         plt.tight_layout()
```



```
In [26]: df[df['Reason']=='Fire'].groupby('Date').count()['twp'].plot()
         plt.title('Fire')
         plt.tight_layout()
```



** Now let's move on to creating heatmaps with seaborn and our data. We'll first need to restructure the dataframe so that the columns become the Hours and the Index becomes the Day of the Week using unstack()**

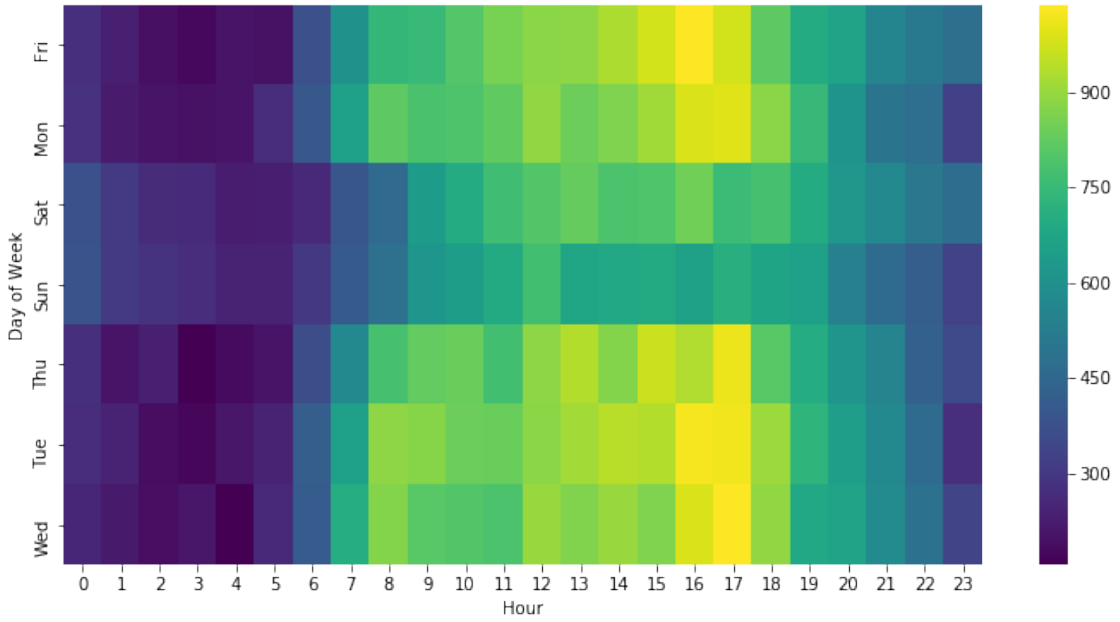
```
In [27]: dayHour = df.groupby(by=['Day of Week','Hour']).count()['Reason'].unstack()
         dayHour.head()
```

```
Out[27]: Hour          0    1    2    3    4    5    6    7    8    9  ...   14   15  \
         Day of Week                                                   ...
         Fri         275  235  191  175  201  194  372  598  742  752 ...  932  980
         Mon         282  221  201  194  204  267  397  653  819  786 ...  869  913
         Sat         375  301  263  260  224  231  257  391  459  640 ...  789  796
         Sun         383  306  286  268  242  240  300  402  483  620 ...  684  691
         Thu         278  202  233  159  182  203  362  570  777  828 ...  876  969

         Hour           16    17   18   19   20   21   22   23
         Day of Week
         Fri          1039   980  820  696  667  559  514  474
```

```
Mon            989   997  885  746  613  497  472  325
Sat            848   757  778  696  628  572  506  467
Sun            663   714  670  655  537  461  415  330
Thu            935  1013  810  698  617  553  424  354

