Exploratory Data Analysis - Casino Jitter Data

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Introduction

Conduct exploratory data analysis (EDA) on a casino jitter dataset to determine important relationships or key insights in preparation for predictive models to help the casino determine the best time of day to open X number of tables for particular casino games.

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

%matplotlib inline
import matplotlib.pyplot as plt

import warnings
warnings.filterwarnings("ignore")
```

In [2]:
```
url = "https://library.startlearninglabs.uw.edu/DATASCI410/Datasets/JitteredHeadCount.csv"
casino_data = pd.read_csv(url).reset_index(drop=True)
```

In [3]:
```
print (casino_data.shape)
```

```
(175677, 9)
```

In [4]:
```
casino_data.describe()
```

Out[4]:

	Hour	TablesOcc	TablesOpen	TablesClosed	HeadCount	DayOfW
count	175677.000000	175677.000000	175677.000000	175677.000000	175677.000000	175677.00
mean	11.504431	2.074591	2.555804	1.853430	7.390228	3.992
std	6.922330	3.307518	3.673229	2.993767	12.458613	1.997
min	0.000000	0.000000	0.000000	0.000000	0.000000	1.00
25%	6.000000	0.000000	1.000000	0.000000	0.000000	2.00
50%	12.000000	1.000000	1.000000	1.000000	3.000000	4.00
75%	18.000000	2.000000	3.000000	3.000000	8.000000	6.00
max	23.000000	24.000000	24.000000	23.000000	109.000000	7.00

In [5]:
```
# Initial Summary Stats
casino_data.dtypes
```

Out[5]:
```
GameCode        object
DateFormat      object
Hour             int64
TablesOcc        int64
TablesOpen       int64
TablesClosed     int64
HeadCount        int64
DayOfWeek        int64
DayNumber        int64
dtype: object
```

In [6]:
```
casino_data.head(10)
```

Out[6]:

	GameCode	DateFormat	Hour	TablesOcc	TablesOpen	TablesClosed	HeadCount	DayOfW
0	BA	9/16/2011	6	0	0	1	0	
1	BA	9/16/2011	7	0	0	1	0	
2	BA	9/16/2011	8	0	0	1	0	
3	BA	9/16/2011	9	0	0	1	0	
4	BA	9/16/2011	10	0	1	0	0	
5	BA	9/16/2011	11	0	1	0	0	
6	BA	9/16/2011	12	0	1	0	0	
7	BA	9/16/2011	13	0	1	0	0	
8	BA	9/16/2011	14	0	1	0	0	
9	BA	9/16/2011	15	0	1	0	0	

In [184]:
```
# Create a new Data column formatted properly to use for time series p
lots
