matplotlib-advance

June 17, 2023

```
[ ]: import numpy as np
     import pandas as pd
     import matplotlib.pyplot as plt
```

0.0.1 Colored Scatterplots

```
[ ]: iris = pd.read_csv('iris.csv')
     iris.sample(5)
```

```
[ ]:       Id  SepalLengthCm  SepalWidthCm  PetalLengthCm  PetalWidthCm  \
     9     10            4.9           3.1            1.5           0.1
     73    74            6.1           2.8            4.7           1.2
     44    45            5.1           3.8            1.9           0.4
     51    52            6.4           3.2            4.5           1.5
     104  105            6.5           3.0            5.8           2.2

                  Species
     9        Iris-setosa
     73   Iris-versicolor
     44       Iris-setosa
     51   Iris-versicolor
     104   Iris-virginica
```

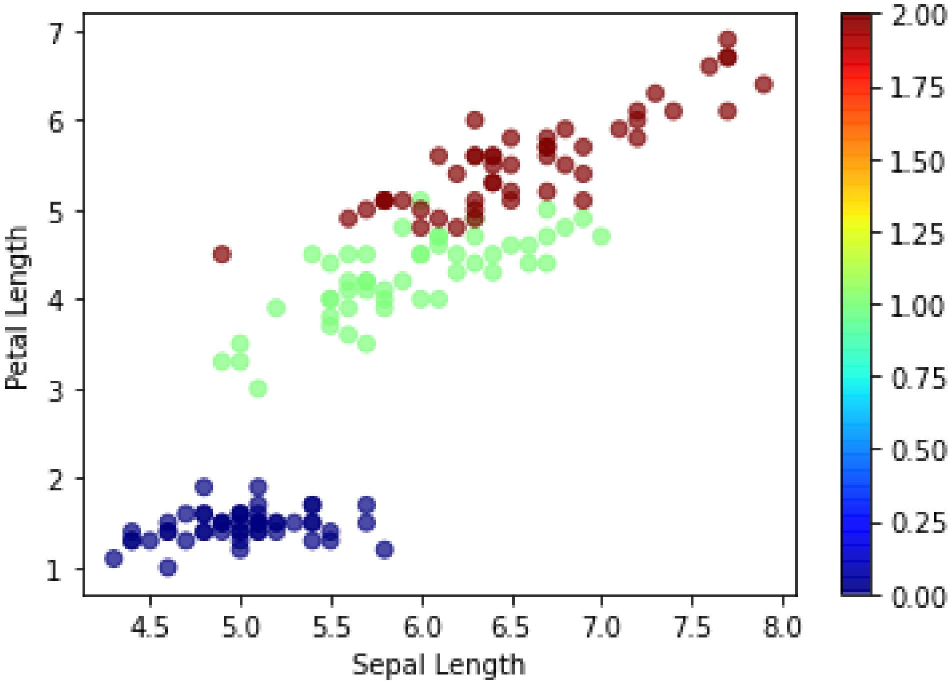
```
[ ]: iris['Species'] = iris['Species'].replace({'Iris-setosa':0,'Iris-versicolor':
      ↪1,'Iris-virginica':2})
     iris.sample(5)
```

```
[ ]:       Id  SepalLengthCm  SepalWidthCm  PetalLengthCm  PetalWidthCm  Species
     87    88            6.3           2.3            4.4           1.3        1
     20    21            5.4           3.4            1.7           0.2        0
     56    57            6.3           3.3            4.7           1.6        1
     140  141            6.7           3.1            5.6           2.4        2
     141  142            6.9           3.1            5.1           2.3        2
```

```
[ ]: plt.
      ↪scatter(iris['SepalLengthCm'],iris['PetalLengthCm'],c=iris['Species'],cmap='jet',alpha=0.
      ↪7)
```

```
plt.xlabel('Sepal Length')
plt.ylabel('Petal Length')
plt.colorbar()
```

```
[ ]: <matplotlib.colorbar.Colorbar at 0x7f5e17170bb0>
```

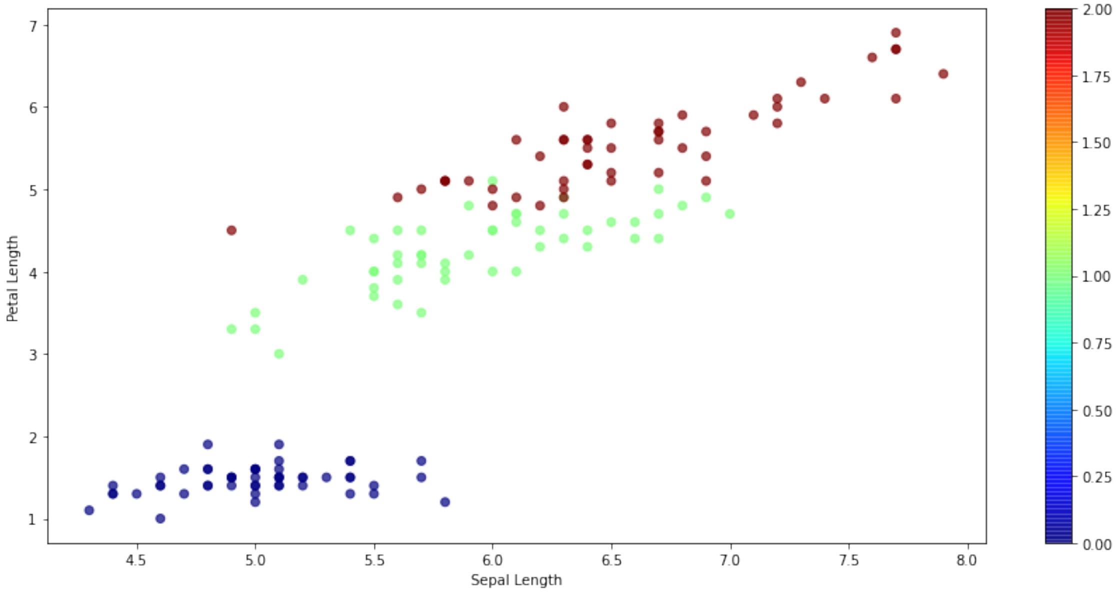


```
[ ]: # cmap and alpha
```

0.0.2 Plot size

```
[ ]: plt.figure(figsize=(15,7))

     plt.
      ↪scatter(iris['SepalLengthCm'],iris['PetalLengthCm'],c=iris['Species'],cmap='jet',alpha=0.
      ↪7)
     plt.xlabel('Sepal Length')
     plt.ylabel('Petal Length')
     plt.colorbar()
```

```
[ ]: <matplotlib.colorbar.Colorbar at 0x7f5e16ee4430>
```



0.0.3 Annotations

```
[ ]: batters = pd.read_csv('batter.csv')
```

```
[ ]: batters.shape
```

```
[ ]: (605, 4)
```

```
[ ]: sample_df = df.head(100).sample(25,random_state=5)
```

```
---------------------------------------------------------------------------
ValueError                                Traceback (most recent call last)
<ipython-input-137-839dfd0bcf32> in <module>
----> 1 sample_df = df.head(100).sample(25,random_state=5)

/usr/local/lib/python3.8/dist-packages/pandas/core/generic.py in sample(self, n ␣
↪frac, replace, weights, random_state, axis, ignore_index)
   5363             )
   5364
-> 5365         locs = rs.choice(axis_length, size=n, replace=replace, p=weight: )
   5366         result = self.take(locs, axis=axis)
   5367         if ignore_index:

mtrand.pyx in numpy.random.mtrand.RandomState.choice()

ValueError: Cannot take a larger sample than population when 'replace=False'
```