[5 rows x 24 columns]
```

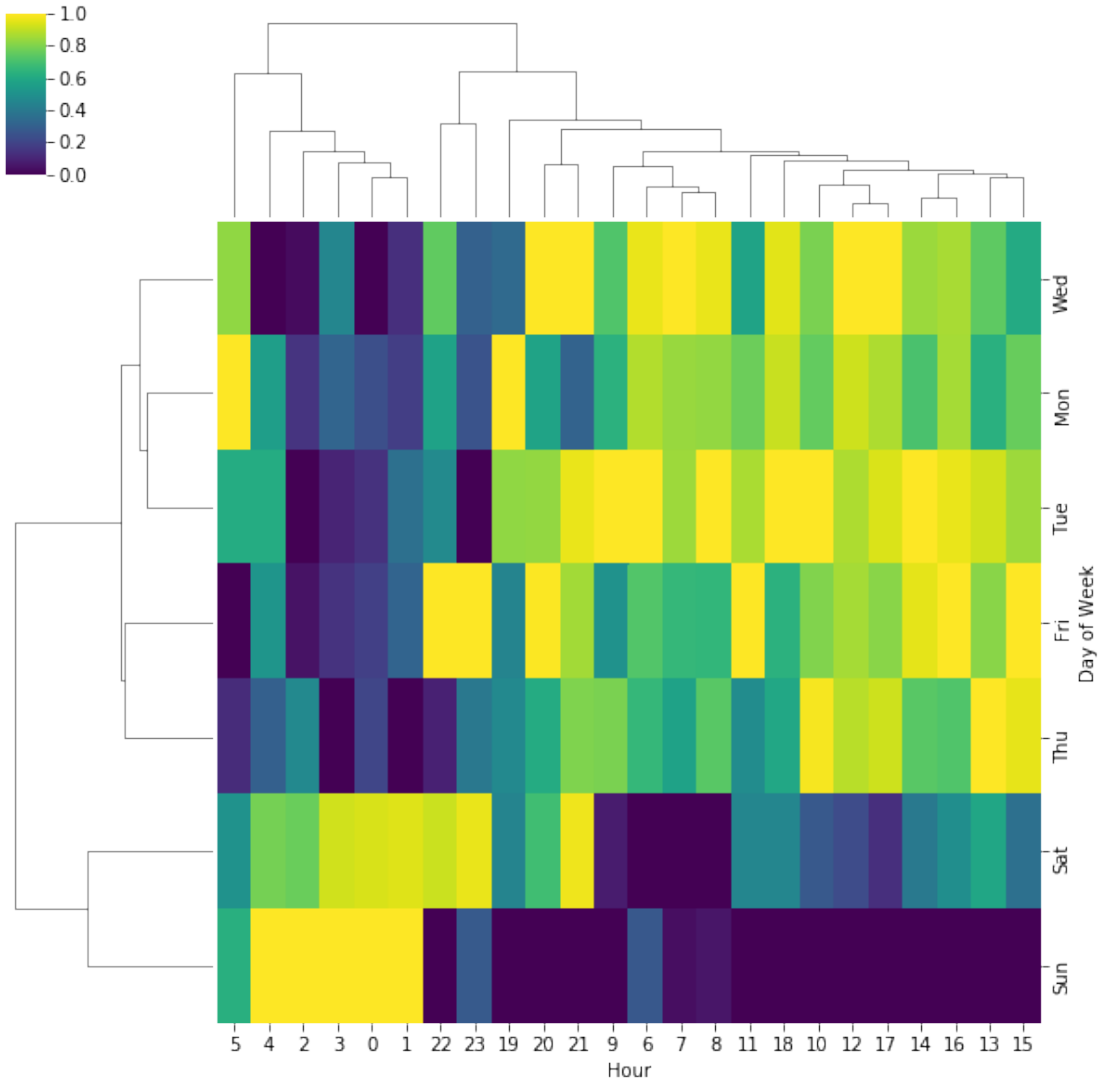
** Now create a HeatMap using this new DataFrame. Here, we can notice that in the afternoon and the hours between 12-5 notices increase cases of 911 calls which means in the start of the day the calls received are less and more frequent in the afternoon **

```
In [28]: plt.figure(figsize=(12,6))
         sns.heatmap(dayHour,cmap='viridis')