casino_data.loc[:, 'Date'] = pd.to_datetime(casino_data.loc[:, 'DateFo
rmat'])
```

In [7]:
```
casino_data.head(10)
```

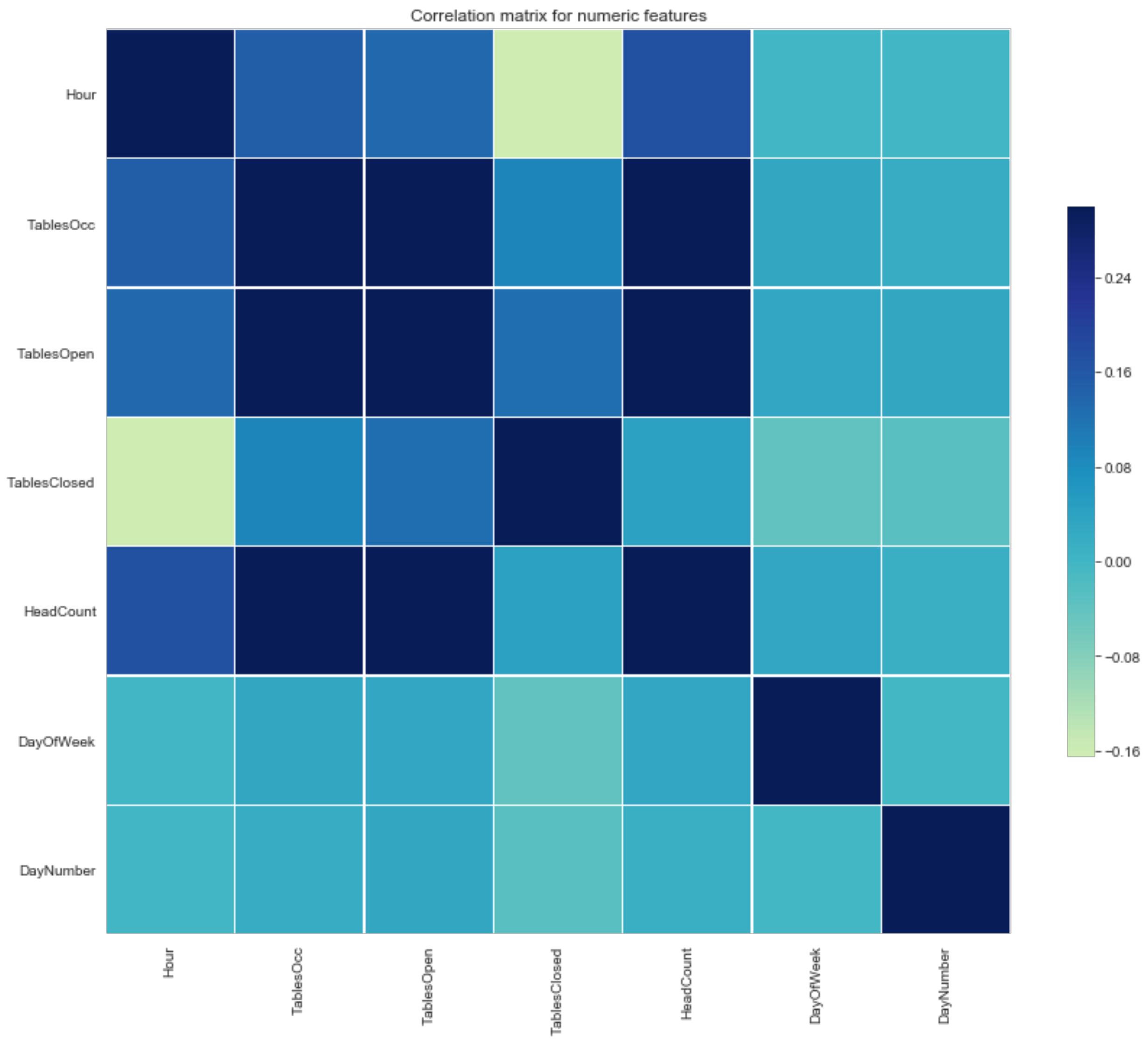
Out[7]:

	GameCode	DateFormat	Hour	TablesOcc	TablesOpen	TablesClosed	HeadCount	DayOfW
0	BA	9/16/2011	6	0	0	1	0	
1	BA	9/16/2011	7	0	0	1	0	
2	BA	9/16/2011	8	0	0	1	0	
3	BA	9/16/2011	9	0	0	1	0	
4	BA	9/16/2011	10	0	1	0	0	
5	BA	9/16/2011	11	0	1	0	0	
6	BA	9/16/2011	12	0	1	0	0	
7	BA	9/16/2011	13	0	1	0	0	
8	BA	9/16/2011	14	0	1	0	0	
9	BA	9/16/2011	15	0	1	0	0	

Correlation plots

As a starting point to help indentity what possible value relationships to explore we have a function to plot a heatmap of all the numerical values in the dataset. This function can later be expanded to exclude values as well.

In [186]:
```
# A function to plot of a heatmap of the correlation of data numerical values
def corr_heatmap():
    vals_corr = casino_data[['Hour',
                             'TablesOcc',
                             'TablesOpen',
                             'TablesClosed',
                             'HeadCount',
                             'DayOfWeek',
                             'DayNumber'
                            ]].corr()
    plt.subplots(figsize=(14,14))
    sns.color_palette("BuGn_r")
    sns.heatmap(vals_corr, vmax=.3, center=0,cmap="YlGnBu",
                square=True, linewidths=.25, cbar_kws={"shrink": .5})
    plt.title('Correlation matrix for numeric features')
    plt.yticks(rotation='horizontal')
    plt.xticks(rotation='vertical')
    return
corr_heatmap()
```



In [9]:
```
# Create a new categorical column from the DayOfWeek column
casino_data.loc[casino_data.loc[:, "DayOfWeek"] == 1, "DayName"] = "Su
nday"
casino_data.loc[casino_data.loc[:, "DayOfWeek"] == 2, "DayName"] = "Mo
nday"
casino_data.loc[casino_data.loc[:, "DayOfWeek"] == 3, "DayName"] = "Tu
esday"
casino_data.loc[casino_data.loc[:, "DayOfWeek"] == 4, "DayName"] = "We
dnesday"
casino_data.loc[casino_data.loc[:, "DayOfWeek"] == 5, "DayName"] = "Th
ursday"
casino_data.loc[casino_data.loc[:, "DayOfWeek"] == 6, "DayName"] = "Fr
