Instructions

The assignment is at the bottom!

This cell automatically downloads Capital Bikeshare data

And here we read in the data

In [182…

```
import seaborn as sns
import matplotlib.pyplot as plt
%matplotlib inline
plt.rcParams['figure.figsize'] = 20, 10
import pandas as pd
import numpy as np
bikes = pd.read_csv(r'C:\Users\17036\Desktop\mlnn\data\bikeshare.csv.gz')
bikes.head()
bikes['start'] = pd.to_datetime(bikes['Start date'], infer_datetime_format=True)
bikes['end'] = pd.to_datetime(bikes['End date'], infer_datetime_format=True)
bikes["dur"] = (bikes['Duration (ms)']/1000).astype(int)
bikes.head()
```

Out[182…

	Duration (ms)	Start date	End date	Start station number	Start station	End station number	End station	Bike number	Member Type	star
0	301295	3/31/2016 23:59	4/1/2016 0:04	31280	11th & S St NW	31506	1st & Rhode Island Ave NW	W00022	Registered	2016 03-3 23:59:0
1	557887	3/31/2016 23:59	4/1/2016 0:08	31275	New Hampshire Ave & 24th St NW	31114	18th St & Wyoming Ave NW	W01294	Registered	2016 03-3 23:59:0
2	555944	3/31/2016 23:59	4/1/2016 0:08	31101	14th & V St NW	31221	18th & M St NW	W01416	Registered	2016 03-3 23:59:0
3	766916	3/31/2016 23:57	4/1/2016 0:09	31226	34th St & Wisconsin Ave NW	31214	17th & Corcoran St NW	W01090	Registered	2016 03-3 23:57:0
4	139656	3/31/2016 23:57	3/31/2016 23:59	31011	23rd & Crystal Dr	31009	27th & Crystal Dr	W21934	Registered	2016 03-3 23:57:0

In [183…

```
bikes.dur.mean()
```

Out[183…

```
992.8716543657755
```

In [184…
```
bikes.dur.std()
```

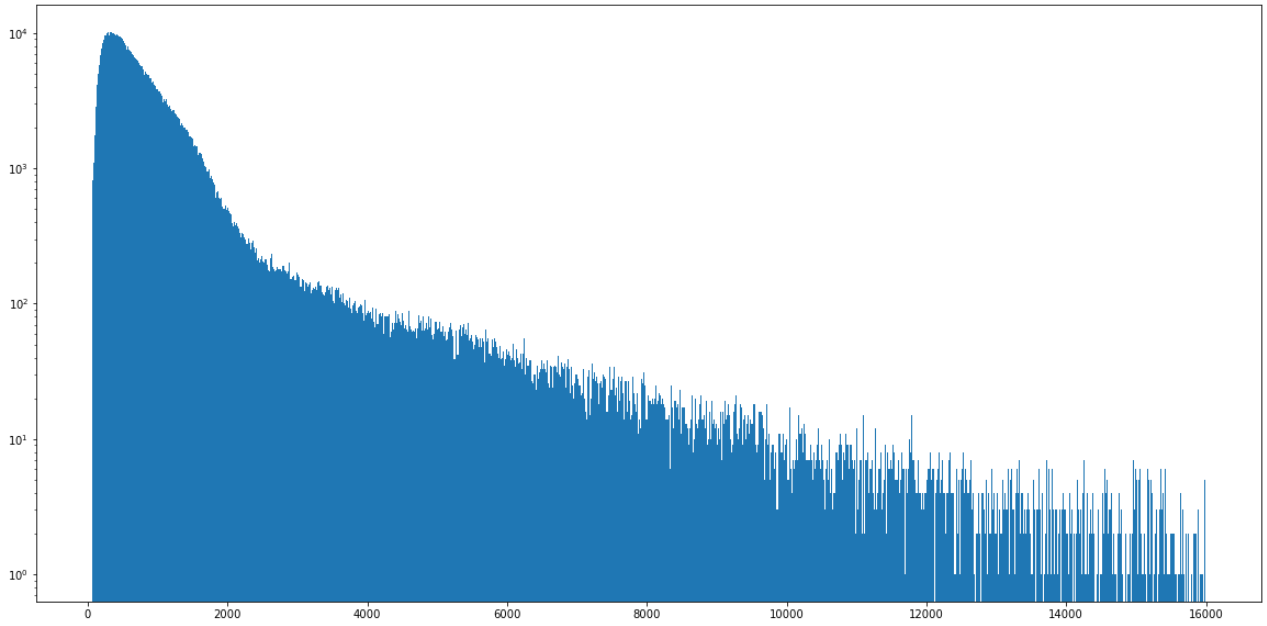
Out[184…
```
2073.9809135296514
```

In [185…
```
bikes[bikes.dur>16000].shape
```

Out[185…
```
(973, 12)
```

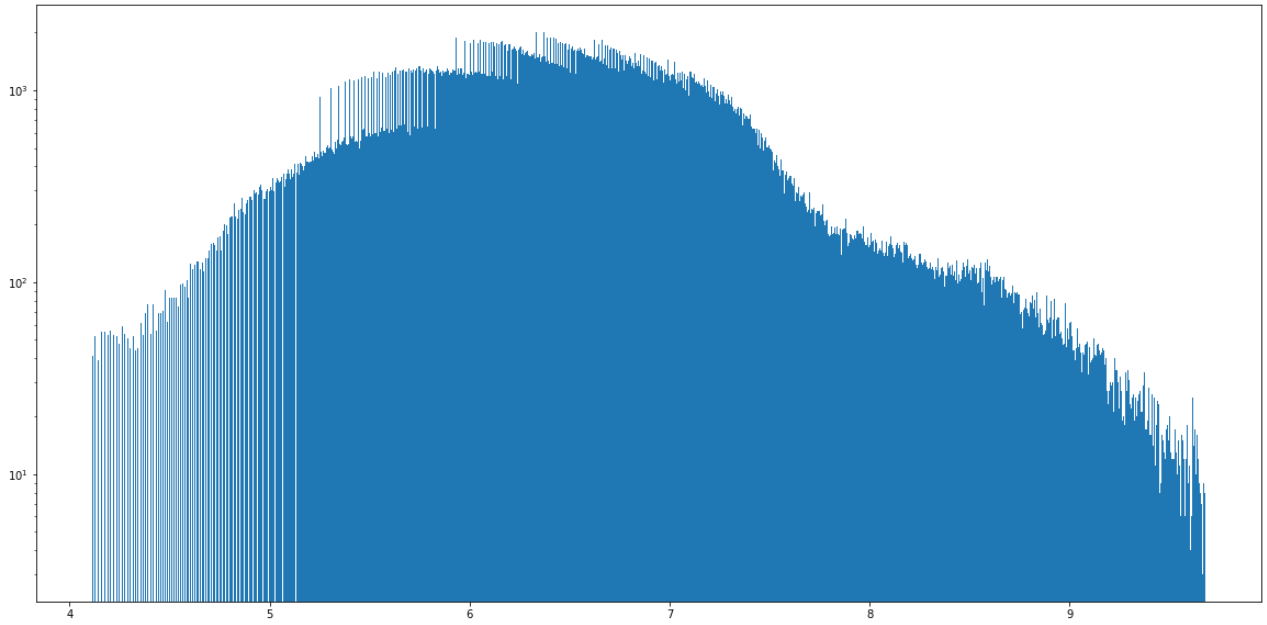
In [186…
```
plt.rcParams['figure.figsize'] = 20, 10
```