Out[28]: <matplotlib.axes._subplots.AxesSubplot at 0x2a907cf4160>
```



** Now we will create a clustermap using this DataFrame by normalising the numbe rof calls on a standard scale of 0-1. We can notice that Thursday and Friday are combined together which shows and they have high scale of numbe of 911 calls whereas mon and wednesday is in group 2 and sat, sunday are in group 3, receiving the least calls. Also, mostly on sunday's maximum calls are received in the early morning from 12:00 am - 5:00 am **

```
In [29]: sns.clustermap(dayHour,standard_scale=1,cmap='viridis')

Out[29]: <seaborn.matrix.ClusterGrid at 0x2a907cb6588>
```



** Now repeat these same plots and operations, for a DataFrame that shows the Month as the column. **

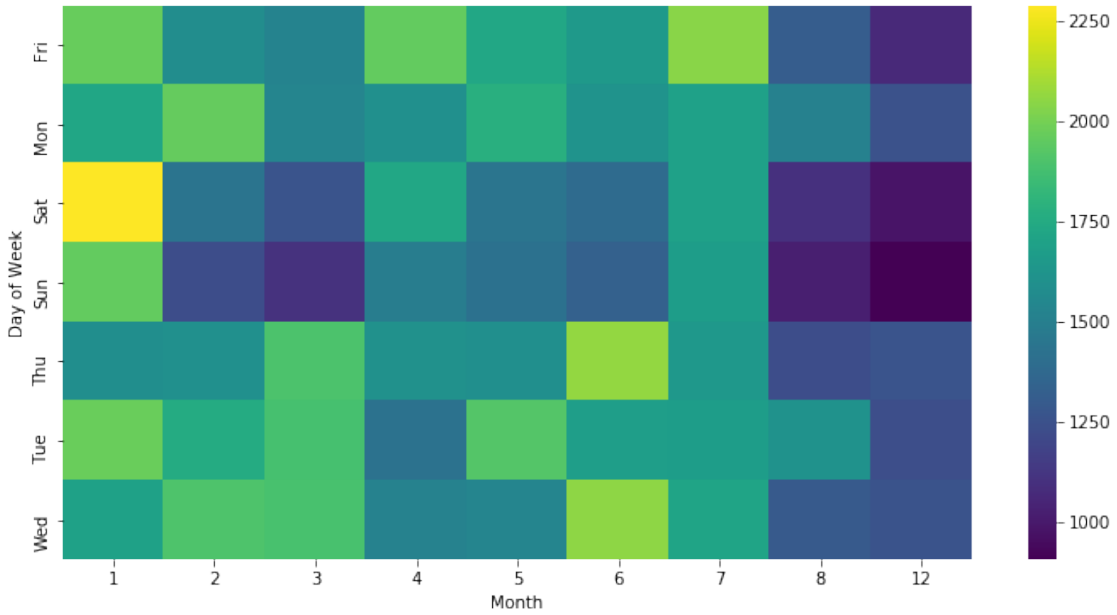