[ ]:

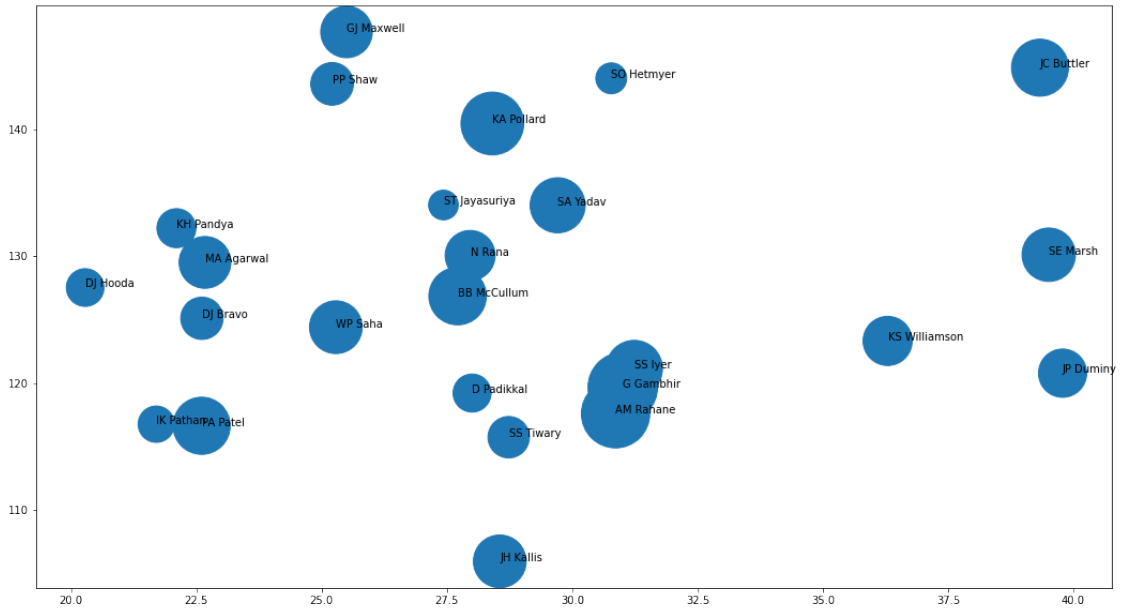
```
sample_df
```

[ ]:

```
           batter  runs        avg  strike_rate
66       KH Pandya  1326  22.100000   132.203390
32        SE Marsh  2489  39.507937   130.109775
46       JP Duminy  2029  39.784314   120.773810
28        SA Yadav  2644  29.707865   134.009123
74       IK Pathan  1150  21.698113   116.751269
23      JC Buttler  2832  39.333333   144.859335
10       G Gambhir  4217  31.007353   119.665153
20     BB McCullum  2882  27.711538   126.848592
17      KA Pollard  3437  28.404959   140.457703
35         WP Saha  2427  25.281250   124.397745
97  ST Jayasuriya   768  27.428571   134.031414
37      MA Agarwal  2335  22.669903   129.506378
70        DJ Hooda  1237  20.278689   127.525773
40          N Rana  2181  27.961538   130.053667
60       SS Tiwary  1494  28.730769   115.724245
34       JH Kallis  2427  28.552941   105.936272
42  KS Williamson  2105  36.293103   123.315759
57        DJ Bravo  1560  22.608696   125.100241
12       AM Rahane  4074  30.863636   117.575758
69      D Padikkal  1260  28.000000   119.205298
94      SO Hetmyer   831  30.777778   144.020797
56         PP Shaw  1588  25.206349   143.580470
22        PA Patel  2848  22.603175   116.625717
39      GJ Maxwell  2320  25.494505   147.676639
24         SS Iyer  2780  31.235955   121.132898
```

[ ]:

```
plt.figure(figsize=(18,10))
plt.scatter(sample_df['avg'],sample_df['strike_rate'],s=sample_df['runs'])

for i in range(sample_df.shape[0]):
  plt.text(sample_df['avg'].values[i],sample_df['strike_rate'].
 ↪values[i],sample_df['batter'].values[i])
```

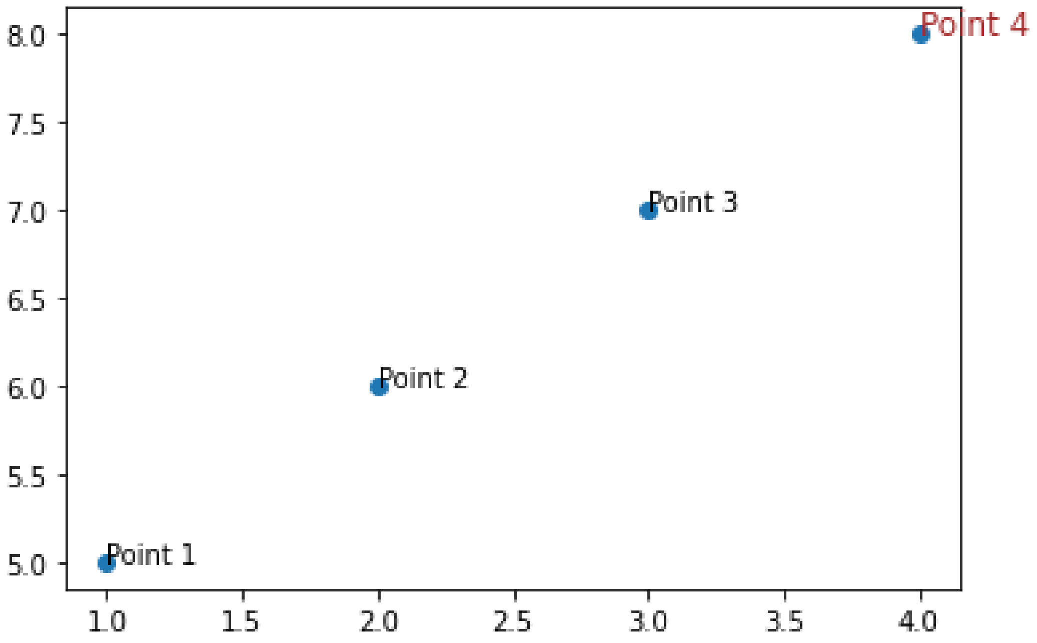


[ ]:

```
x = [1,2,3,4]
y = [5,6,7,8]

plt.scatter(x,y)
plt.text(1,5,'Point 1')
plt.text(2,6,'Point 2')
plt.text(3,7,'Point 3')
plt.text(4,8,'Point 4',fontdict={'size':12,'color':'brown'})
```

[ ]:

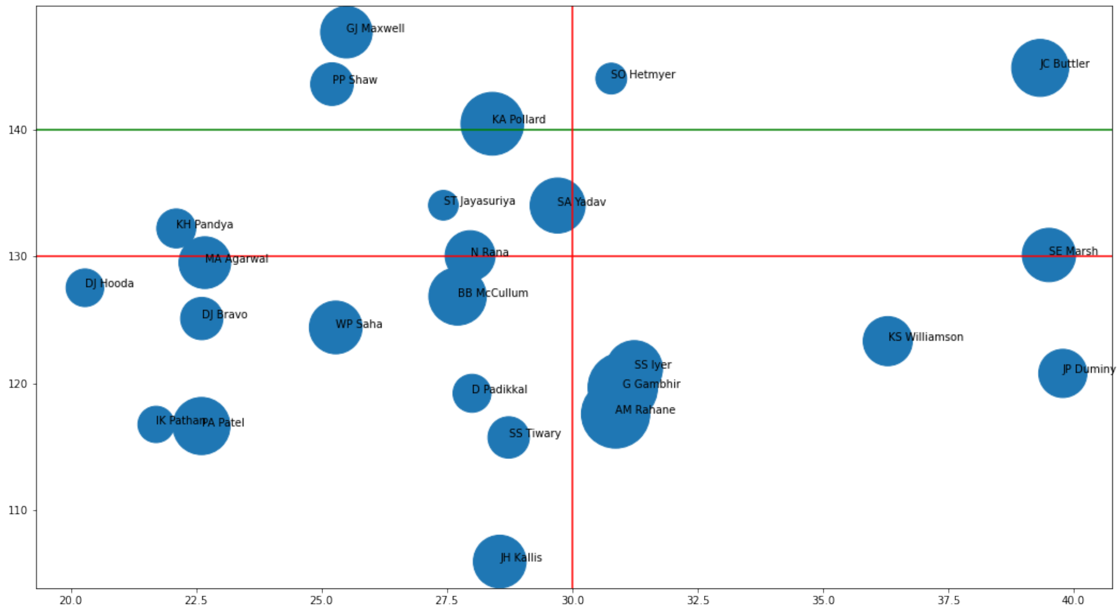
```
Text(4, 8, 'Point 4')
```



0.0.4 Horizontal and Vertical lines

[ ]:

```
plt.figure(figsize=(18,10))
plt.scatter(sample_df['avg'],sample_df['strike_rate'],s=sample_df['runs'])

plt.axhline(130,color='red')
plt.axhline(140,color='green')
plt.axvline(30,color='red')

for i in range(sample_df.shape[0]):
  plt.text(sample_df['avg'].values[i],sample_df['strike_rate'].
 ↪values[i],sample_df['batter'].values[i])
```



0.0.5 Subplots

[ ]:

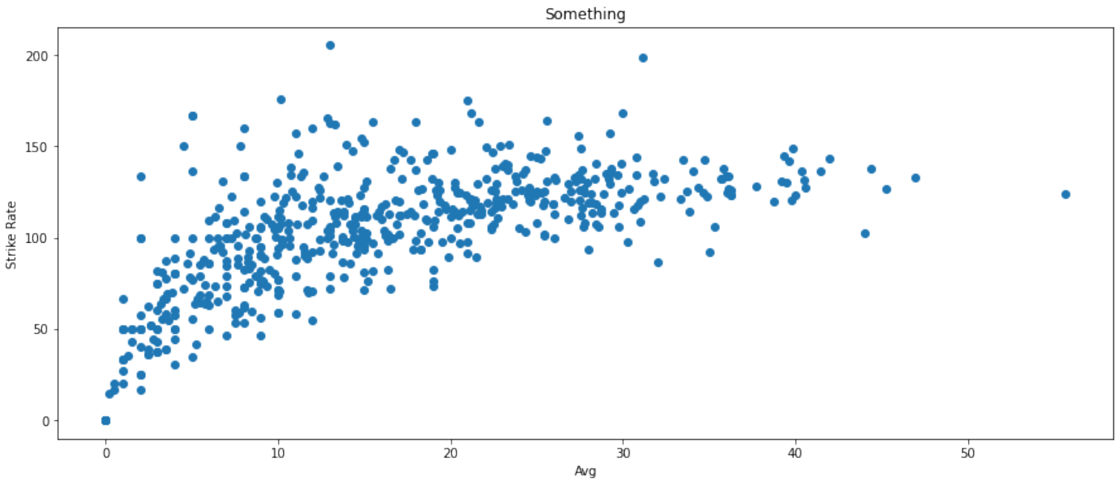
```
# A diff way to plot graphs
batters.head()
```

[ ]:

```
       batter  runs        avg  strike_rate
0     V Kohli  6634  36.251366   125.977972
1    S Dhawan  6244  34.882682   122.840842
2   DA Warner  5883  41.429577   136.401577
3   RG Sharma  5881  30.314433   126.964594
4    SK Raina  5536  32.374269   132.535312
```

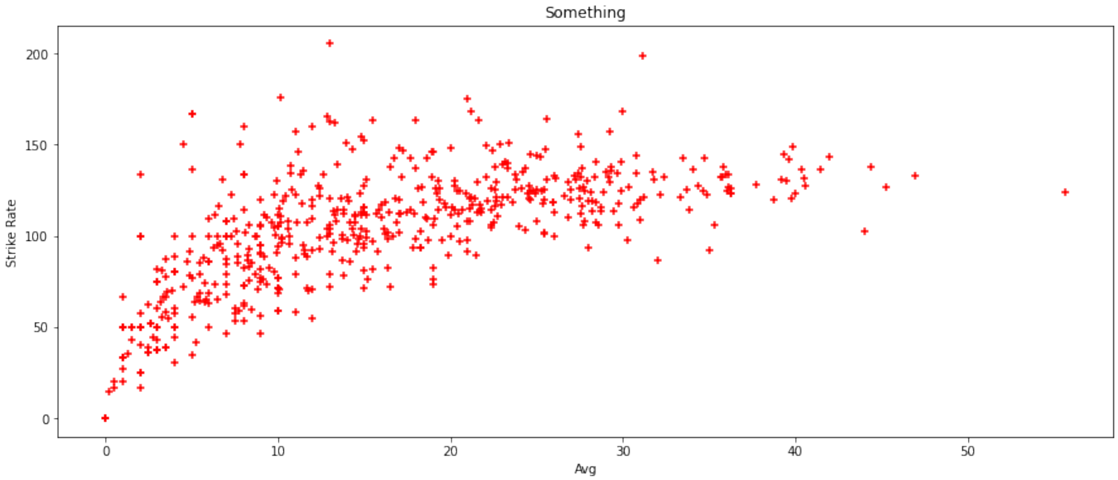
[ ]:

```
plt.figure(figsize=(15,6))
plt.scatter(batters['avg'],batters['strike_rate'])
plt.title('Something')
plt.xlabel('Avg')
plt.ylabel('Strike Rate')

plt.show()
```



[ ]:

```
fig,ax = plt.subplots(figsize=(15,6))

ax.scatter(batters['avg'],batters['strike_rate'],color='red',marker='+')
ax.set_title('Something')
ax.set_xlabel('Avg')
ax.set_ylabel('Strike Rate')

fig.show()
```



[ ]:

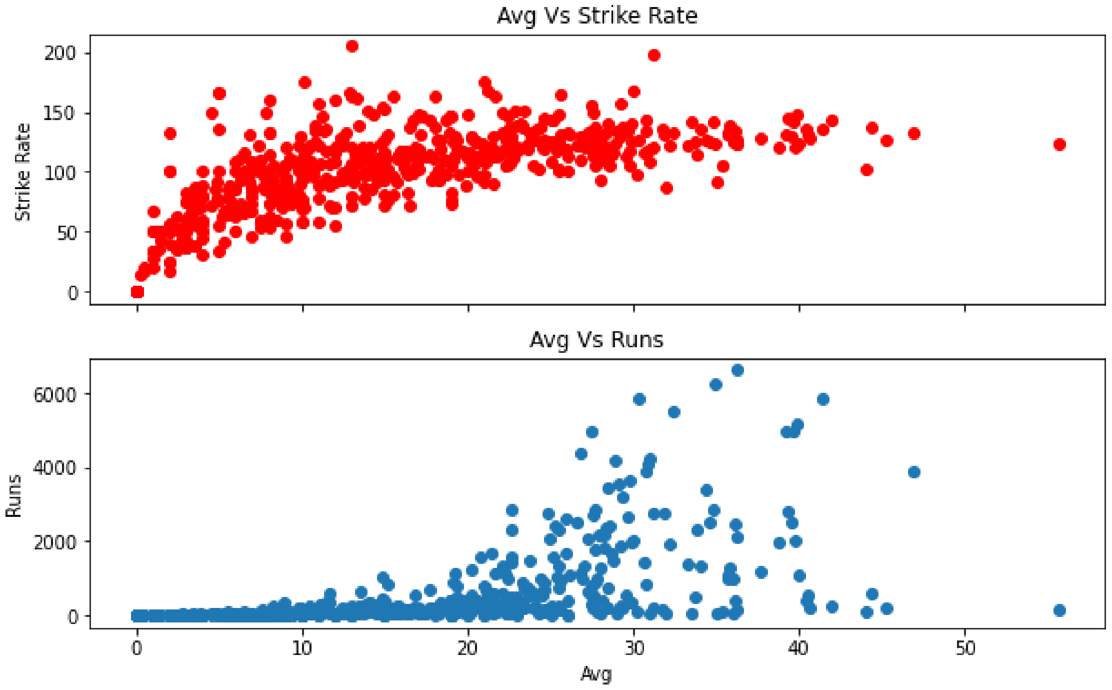
```
# batter dataset
```

[ ]:

```
fig, ax = plt.subplots(nrows=2,ncols=1,sharex=True,figsize=(10,6))

ax[0].scatter(batters['avg'],batters['strike_rate'],color='red')
```

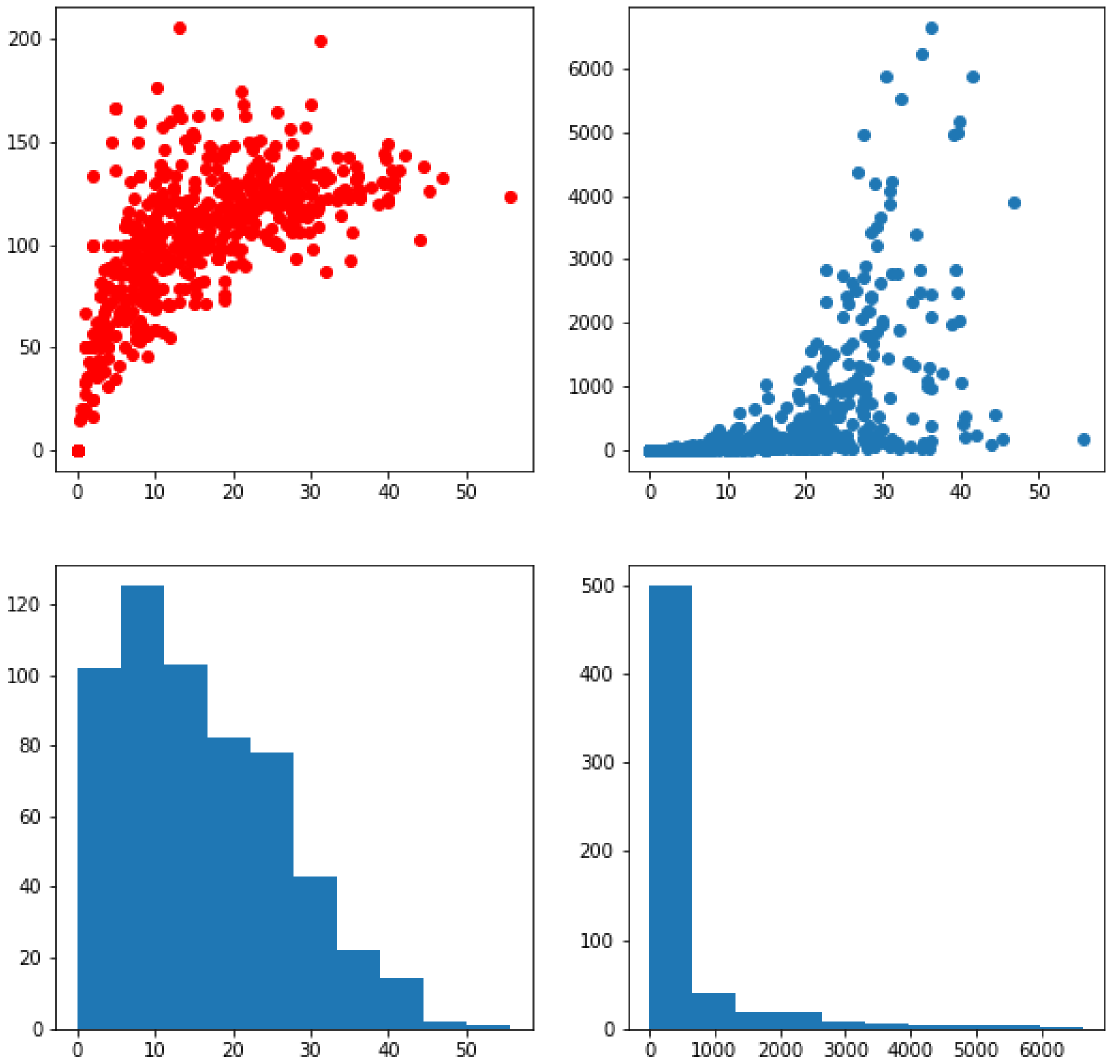
```
ax[1].scatter(batters['avg'],batters['runs'])

ax[0].set_title('Avg Vs Strike Rate')
ax[0].set_ylabel('Strike Rate')


ax[1].set_title('Avg Vs Runs')
ax[1].set_ylabel('Runs')
ax[1].set_xlabel('Avg')
```

```
[ ]: Text(0.5, 0, 'Avg')
```