In [187…
```
_=plt.hist(bikes[bikes.dur<16000].dur, log=True, bins=1000)
```



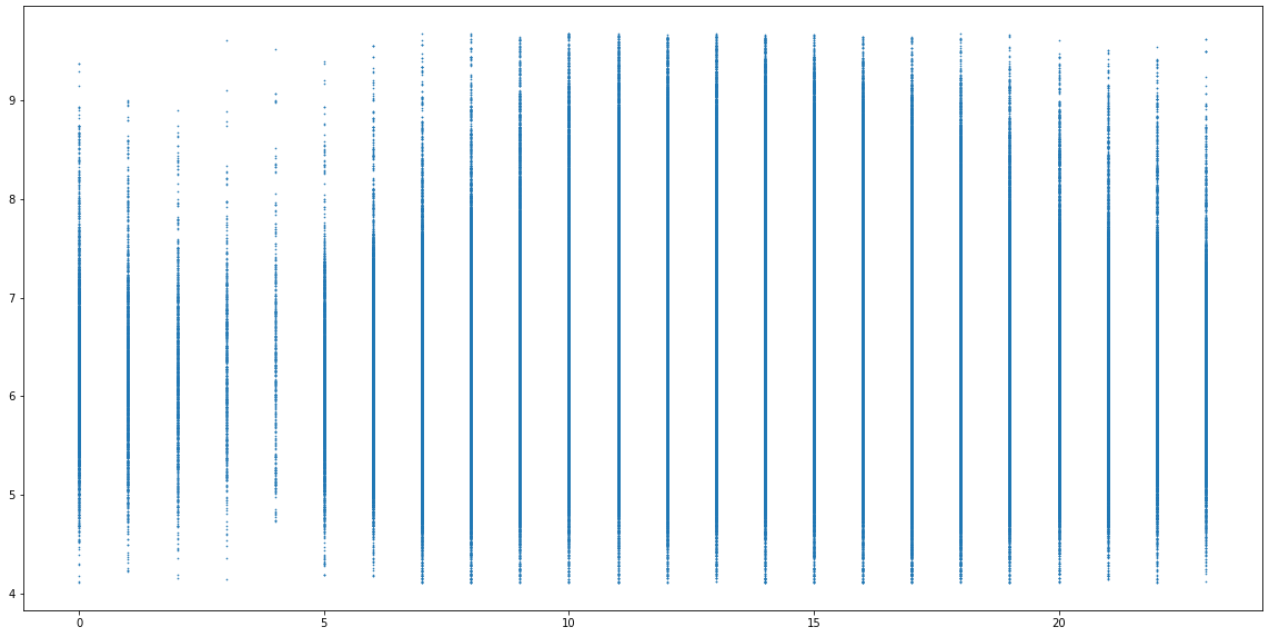
In [188…
```
short = bikes[bikes.dur<16000]
```

In [189…
```
_=plt.hist(np.log1p(short.dur), log=True, bins=1000)
```



In [190…
```
plt.scatter(short.start.dt.hour, np.log1p(short.dur), s=.4)
```

Out[190…
```
<matplotlib.collections.PathCollection at 0x1c1d28bfb20>
```



In [191…
```
np.log1p(0), np.log(0), np.log(1+0)
```

Out[191…
```
C:\Users\17036\AppData\Local\Temp/ipykernel_10104/3982265232.py:1: RuntimeWarning: divid
e by zero encountered in log
  np.log1p(0), np.log(0), np.log(1+0)
(0.0, -inf, 0.0)
```

In [192…
```
bikes['log_dur'] = np.round(np.log1p(bikes.dur), 1)
```

In [193…
```
monday = bikes[bikes.start.dt.dayofweek==1]
```

In [194...
```
dur_hour = monday.groupby(['log_dur', monday.start.dt.hour]).count()
```

In [195...
```
dur_hour
```

Out[195...

		Duration (ms)	Start date	End date	Start station number	Start station	End station number	End station	Bike number	Member Type	start	enc
log_dur	**start**											
4.1	**7**	1	1	1	1	1	1	1	1	1	1	1
	9	2	2	2	2	2	2	2	2	2	2	2
	11	1	1	1	1	1	1	1	1	1	1	1
	14	2	2	2	2	2	2	2	2	2	2	2
	16	2	2	2	2	2	2	2	2	2	2	2
...	**...**	...	...	...	...	...	...	...	...	...	...	...
11.2	**21**	2	2	2	2	2	2	2	2	2	2	2
11.3	**14**	1	1	1	1	1	1	1	1	1	1	1
	17	1	1	1	1	1	1	1	1	1	1	1
	19	1	1	1	1	1	1	1	1	1	1	1
11.4	**18**	1	1	1	1	1	1	1	1	1	1	1

1184 rows × 12 columns

In [196...
```
duration_hour = dur_hour.start.unstack().T.fillna(0)
duration_hour
```

Out[196...

log_dur	**4.1**	**4.2**	**4.3**	**4.4**	**4.5**	**4.6**	**4.7**	**4.8**	**4.9**	**5.0**	...	**10.5**	**10.6**	**10.7**	**10.8**	**10.9**	**11.0**
start																	
0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	1.0	2.0	3.0	...	0.0	0.0	0.0	0.0	0.0	0.0
1	0.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0	3.0	1.0	...	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	...	0.0	0.0	0.0	1.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	1.0	...	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	1.0	0.0	0.0	1.0	4.0	1.0	7.0	6.0	...	0.0	0.0	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	2.0	1.0	2.0	4.0	9.0	11.0	21.0	...	0.0	0.0	0.0	1.0	0.0	0.0
7	1.0	5.0	4.0	1.0	5.0	12.0	25.0	31.0	46.0	46.0	...	0.0	1.0	1.0	0.0	0.0	0.0
8	0.0	3.0	2.0	6.0	7.0	11.0	22.0	52.0	68.0	79.0	...	4.0	2.0	1.0	0.0	0.0	0.0

log_dur	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0	...	10.5	10.6	10.7	10.8	10.9	11.0
start																	
9	2.0	3.0	2.0	4.0	3.0	11.0	18.0	22.0	28.0	42.0	...	1.0	1.0	0.0	0.0	0.0	0.0
10	0.0	0.0	1.0	3.0	5.0	7.0	8.0	5.0	10.0	31.0	...	0.0	0.0	0.0	0.0	0.0	0.0
11	1.0	0.0	2.0	5.0	4.0	7.0	7.0	10.0	13.0	22.0	...	1.0	0.0	0.0	0.0	0.0	0.0
12	0.0	0.0	4.0	2.0	7.0	6.0	12.0	16.0	36.0	30.0	...	0.0	1.0	0.0	0.0	0.0	0.0
13	0.0	2.0	6.0	3.0	5.0	6.0	4.0	15.0	20.0	36.0	...	0.0	0.0	0.0	0.0	0.0	0.0
14	2.0	0.0	1.0	1.0	3.0	8.0	9.0	11.0	26.0	24.0	...	0.0	0.0	0.0	0.0	0.0	0.0
15	0.0	3.0	0.0	5.0	1.0	7.0	6.0	22.0	26.0	31.0	...	0.0	0.0	0.0	0.0	0.0	0.0
16	2.0	6.0	1.0	11.0	6.0	10.0	14.0	17.0	36.0	35.0	...	0.0	0.0	0.0	0.0	2.0	0.0
17	3.0	7.0	7.0	13.0	12.0	14.0	20.0	36.0	57.0	71.0	...	0.0	0.0	0.0	3.0	1.0	1.0
18	0.0	4.0	7.0	9.0	13.0	20.0	21.0	40.0	79.0	75.0	...	0.0	0.0	2.0	4.0	1.0	0.0
19	3.0	0.0	7.0	7.0	9.0	16.0	19.0	34.0	43.0	52.0	...	0.0	1.0	2.0	3.0	0.0	1.0
20	0.0	7.0	2.0	4.0	2.0	13.0	14.0	19.0	34.0	38.0	...	0.0	1.0	1.0	1.0	1.0	1.0
21	1.0	2.0	1.0	2.0	3.0	6.0	16.0	19.0	26.0	35.0	...	1.0	2.0	0.0	1.0	0.0	0.0
22	1.0	0.0	2.0	2.0	1.0	8.0	1.0	13.0	10.0	20.0	...	1.0	0.0	1.0	0.0	0.0	0.0
23	0.0	0.0	1.0	0.0	2.0	5.0	4.0	8.0	3.0	5.0	...	0.0	0.0	1.0	1.0	0.0	0.0