iday"
casino_data.loc[casino_data.loc[:, "DayOfWeek"] == 7, "DayName"] = "Sa
turday"
```

In [10]:
```
tables_open = casino_data[["GameCode","TablesOpen","DayName","DayOfWee
k","DayNumber","Hour"]]
```

In [11]:
```
tables_open.loc[:, 'hours_bin'] = pd.cut(tables_open.loc[:, 'Hour'], b
ins=3,labels=["Morning","Afternoon","Evening"])
```

In [12]:
```
# Create a pivot table that is a slice of the main dataset to focus on
Tables that were opened
tables_open = pd.pivot_table(tables_open, index=['GameCode','DayNumber
','DayName','hours_bin','DayOfWeek'], values='TablesOpen', aggfunc='su
m')
```

In [13]:
```
tables_open.head(10)
```

Out[13]:

					TablesOpen
GameCode	DayNumber	DayName	hours_bin	DayOfWeek	
BA	47	Friday	Morning	6	0
			Afternoon	6	6
			Evening	6	8
	48	Saturday	Morning	7	8
			Afternoon	7	8
			Evening	7	8
	49	Sunday	Morning	1	8
			Afternoon	1	8
			Evening	1	8
	50	Monday	Morning	2	8

In [194]:
```
# View data of day, time of day (categorical) and number of tables ope
n for game code by day number
tables_open.loc['BA', 47]
```

Out[194]:

			TablesOpen
DayName	hours_bin	DayOfWeek	
Friday	Morning	6	0
	Afternoon	6	6
	Evening	6	8

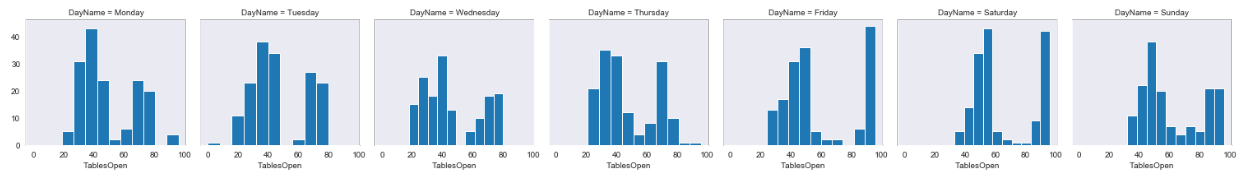
Facet Grid Histograms

A function that takes a game code and plots a facet grid of histograms showing the distribution of open tables by day of the week accross the range of days that game code has data. Texas Hold'em poker is probably one of the most popular tables at a casino so we will input that game code to view the data. We can see from the plots that tables being opened align with the likely traffic flowing into the casino during busy times of a given week day. We can also see the values increase on the weekends.

In [195]:
```python
# Function takes a game code as string and plots a facet grid of the d
istribution of open tables by day of the week
def facetHist(game_code):
    tables_open_tp = tables_open.loc[game_code]
    tables_open_tp.reset_index(inplace=True)
    print (tables_open_tp.head(20))
    gr = sns.FacetGrid(tables_open_tp, col="DayName")
    gr = gr.map(plt.hist, "TablesOpen")
    return