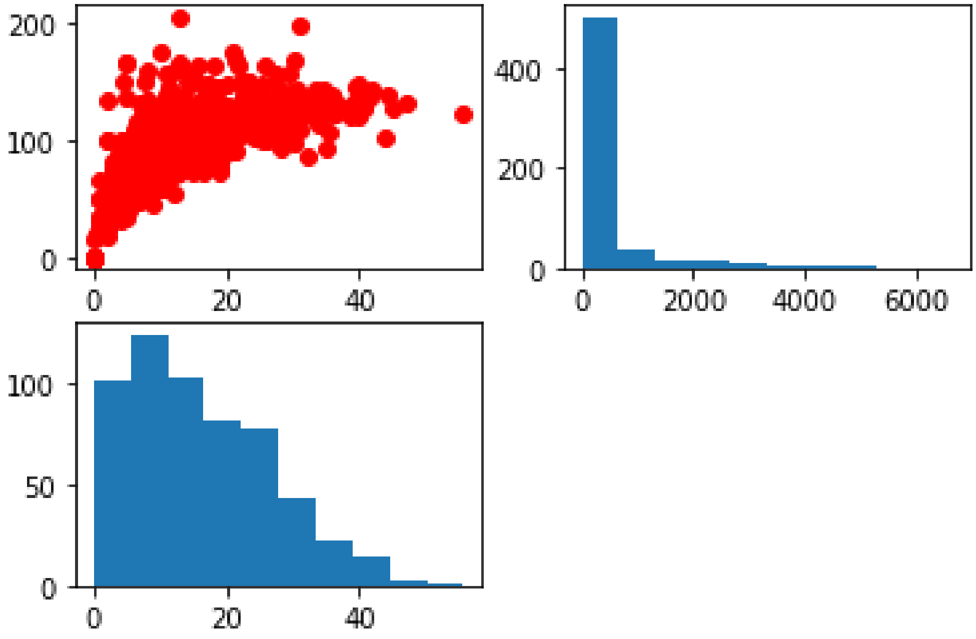
```
[ ]: fig, ax = plt.subplots(nrows=2,ncols=2,figsize=(10,10))

     ax[0,0].
     ax[0,1].scatter(batters['avg'],batters['runs'])
     ax[1,0].hist(batters['avg'])
     ax[1,1].hist(batters['runs'])
```

```
[ ]: (array([499.,  40.,  19.,  19.,   9.,   6.,   4.,   4.,   3.,   2.]),
      array([   0. ,  663.4, 1326.8, 1990.2, 2653.6, 3317. , 3980.4, 4643.8,
             5307.2, 5970.6, 6634. ]),
      <a list of 10 Patch objects>)
```



```
[ ]: fig = plt.figure()

     ax1 = fig.add_subplot(2,2,1)
     ax1.scatter(batters['avg'],batters['strike_rate'],color='red')

     ax2 = fig.add_subplot(2,2,2)
     ax2.hist(batters['runs'])

     ax3 = fig.add_subplot(2,2,3)
     ax3.hist(batters['avg'])
```

```
[ ]: (array([102., 125., 103.,  82.,  78.,  43.,  22.,  14.,   2.,   1.]),
      array([ 0.        ,  5.56666667, 11.13333333, 16.7       , 22.26666667,
             27.83333333, 33.4       , 38.96666667, 44.53333333, 50.1       ,
             55.66666667]),
      <a list of 10 Patch objects>)
```

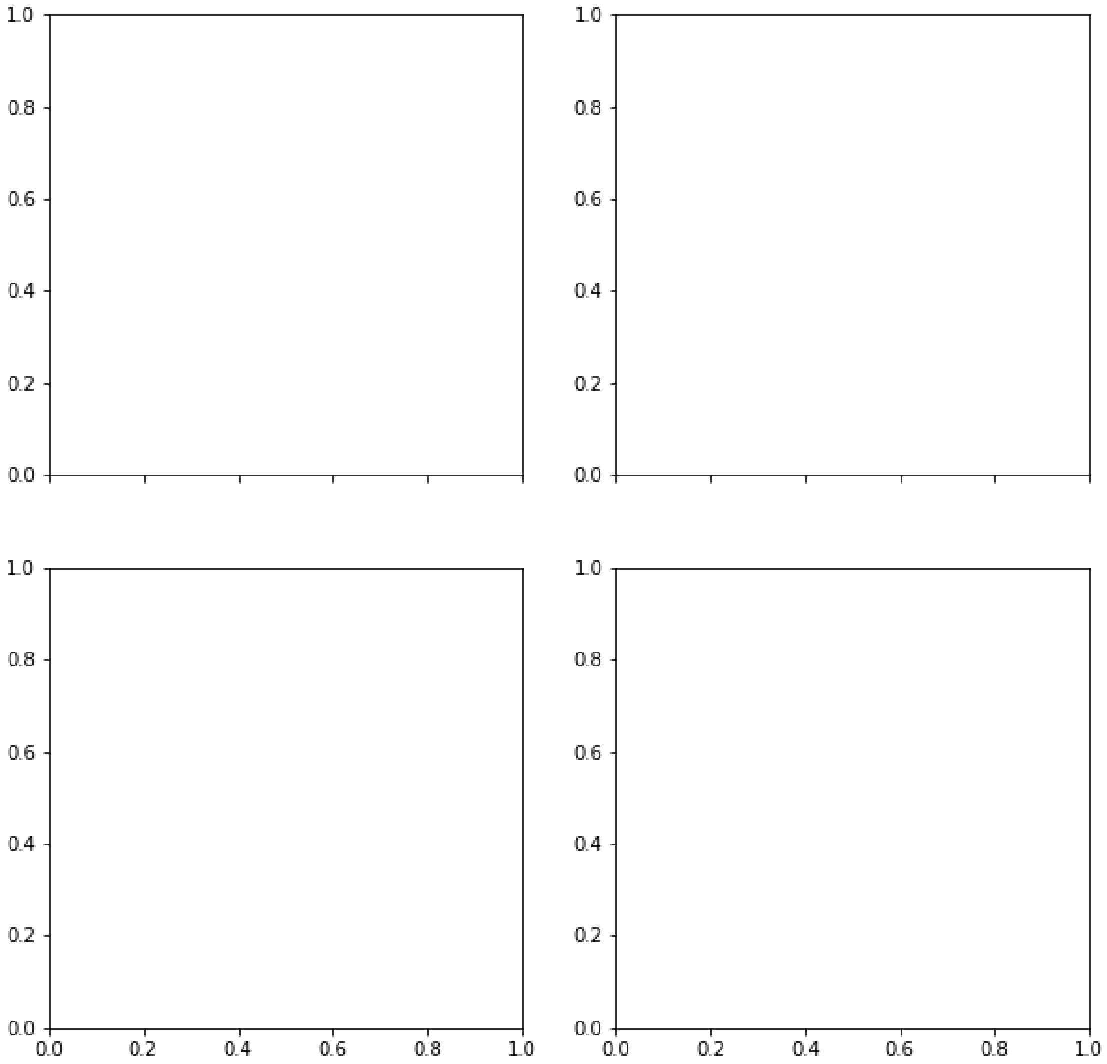


[ ]:

```
fig, ax = plt.subplots(nrows=2,ncols=2,sharex=True,figsize=(10,10))

ax[1,1]
```

[ ]:

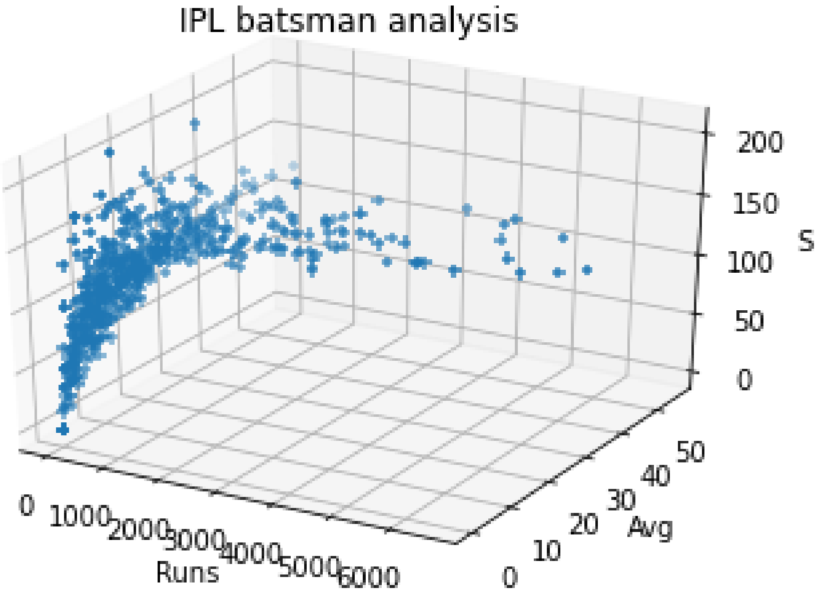
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f5e15913c10>
```



0.0.6 3D Scatter Plots

```
[ ]: batters

     fig = plt.figure()

     ax = plt.subplot(projection='3d')

     ax.scatter3D(batters['runs'],batters['avg'],batters['strike_rate'],marker='+')
     ax.set_title('IPL batsman analysis')

     ax.set_xlabel('Runs')
     ax.set_ylabel('Avg')
     ax.set_zlabel('SR')
```

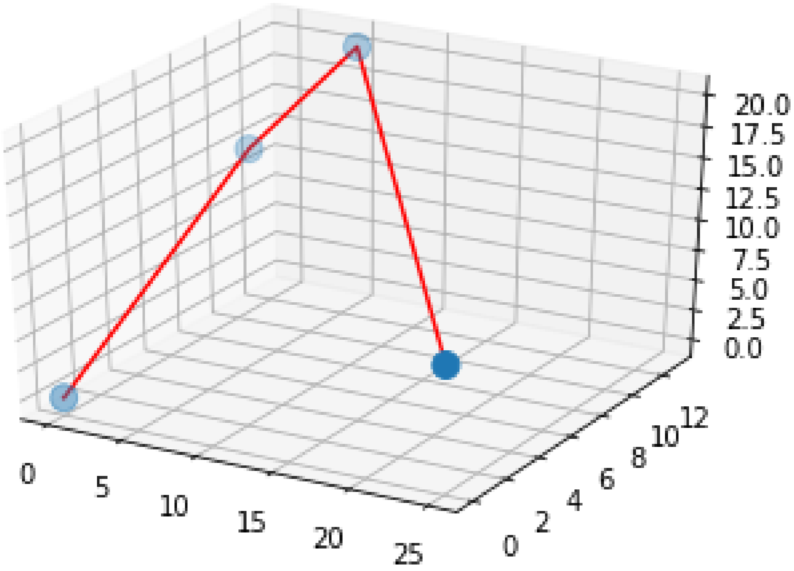
```
[ ]: Text(0.5, 0, 'SR')
```



0.0.7 3D Line Plot

```
[ ]: x = [0,1,5,25]
     y = [0,10,13,0]
     z = [0,13,20,9]

     fig = plt.figure()

     ax = plt.subplot(projection='3d')

     ax.scatter3D(x,y,z,s=[100,100,100,100])
     ax.plot3D(x,y,z,color='red')
```

```
[ ]: [<mpl_toolkits.mplot3d.art3d.Line3D at 0x7f5e14d13f10>]
```



0.0.8 3D Surface Plots

[ ]:
```
x = np.linspace(-10,10,100)
y = np.linspace(-10,10,100)
```

[ ]:
```
xx, yy = np.meshgrid(x,y)
```

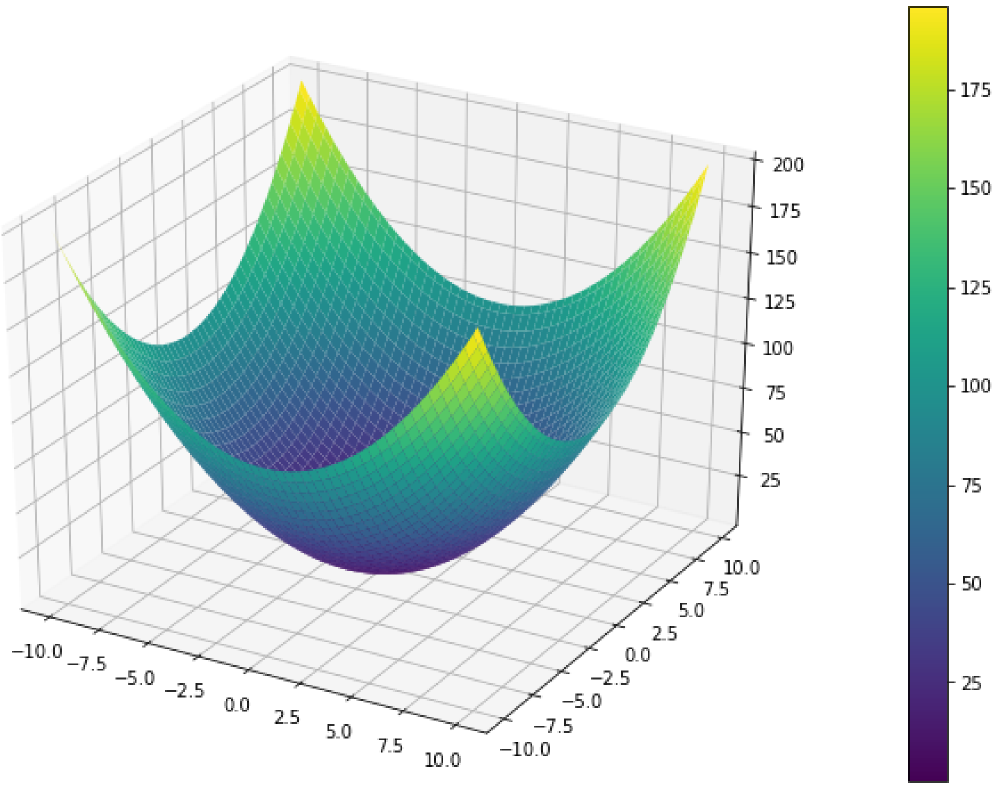
[ ]:
```
(100, 100)
```

[ ]:
```
z = xx**2 + yy**2
z.shape
```

[ ]:
```
(100, 100)
```

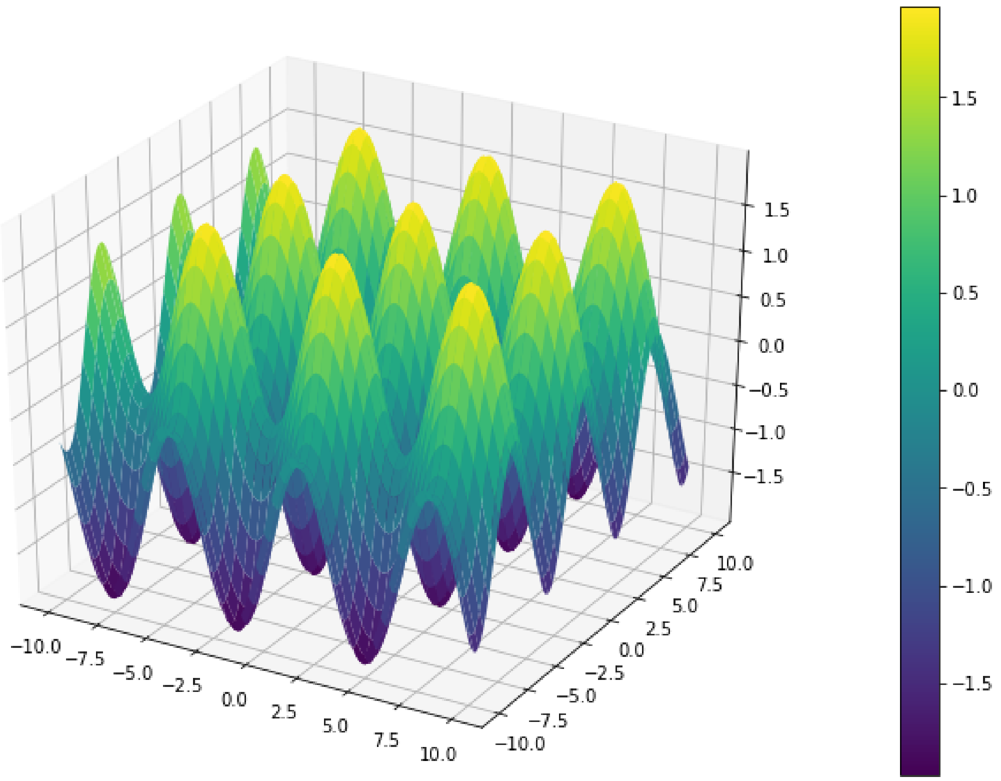
[ ]:
```
fig = plt.figure(figsize=(12,8))