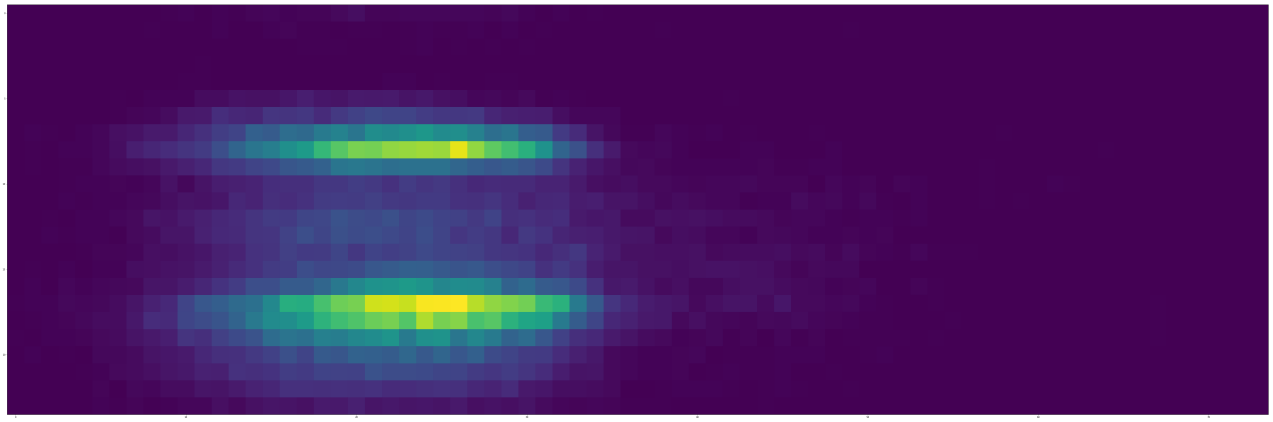
24 rows × 74 columns

In [197…

```
plt.figure(figsize=(100,100))
plt.imshow(duration_hour)
```

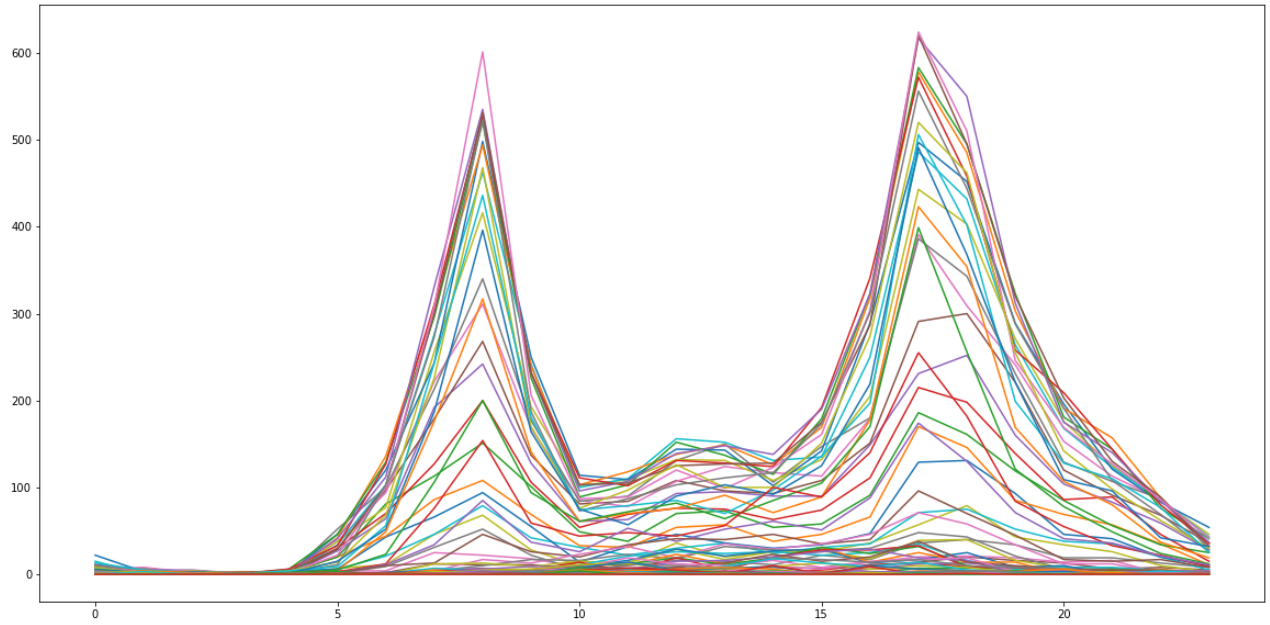
Out[197…

```
<matplotlib.image.AxesImage at 0x1c1d2d9bb80>
```



In [198…

```
_=plt.plot(duration_hour)
```



In [199…
```
bikes['Member Type'].value_counts()
```

Out[199…
```
Registered    467432
Casual         84967
Name: Member Type, dtype: int64
```

Create a new column that represents the hour+minute of the day as a fraction (i.e. 1:30pm = 13.5)

In [200…
```
np.round(.65, 1)
```

Out[200…
```
0.6
```

In [201…
```
37//6, (37//6)/10, 37/60
```

Out[201…
```
(6, 0.6, 0.6166666666666667)
```

In [202…
```
bikes['hour_of_day'] = (bikes.start.dt.hour + (bikes.start.dt.minute//6)/10)
```

In [203…
```
bikes['roundhour_of_day'] = (bikes.start.dt.hour ) # keep the hour handy as well
```

Aggregate to get a count per hour/minute of the day across all trips

In [204…
```
hours
```

Out[204…

	Duration (ms)	Start date	End date	Start station number	Start station	End station number	End station	Bike number	Member Type	start

hour_of_day	start	Duration (ms)	Start date	End date	Start station number	Start station	End station number	End station	Bike number	Member Type	start
hour_of_day	start										
0.0	0	21	21	21	21	21	21	21	21	21	21
	1	34	34	34	34	34	34	34	34	34	34
	2	43	43	43	43	43	43	43	43	43	43
	3	47	47	47	47	47	47	47	47	47	47
	4	51	51	51	51	51	51	51	51	51	51
...	...	...	...	...	...	...	...	...	...	...	...
23.9	2	48	48	48	48	48	48	48	48	48	48
	3	65	65	65	65	65	65	65	65	65	65
	4	105	105	105	105	105	105	105	105	105	105
	5	111	111	111	111	111	111	111	111	111	111
	6	23	23	23	23	23	23	23	23	23	23