facetHist("TP")
```

```
    DayNumber    DayName  hours_bin  DayOfWeek  TablesOpen
0           1     Monday    Morning          2          27
1           1     Monday  Afternoon          2          45
2           1     Monday    Evening          2          66
3           2    Tuesday    Morning          3          32
4           2    Tuesday  Afternoon          3          43
5           2    Tuesday    Evening          3          64
6           3  Wednesday    Morning          4          28
7           3  Wednesday  Afternoon          4          40
8           3  Wednesday    Evening          4          63
9           4   Thursday    Morning          5          32
10          4   Thursday  Afternoon          5          40
11          4   Thursday    Evening          5          64
12          5     Friday    Morning          6          27
13          5     Friday  Afternoon          6          54
14          5     Friday    Evening          6          88
15          6   Saturday    Morning          7          48
16          6   Saturday  Afternoon          7          52
17          6   Saturday    Evening          7          90
18          7     Sunday    Morning          1          42
19          7     Sunday  Afternoon          1          41
```

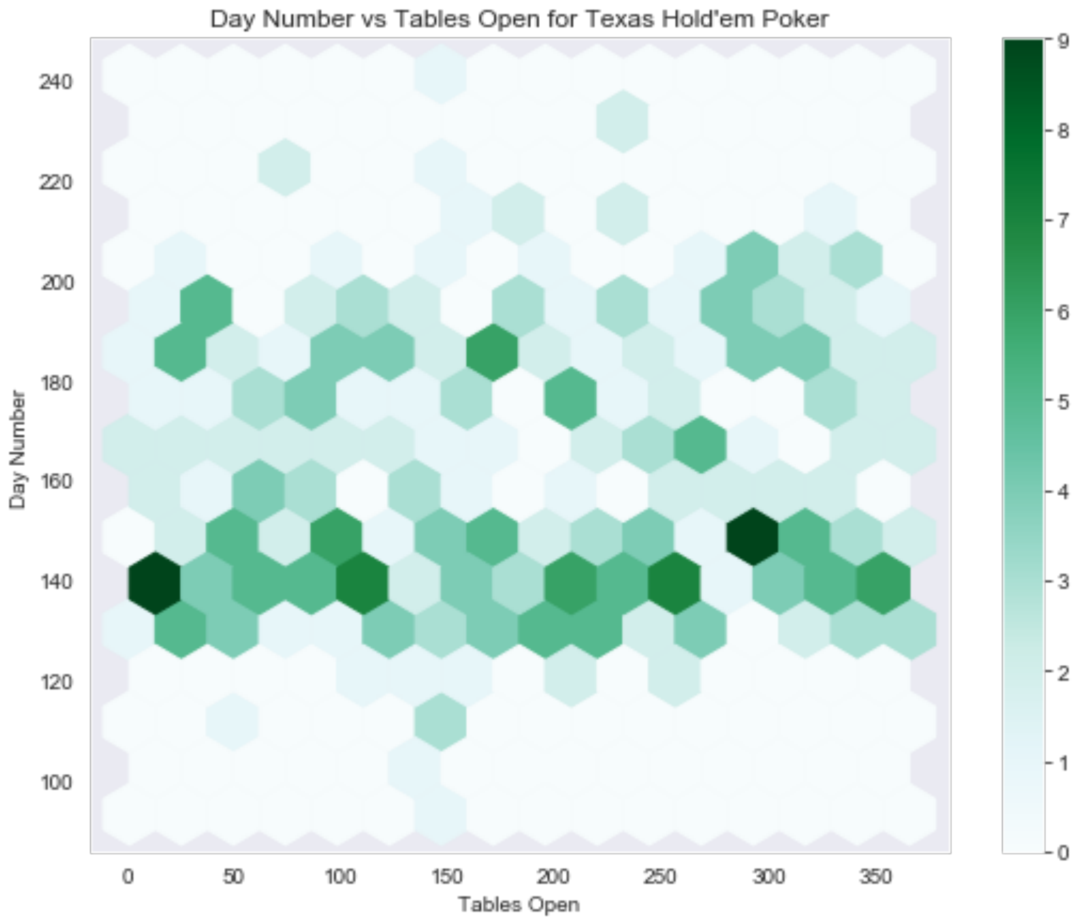


Hexbin plots

The hexbin plot avoids the issue of overplotting so that the relationship of the quantity of open tables by game code can be viewed over the range of days. By creating a function that takes the game code as input we can easily plot hexbins for any of the game codes.

In [196]:
```
# a Function that takes game code and name as a string to plot hexbins
on days vs open tables
def hexbin_plot(game_code,game_name):
    t = pd.pivot_table(tables_open.loc[game_code], index=['DayNumber']
, values='TablesOpen', aggfunc='sum')
    t.reset_index(inplace=True)
    ax = plt.figure(figsize=(9, 7)).gca() # define axis
    t.plot.hexbin(x = 'DayNumber', y = 'TablesOpen', gridsize = 15, ax
= ax)
    ax.set_title('Day Number vs Tables Open for {}'.format(game_name))
    ax.set_ylabel('Day Number')# Set text for y axis
    ax.set_xlabel('Tables Open')
    return