```
In [30]: dayMonth = df.groupby(by=['Day of Week','Month']).count()['Reason'].unstack()
         dayMonth.head()
```

Out[30]:

Month	1	2	3	4	5	6	7	8	12
Day of Week									
Fri	1970	1581	1525	1958	1730	1649	2045	1310	1065
Mon	1727	1964	1535	1598	1779	1617	1692	1511	1257
Sat	2291	1441	1266	1734	1444	1388	1695	1099	978
Sun	1960	1229	1102	1488	1424	1333	1672	1021	907
Thu	1584	1596	1900	1601	1590	2065	1646	1230	1266

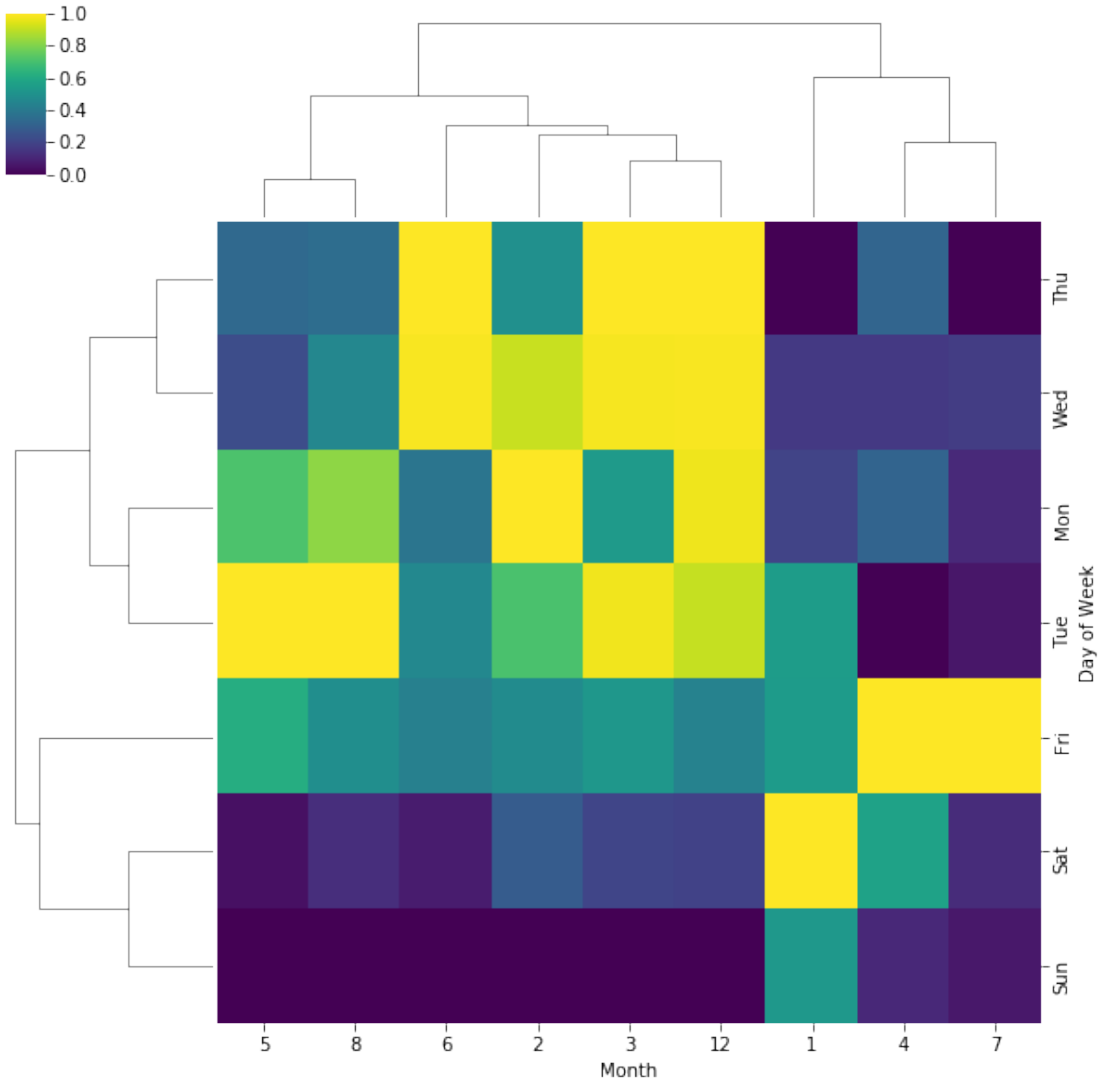
```
In [31]: plt.figure(figsize=(12,6))
         sns.heatmap(dayMonth,cmap='viridis')
```

Out[31]: <matplotlib.axes._subplots.AxesSubplot at 0x2a90a085ba8>



In [46]: sns.clustermap(dayMonth,cmap='viridis',standard_scale=1)

Out[46]: <seaborn.matrix.ClusterGrid at 0x2a90a8bb978>



Thank You Regards Ankur Bansal