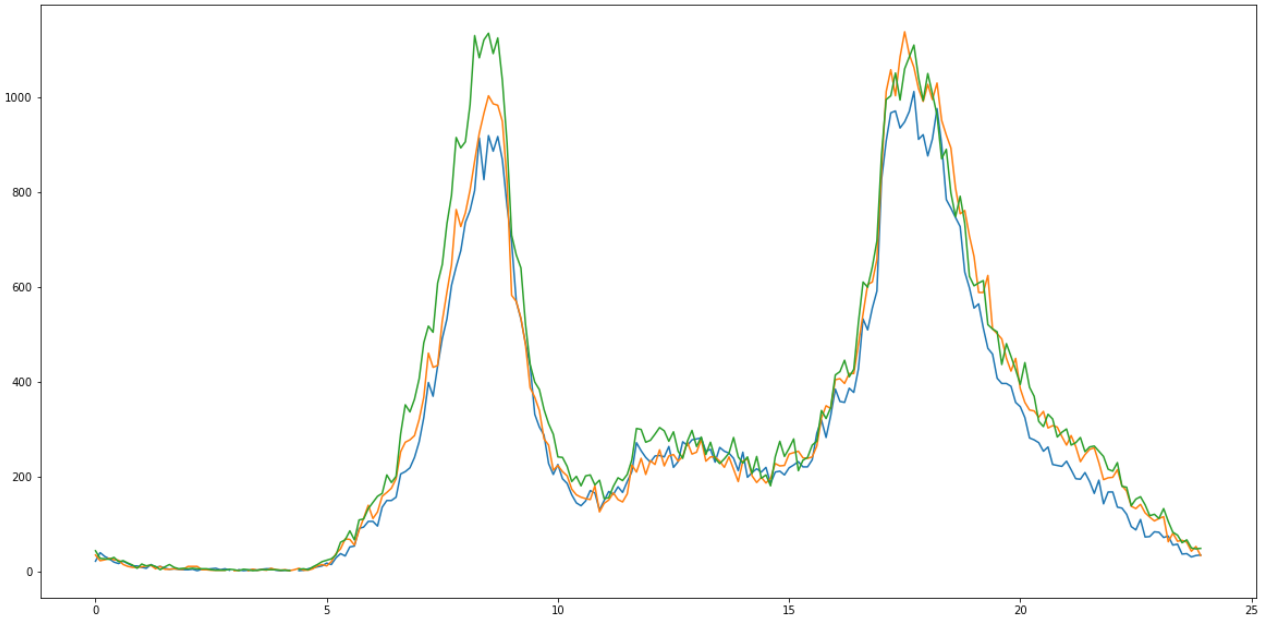
1674 rows × 14 columns

In [205…

```
reg_bikes = bikes[bikes['Member Type']=='Registered']
hours = reg_bikes.groupby([reg_bikes.hour_of_day, reg_bikes.start.dt.dayofweek]).agg('c
#hours['hour'] = hours.index
day_hour_count = hours.dur.unstack()
plt.figure(figsize=(20,10))
plt.plot(day_hour_count.index, day_hour_count[0])
plt.plot(day_hour_count.index, day_hour_count[1])
plt.plot(day_hour_count.index, day_hour_count[2])
# plt.plot(y.index, day_hour_count[3])
# plt.plot(y.index, day_hour_count[4])
# plt.plot(y.index, day_hour_count[5])
# plt.plot(y.index, day_hour_count[6])
```

Out[205…

```
[<matplotlib.lines.Line2D at 0x1c1d29723a0>]
```



In [206…
```
day_hour_count
```

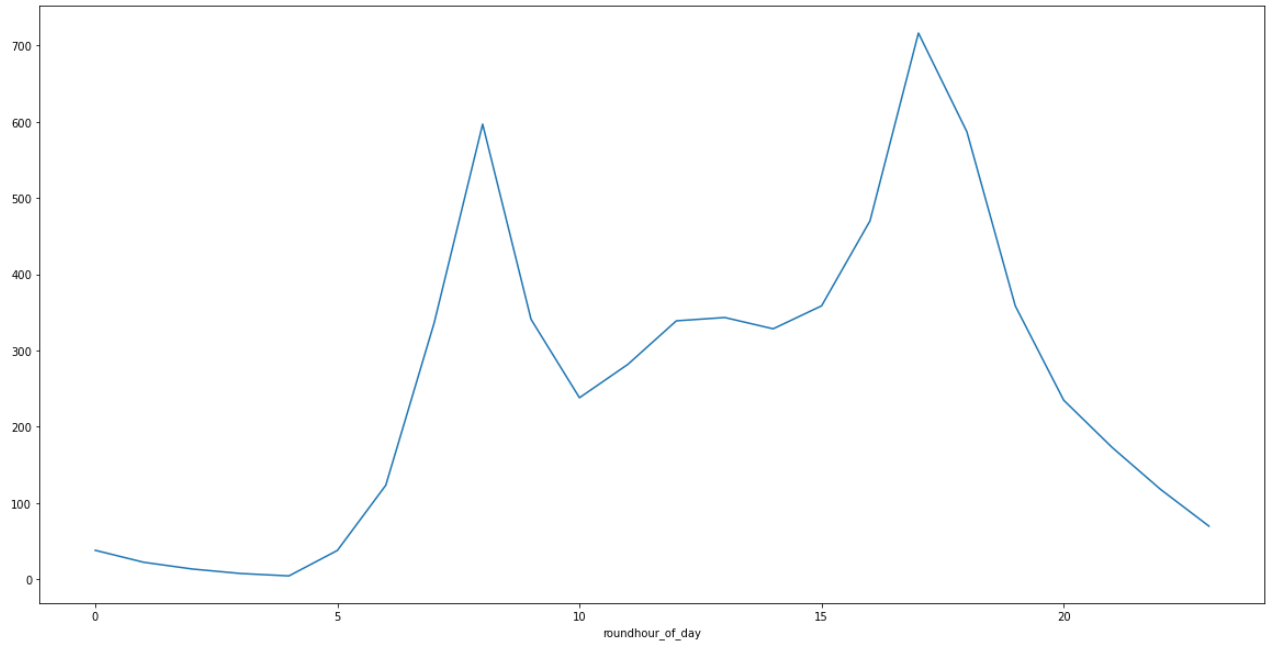
Out[206…

hour_of_day	start	0	1	2	3	4	5	6
0.0		21.0	34.0	43.0	47.0	51.0	89.0	106.0
0.1		39.0	22.0	27.0	37.0	56.0	87.0	100.0
0.2		31.0	24.0	26.0	42.0	50.0	98.0	77.0
0.3		26.0	27.0	25.0	29.0	52.0	99.0	87.0
0.4		19.0	24.0	29.0	29.0	50.0	98.0	69.0
…		…	…	…	…	…	…	…
23.5		36.0	65.0	60.0	94.0	80.0	93.0	28.0
23.6		37.0	61.0	66.0	100.0	81.0	95.0	28.0
23.7		30.0	42.0	49.0	80.0	101.0	105.0	27.0
23.8		33.0	52.0	47.0	79.0	91.0	93.0	24.0
23.9		34.0	33.0	48.0	65.0	105.0	111.0	23.0

240 rows × 7 columns

In [207…
```
hoursn = bikes.groupby('roundhour_of_day').agg('count')
hoursn['hour'] = hoursn.index
(hoursn.start/90).plot() # 90 days in a quarter
```