hexbin_plot("TP","Texas Hold'em Poker")
```

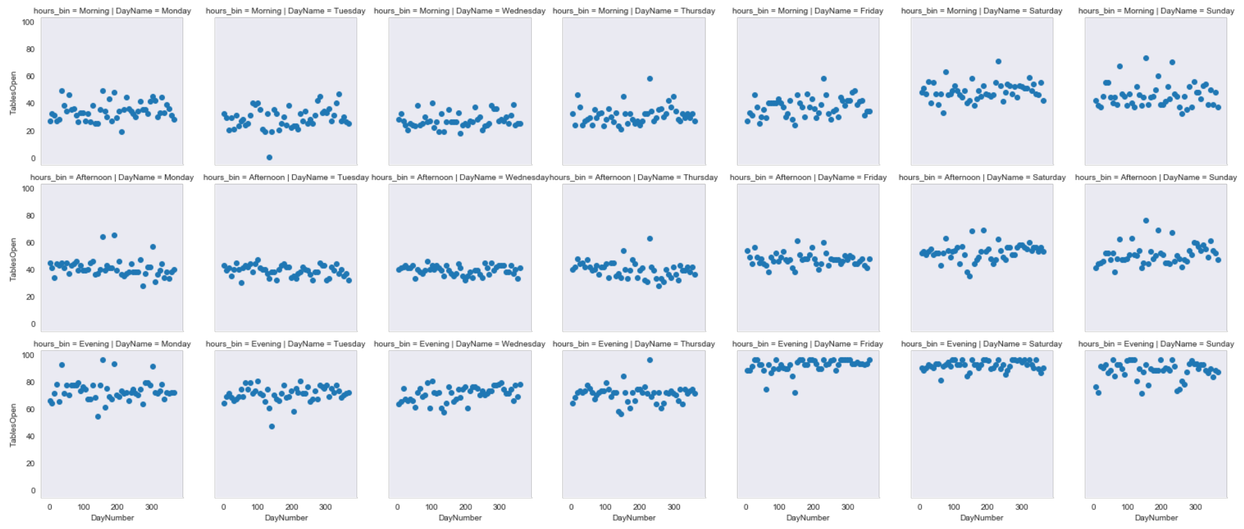


Facet Grids

The facet grid with scatter points is being used to show how many tables are open for a give game code by day of the week and hours of the day binned into morning, afternoon and evening categories.

In [197]:
```
def facetGrid(game_code):
    t = tables_open.loc[game_code]
    t.reset_index(inplace=True)
    g = sns.FacetGrid(t,
                      col="DayName",
                      row='hours_bin',
                      palette="Set1")
    g = g.map(plt.scatter, "DayNumber", "TablesOpen")
    return plt.show()