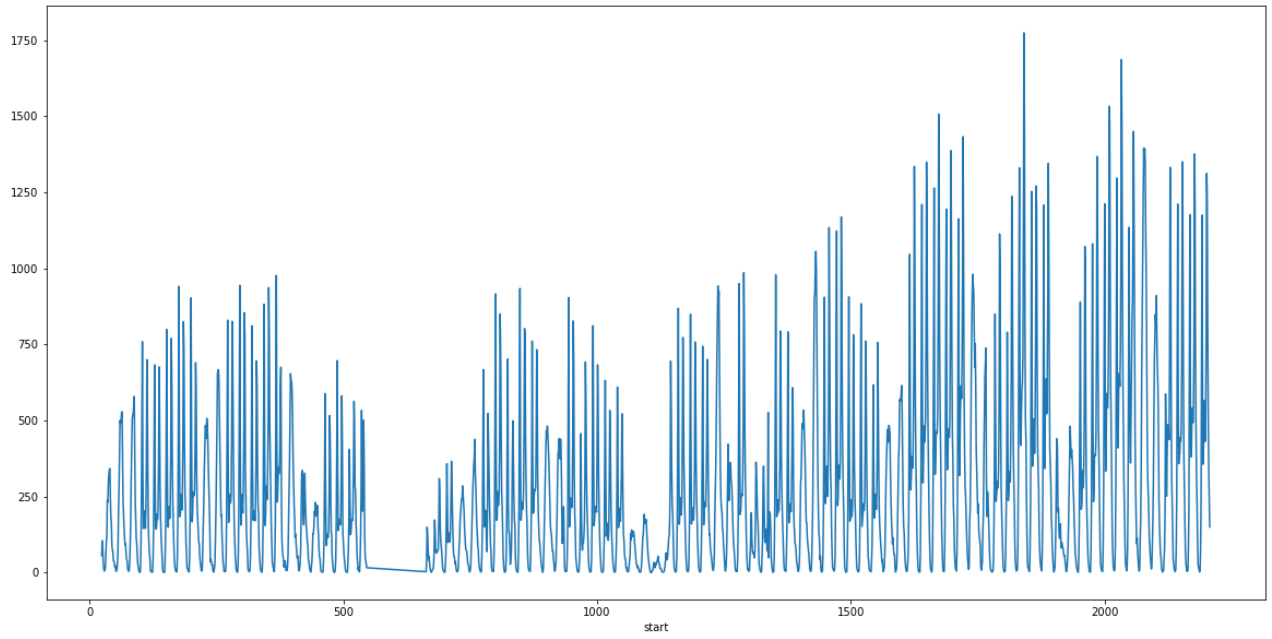
Out[207…
```
<AxesSubplot:xlabel='roundhour_of_day'>
```



In [208…
```
hour_count = bikes.groupby(bikes.start.dt.dayofyear*24 + bikes.start.dt.hour).count()
```

In [209…
```
plt.figure(figsize=(20,10))
hour_count.start.plot()
```

Out[209…
```
<AxesSubplot:xlabel='start'>
```



In [210…
```
day_count = bikes.groupby(bikes.start.dt.dayofyear).count()
```

In [211…
```
day_hour = bikes.groupby([bikes.start.dt.dayofyear, bikes.start.dt.hour]).count()
```

In [212…
```
day_hour.start.unstack()
```

Out[212...

start	0	1	2	3	4	5	6	7	8	9	...	14	15	16	17	
start																
1	56.0	105.0	74.0	32.0	13.0	5.0	10.0	14.0	54.0	101.0	...	324.0	338.0	342.0	247.0	
2	37.0	31.0	17.0	23.0	4.0	7.0	10.0	34.0	80.0	203.0	...	495.0	525.0	529.0	392.0	
3	59.0	42.0	39.0	15.0	6.0	9.0	5.0	33.0	87.0	168.0	...	524.0	546.0	579.0	398.0	
4	20.0	6.0	2.0	1.0	3.0	58.0	192.0	468.0	759.0	321.0	...	145.0	206.0	365.0	700.0	
5	5.0	5.0	3.0	1.0	2.0	42.0	131.0	363.0	683.0	329.0	...	175.0	208.0	365.0	676.0	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
87	113.0	82.0	50.0	34.0	12.0	24.0	94.0	166.0	297.0	509.0	...	910.0	761.0	667.0	611.0	
88	15.0	7.0	2.0	3.0	8.0	42.0	81.0	197.0	587.0	464.0	...	481.0	437.0	696.0	1332.0	1
89	31.0	11.0	9.0	3.0	8.0	79.0	240.0	727.0	1211.0	564.0	...	433.0	473.0	700.0	1350.0	1
90	31.0	18.0	4.0	6.0	7.0	79.0	215.0	703.0	1176.0	593.0	...	493.0	545.0	749.0	1376.0	1
91	28.0	16.0	10.0	2.0	8.0	80.0	240.0	750.0	1175.0	589.0	...	431.0	504.0	746.0	1312.0	1

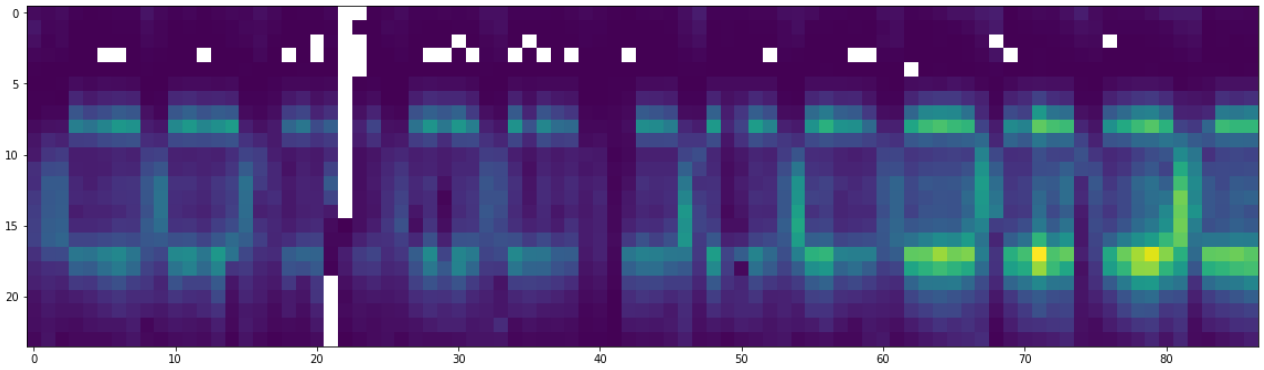
87 rows × 24 columns

In [213...

```
plt.figure(figsize=(20,10))
plt.imshow(day_hour.start.unstack().T)
```

Out[213...

```
<matplotlib.image.AxesImage at 0x1c1d2ddb0d0>
```

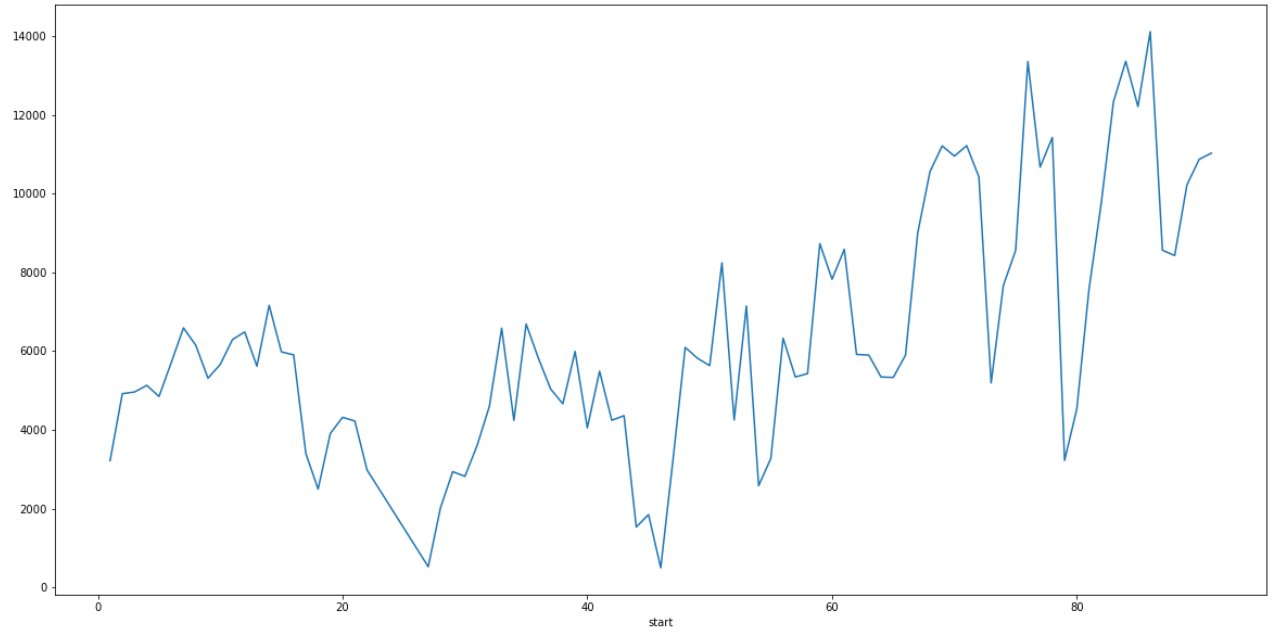


In [214...

```
day_count.start.plot()
```

Out[214...

```
<AxesSubplot:xlabel='start'>
```



In [215…
```
bikes.start.dt.dayofyear
```

Out[215…
```
0         91
1         91
2         91
3         91
4         91
          ..
552394     1
552395     1
552396     1
552397     1
552398     1
Name: start, Length: 552399, dtype: int64
```

In [216…
```
bikes[bikes.start=="2016-01-10"].shape
```

Out[216…
```
(1, 15)
```

Assignment 4

Explain the results in a **paragraph + charts** of to describe which model you'd recommend. This means show the data and the model's line on the same chart. The paragraph is a simple justification and comparison of the several models you tried.

1. Using the `day_hour_count` dataframe create two dataframes `monday` and `saturday` that represent the data for those days. (hint: Monday is day=0)

In [217…
```
monday = day_hour_count[[0]].copy()
```

In [218…
```
monday["hour"] = monday.index
monday = monday.rename(columns = {0:'Count'})
```

In [219…
```
monday
```

Out[219…

hour_of_day	start	Count	hour
0.0		21.0	0.0
0.1		39.0	0.1
0.2		31.0	0.2
0.3		26.0	0.3
0.4		19.0	0.4
…		…	…
23.5		36.0	23.5
23.6		37.0	23.6
23.7		30.0	23.7
23.8		33.0	23.8
23.9		34.0	23.9

240 rows × 2 columns

In [220…
```
saturday = day_hour_count[[5]].copy()
saturday['hour'] = saturday.index
saturday = saturday.rename(columns = {5:'Count'})
saturday
```

Out[220…

hour_of_day	start	Count	hour
0.0		89.0	0.0
0.1		87.0	0.1
0.2		98.0	0.2
0.3		99.0	0.3
0.4		98.0	0.4
…		…	…
23.5		93.0	23.5
23.6		95.0	23.6

hour_of_day	start	Count	hour
	23.7	105.0	23.7
	23.8	93.0	23.8
	23.9	111.0	23.9

240 rows × 2 columns

2a. Create 3 models fit to `monday.hour_of_day` with varying polynomial degrees (choose from `n=1,2,3,5,10,15`). (Repeat for `saturday` below)

Plot all the results for each polynomial.

In [221…

```
# create n = 1, 5, 15 polynomial degrees
from sklearn import linear_model
from sklearn.preprocessing import PolynomialFeatures
xm_1 = monday['hour'].values.reshape(-1, 1)
ym = monday.Count.fillna(0)
linear_n1 = linear_model.LinearRegression()
linear_n1.fit(xm_1, ym)
print(linear_n1.coef_, linear_n1.intercept_)

poly = PolynomialFeatures(degree=5)
xm_5 = poly.fit_transform(monday['hour'].values.reshape(-1, 1))
linear_n5 = linear_model.LinearRegression()
linear_n5.fit(xm_5, ym)
print(linear_n5.coef_, linear_n5.intercept_)

poly = PolynomialFeatures(degree=15)
xm_15 = poly.fit_transform(monday['hour'].values.reshape(-1, 1))
linear_n15 = linear_model.LinearRegression()
linear_n15.fit(xm_15, ym)
print(linear_n15.coef_, linear_n15.intercept_)
```

```
[13.28550843] 114.23817427385899
[ 0.00000000e+00 -1.04237296e+02  4.95325289e+01 -6.19642324e+00
  3.17932596e-01 -5.80441377e-03] 34.270553868955176
[ 0.00000000e+00  1.31320003e-05  7.67091615e-08  9.21496618e-07
  5.83948036e-06  3.24644736e-05  1.50376451e-04  5.17745833e-04
  9.62517332e-04 -3.95905725e-04  6.39090842e-05 -5.57183042e-06
  2.86733470e-07 -8.74868859e-09  1.46888790e-10 -1.04850022e-12] 19.43303644657135
```