facetGrid("TP")
```



In [198]:
```
tables_open.loc["TP"].head()
```

Out[198]:

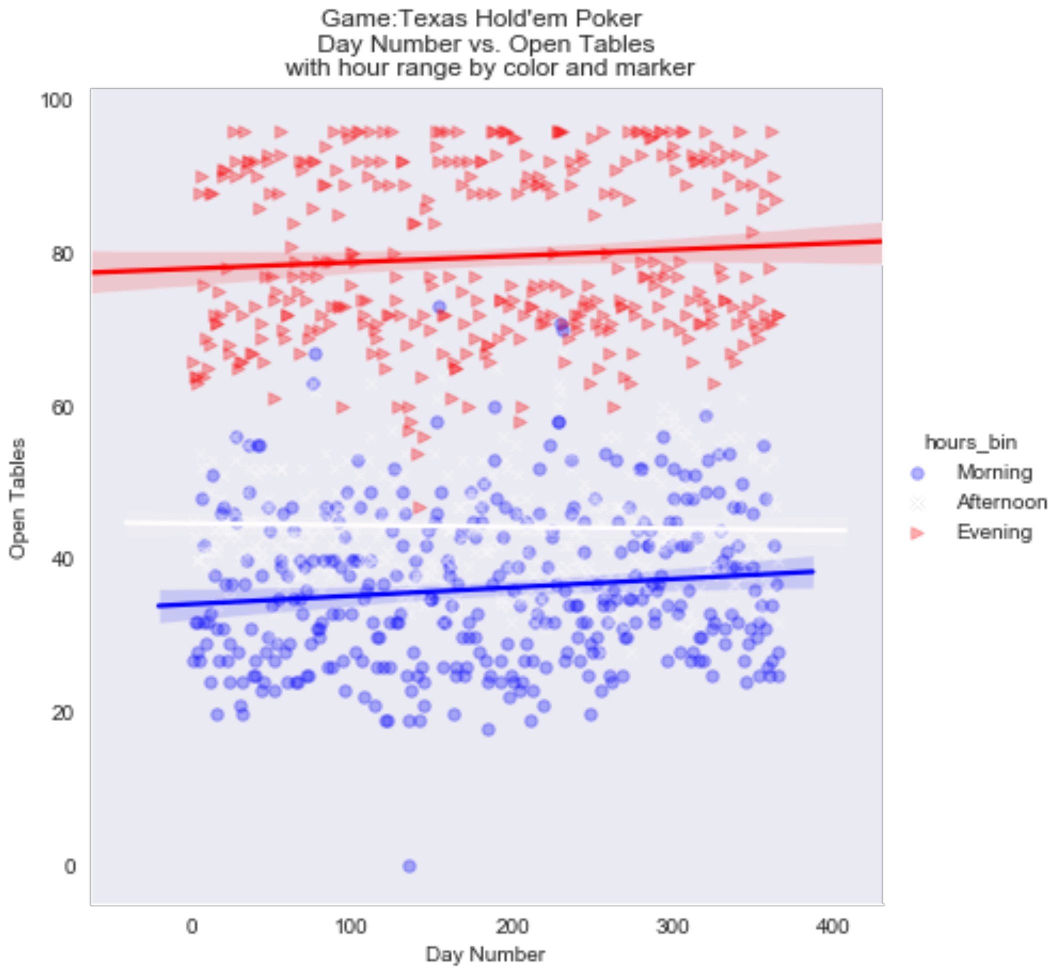
				TablesOpen
DayNumber	**DayName**	**hours_bin**	**DayOfWeek**	
1	Monday	Morning	2	27
		Afternoon	2	45
		Evening	2	66
2	Tuesday	Morning	3	32
		Afternoon	3	43

Scatter Plot with Marker and Color

A function that plots a scatter chart of the number of Open tables for a given casino game over all days in the dataset. The points are marked and colored by categorical hourly ranges during the day. This plot can be improved by plotting marker size with additional numeric data if available. The example plot for the Texas Hold'em Poker game code shows the slight increase in open tables from Day 1 through Day 366 by time of day.

In [199]:
```
def colorScatter(game_code,game_name):
    t = tables_open.loc[game_code]
    t.reset_index(inplace=True)
    sns.lmplot(x = 'DayNumber', y = 'TablesOpen',
               data = t,
               hue = 'hours_bin',
               size=6,
               markers=["o", "x",">"],
               palette="seismic",
               scatter_kws={'alpha':0.3,'s': 30},
               fit_reg = True)
    plt.xlabel('Day Number')
    plt.ylabel('Open Tables')
    plt.title('Game:{} \n Day Number vs. Open Tables \n with hour rang
e by color and marker'.format(game_name))
    return

colorScatter("TP","Texas Hold'em Poker")
```


Game:Texas Hold'em Poker
Day Number vs. Open Tables
with hour range by color and marker
Open Tables
Day Number
0
20
40
60
80
100
0
100
200
300
400
hours_bin
Morning
Afternoon
Evening

```
In [ ]:
```