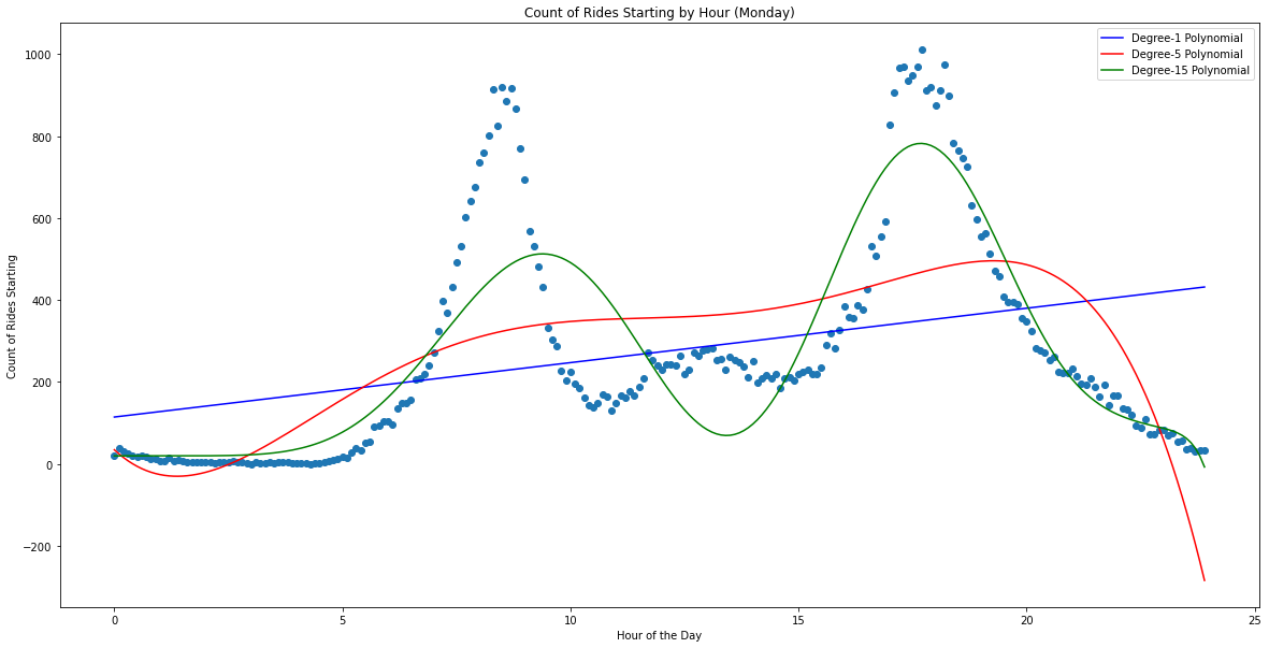
In [222…

```
plt.scatter(xm_1,ym)
plt.plot(xm_1, np.dot(xm_1, linear_n1.coef_) + linear_n1.intercept_, c='b')
plt.plot(xm_1, np.dot(xm_5, linear_n5.coef_) + linear_n5.intercept_, c='r')
plt.plot(xm_1, np.dot(xm_15, linear_n15.coef_) + linear_n15.intercept_, c='g')
plt.legend(['Degree-1 Polynomial', 'Degree-5 Polynomial', 'Degree-15 Polynomial'])
plt.xlabel('Hour of the Day')
```

```
plt.ylabel('Count of Rides Starting')
plt.title(r'Count of Rides Starting by Hour (Monday)')
```

Out[222…

```
Text(0.5, 1.0, 'Count of Rides Starting by Hour (Monday)')
```



2b. Repeat 2a for saturday.hour_of_day

In [223…

```
xs_1 = saturday['hour'].values.reshape(-1, 1)
ys = saturday.Count.fillna(0)
linear_n1 = linear_model.LinearRegression()
linear_n1.fit(xs_1, ys)
print(linear_n1.coef_, linear_n1.intercept_)

poly = PolynomialFeatures(degree=3)
xs_3 = poly.fit_transform(saturday['hour'].values.reshape(-1, 1))
linear_n3 = linear_model.LinearRegression()
linear_n3.fit(xs_3, ys)
print(linear_n3.coef_, linear_n3.intercept_)

poly = PolynomialFeatures(degree=5)
xs_5 = poly.fit_transform(saturday['hour'].values.reshape(-1, 1))
linear_n5 = linear_model.LinearRegression()
linear_n5.fit(xs_5, ys)
print(linear_n5.coef_, linear_n5.intercept_)
```

```
[10.13721158] 91.97282157676354
[  0.         -21.28150575   7.05352239  -0.2664324 ] 34.735790029315524
[ 0.00000000e+00 -7.69357325e+01  8.78980568e+00  7.64304295e-01
 -9.33173938e-02  2.15983799e-03] 133.062987707888
```

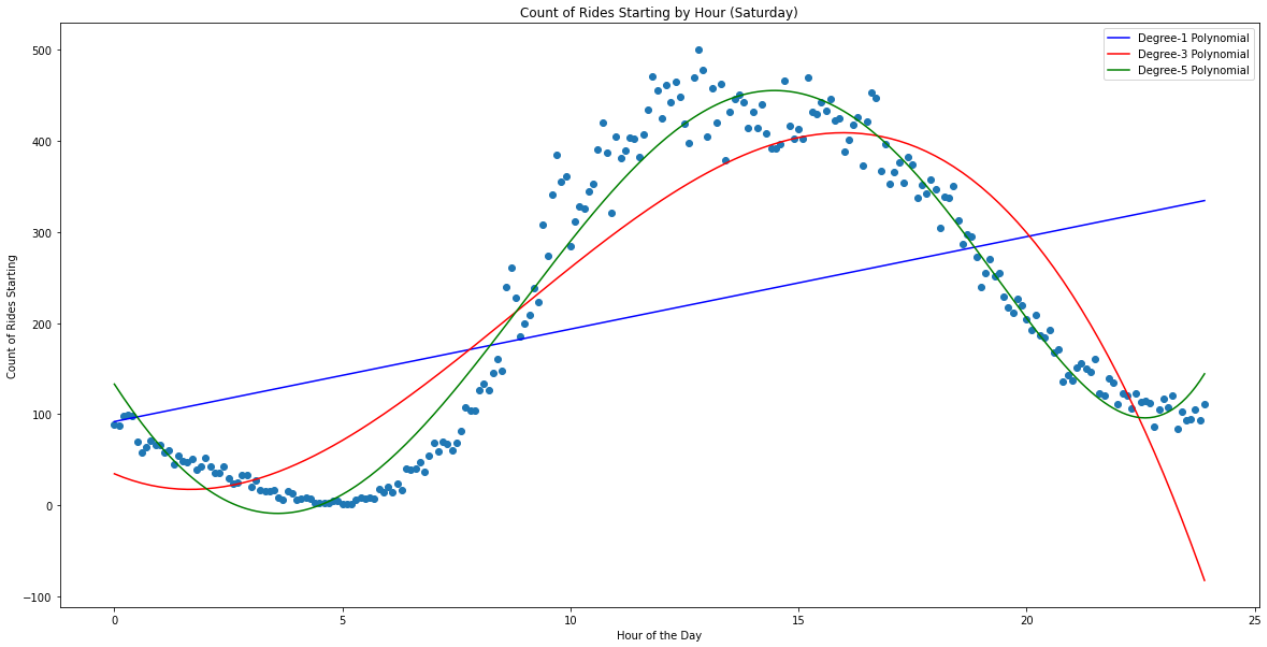
In [224…

```
plt.scatter(xs_1,ys)
plt.plot(xs_1, np.dot(xs_1, linear_n1.coef_) + linear_n1.intercept_, c='b')
plt.plot(xs_1, np.dot(xs_3, linear_n3.coef_) + linear_n3.intercept_, c='r')
plt.plot(xs_1, np.dot(xs_5, linear_n5.coef_) + linear_n5.intercept_, c='g')
plt.legend(['Degree-1 Polynomial', 'Degree-3 Polynomial', 'Degree-5 Polynomial'])
plt.xlabel('Hour of the Day')
```

```
plt.ylabel('Count of Rides Starting')
plt.title(r'Count of Rides Starting by Hour (Saturday)')
```

Out[224…

```
Text(0.5, 1.0, 'Count of Rides Starting by Hour (Saturday)')
```



3. create 3 new models fit to `hour_of_day` with different Ridge Regression α (alpha) Ridge Coefficient values using the `monday` and `saturday` datasets.

In [225…

```
#Monday
# The Degree-15 Polynomial Linear model seemed to have the best fit to the data
ridge_n50 = linear_model.Ridge(alpha=50)
ridge_n50.fit(xm_15, ym)
print(ridge_n50.coef_, ridge_n50.intercept_)

ridge_n75 = linear_model.Ridge(alpha=75)
ridge_n75.fit(xm_15, ym)
print(ridge_n75.coef_, ridge_n75.intercept_)

ridge_n100 = linear_model.Ridge(alpha=100)
ridge_n100.fit(xm_15, ym)
print(ridge_n100.coef_, ridge_n100.intercept_)
```

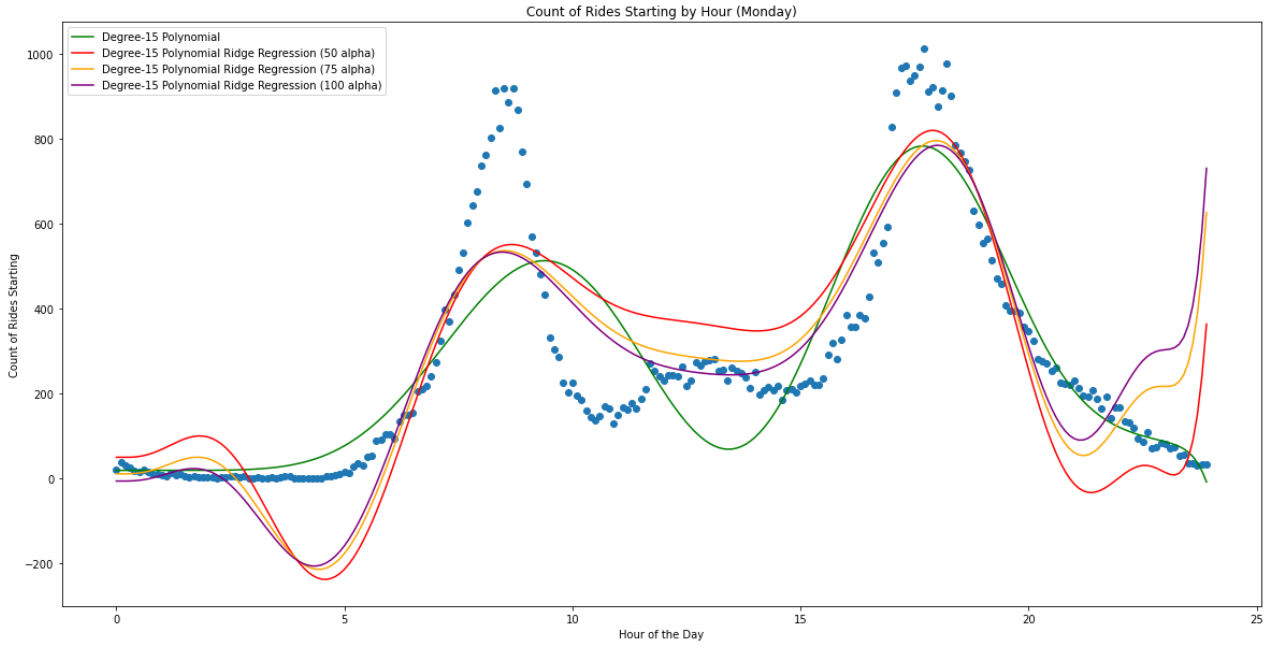
```
[ 0.00000000e+00 -1.49849369e-02 -1.05191255e+01  3.42500475e+01
  2.07539063e+01 -4.17601600e+01  2.06809625e+01 -5.29986400e+00
  8.35775819e-01 -8.72808974e-02  6.23603224e-03 -3.07098445e-04
  1.02659953e-05 -2.22656927e-07  2.82751150e-09 -1.59612925e-11] 50.31060791015625
[ 0.00000000e+00 -1.19651218e-02 -6.72730937e+00  2.80215190e+01
  1.51154820e+01 -3.34571742e+01  1.69056544e+01 -4.36997075e+00
  6.91450405e-01 -7.22192327e-02  5.14904327e-03 -2.52591025e-04
  8.39871608e-06 -1.80934145e-07  2.27915983e-09 -1.27445026e-11] 11.362903594970703
[ 0.00000000e+00 -1.12753174e-02 -4.85351481e+00  2.34830029e+01
  1.17112421e+01 -2.81242888e+01  1.44590956e+01 -3.76485233e+00
  5.97252982e-01 -6.23653502e-02  4.43648512e-03 -2.16800216e-04
  7.17089989e-06 -1.53466889e-07  1.91779432e-09 -1.06227367e-11] -5.649417877197266
```

In [229…

```
plt.scatter(xm_1,ym)
plt.plot(xm_1, np.dot(xm_15, linear_n15.coef_) + linear_n15.intercept_, c='g')
plt.plot(xm_1, np.dot(xm_15, ridge_n50.coef_) + ridge_n50.intercept_, c='r')
plt.plot(xm_1, np.dot(xm_15, ridge_n75.coef_) + ridge_n75.intercept_, c='orange')
plt.plot(xm_1, np.dot(xm_15, ridge_n100.coef_) + ridge_n100.intercept_, c='purple')
plt.legend(['Degree-15 Polynomial',
            r'Degree-15 Polynomial Ridge Regression (50 alpha)',
           r'Degree-15 Polynomial Ridge Regression (75 alpha)',
           r'Degree-15 Polynomial Ridge Regression (100 alpha)'])
plt.xlabel('Hour of the Day')
plt.ylabel('Count of Rides Starting')
plt.title(r'Count of Rides Starting by Hour (Monday)')
```

Out[229…

```
Text(0.5, 1.0, 'Count of Rides Starting by Hour (Monday)')
```



In [227…

```
#Saturday
# The Degree-5 Polynomial Linear model seemed to have the best fit to the data
ridge_np5 = linear_model.Ridge(alpha=.5)
ridge_np5.fit(xs_5, y)
print(ridge_np5.coef_, ridge_np5.intercept_)

ridge_n5 = linear_model.Ridge(alpha=5)
ridge_n5.fit(xs_5, y)
print(ridge_n5.coef_, ridge_n5.intercept_)

ridge_n10 = linear_model.Ridge(alpha=10)
ridge_n10.fit(xs_5, y)
print(ridge_n10.coef_, ridge_n10.intercept_)
```

```
[ 0.00000000e+00 -7.31349548e+01  7.82993105e+00  8.60908492e-01
 -9.75305400e-02  2.22630906e-03] 129.24661958278813
[ 0.00000000e+00 -5.09037769e+01  2.22278512e+00  1.42474048e+00
 -1.22105553e-01  2.61385230e-03] 106.87524078275493
[ 0.00000000e+00 -3.83712739e+01 -9.26844870e-01  1.74069811e+00
 -1.35853254e-01  2.83037257e-03] 94.18740109835272
```

In [228…

```
plt.scatter(xs_1,y)
```

```
plt.plot(xs_1, np.dot(xs_5, linear_n5.coef_) + linear_n5.intercept_, c='g')
plt.plot(xs_1, np.dot(xs_5, ridge_np5.coef_) + ridge_np5.intercept_, c='r')
plt.plot(xs_1, np.dot(xs_5, ridge_n5.coef_) + ridge_n5.intercept_, c='orange')
plt.plot(xs_1, np.dot(xs_5, ridge_n10.coef_) + ridge_n10.intercept_, c='purple')
plt.legend(['Degree-5 Polynomial',
            r'Degree-5 Polynomial Ridge Regression (0.5 alpha)',
           r'Degree-5 Polynomial Ridge Regression (5 alpha)',
           r'Degree-5 Polynomial Ridge Regression (10 alpha)'])
plt.xlabel('Hour of the Day')
plt.ylabel('Count of Rides Starting')
plt.title(r'Count of Rides Starting by Hour (Saturday)')
```

Out[228… `Text(0.5, 1.0, 'Count of Rides Starting by Hour (Saturday)')`