ax = plt.subplot(projection='3d')

p = ax.plot_surface(xx,yy,z,cmap='viridis')
fig.colorbar(p)
```

[ ]:
```
<matplotlib.colorbar.Colorbar at 0x7f5e141ac970>
```



```
[ ]: z = np.sin(xx) + np.cos(yy)

     fig = plt.figure(figsize=(12,8))

     ax = plt.subplot(projection='3d')

     p = ax.plot_surface(xx,yy,z,cmap='viridis')
     fig.colorbar(p)
```

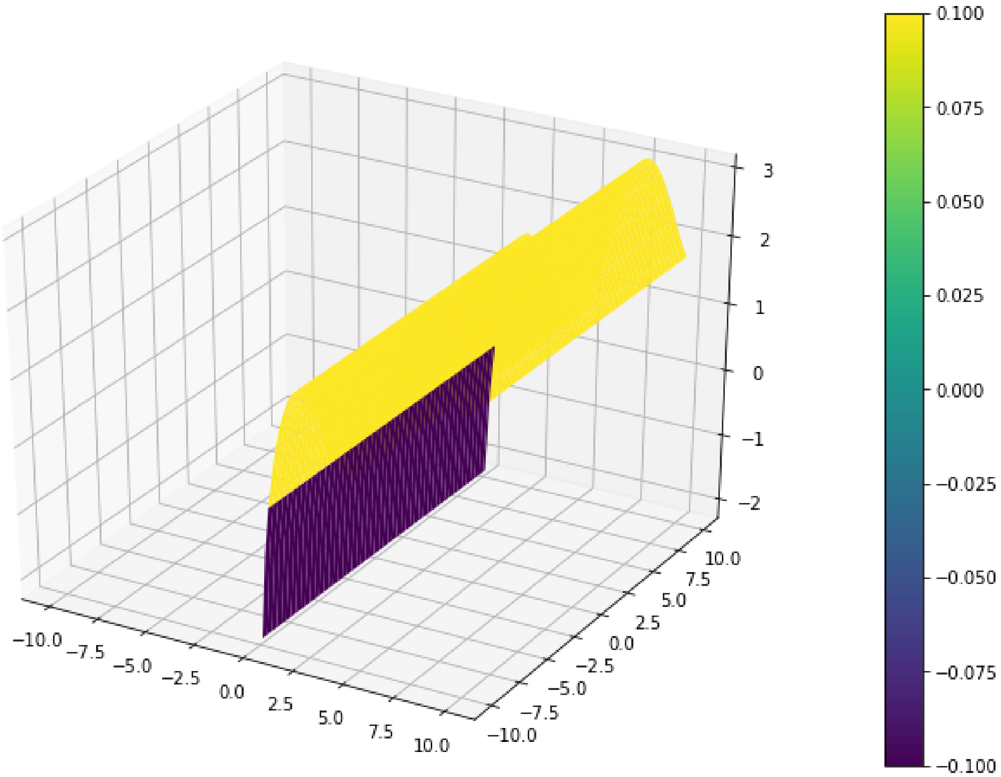
```
[ ]: <matplotlib.colorbar.Colorbar at 0x7f5e14076be0>
```



```
[ ]: z = np.sin(xx) + np.log(xx)

     fig = plt.figure(figsize=(12,8))

     ax = plt.subplot(projection='3d')

     p = ax.plot_surface(xx,yy,z,cmap='viridis')
     fig.colorbar(p)
```

```
<ipython-input-229-bbcd37ea4152>:1: RuntimeWarning: invalid value encountered in
log
  z = np.sin(xx) + np.log(xx)
<ipython-input-229-bbcd37ea4152>:7: UserWarning: Z contains NaN values. This may
result in rendering artifacts.
  p = ax.plot_surface(xx,yy,z,cmap='viridis')
```

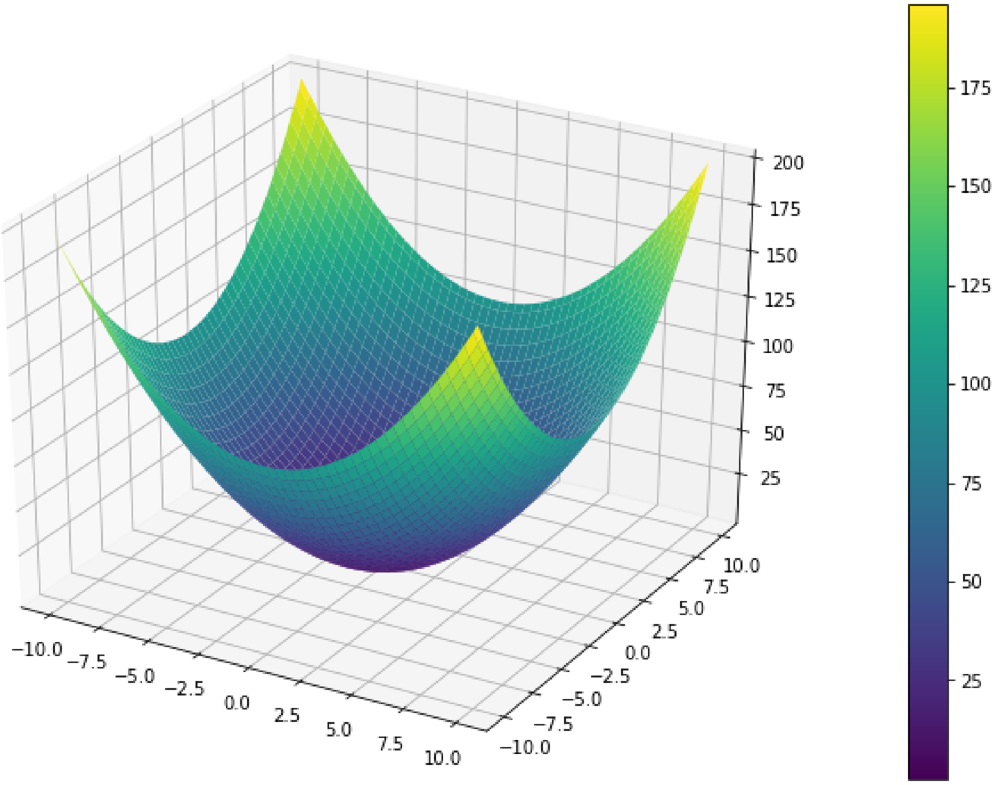
```
[ ]: <matplotlib.colorbar.Colorbar at 0x7f5e139a4a00>
```



[ ]:

```
fig = plt.figure(figsize=(12,8))

ax = plt.subplot(projection='3d')

p = ax.plot_surface(xx,yy,z,cmap='viridis')
fig.colorbar(p)
```

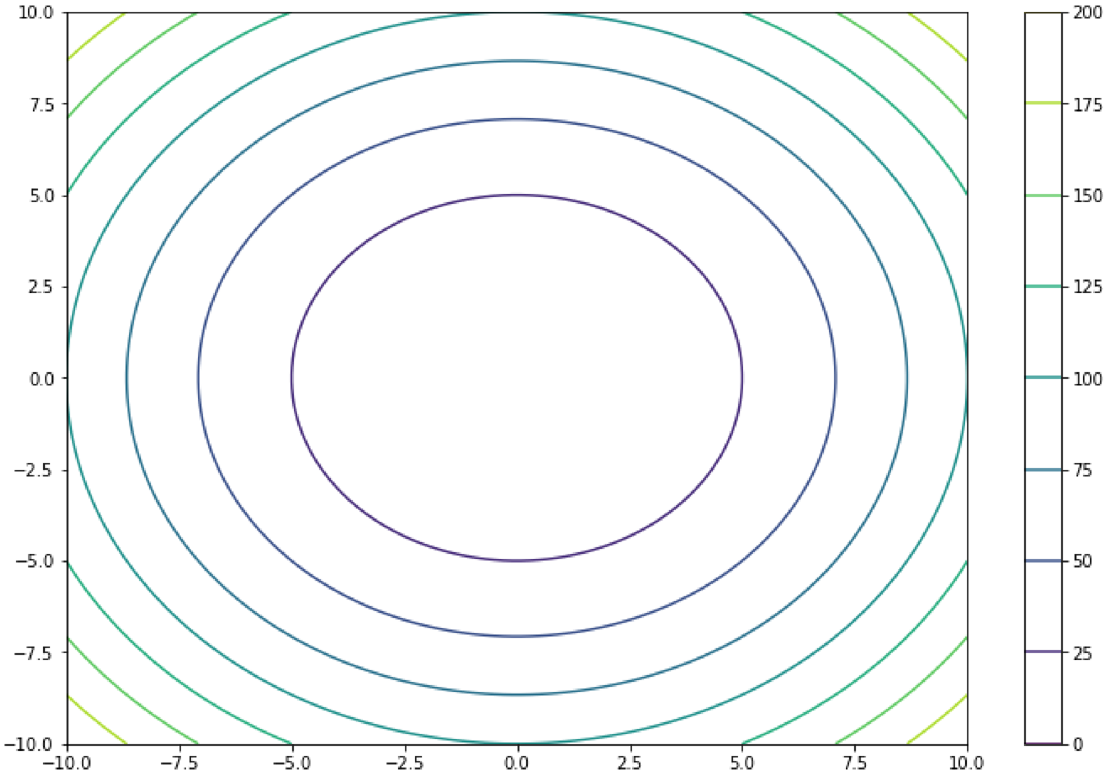
```
[ ]: <matplotlib.colorbar.Colorbar at 0x7f5e136f8970>
```



0.0.9 Contour Plots

```
[ ]: fig = plt.figure(figsize=(12,8))

     ax = plt.subplot()

     p = ax.contour(xx,yy,z,cmap='viridis')
     fig.colorbar(p)
```

```
[ ]: <matplotlib.colorbar.Colorbar at 0x7f5e13580a30>
```

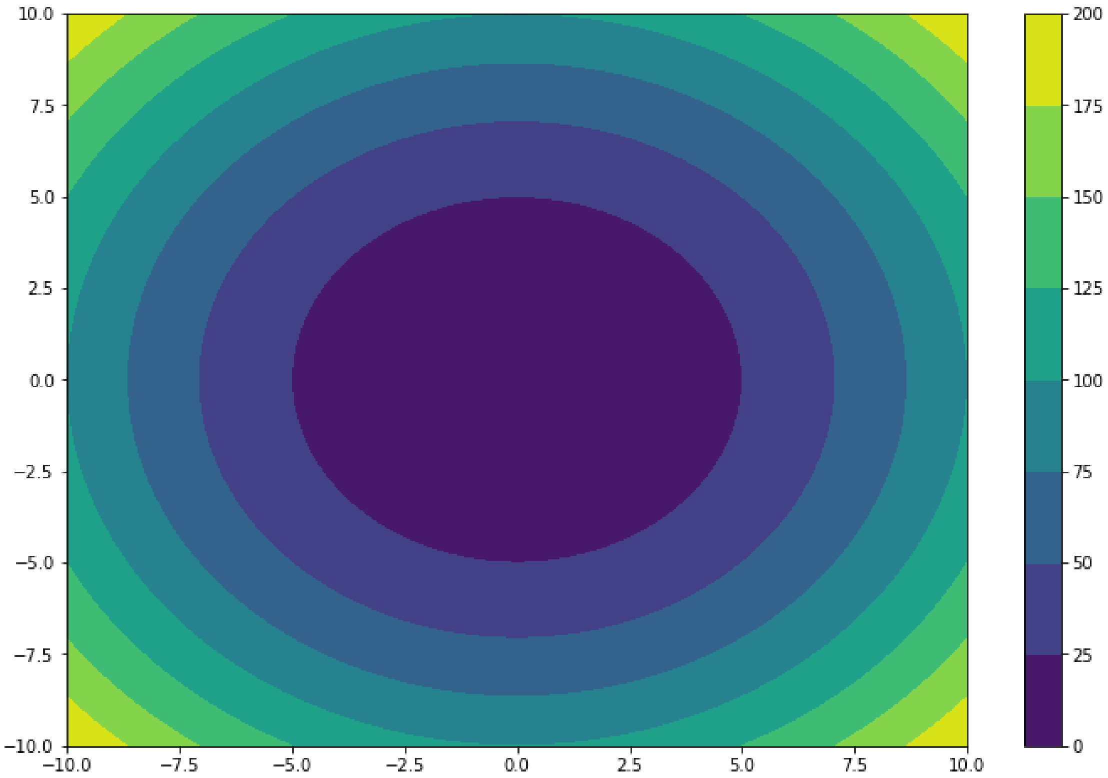


[ ]:

```
fig = plt.figure(figsize=(12,8))

ax = plt.subplot()

p = ax.contourf(xx,yy,z,cmap='viridis')
fig.colorbar(p)
```

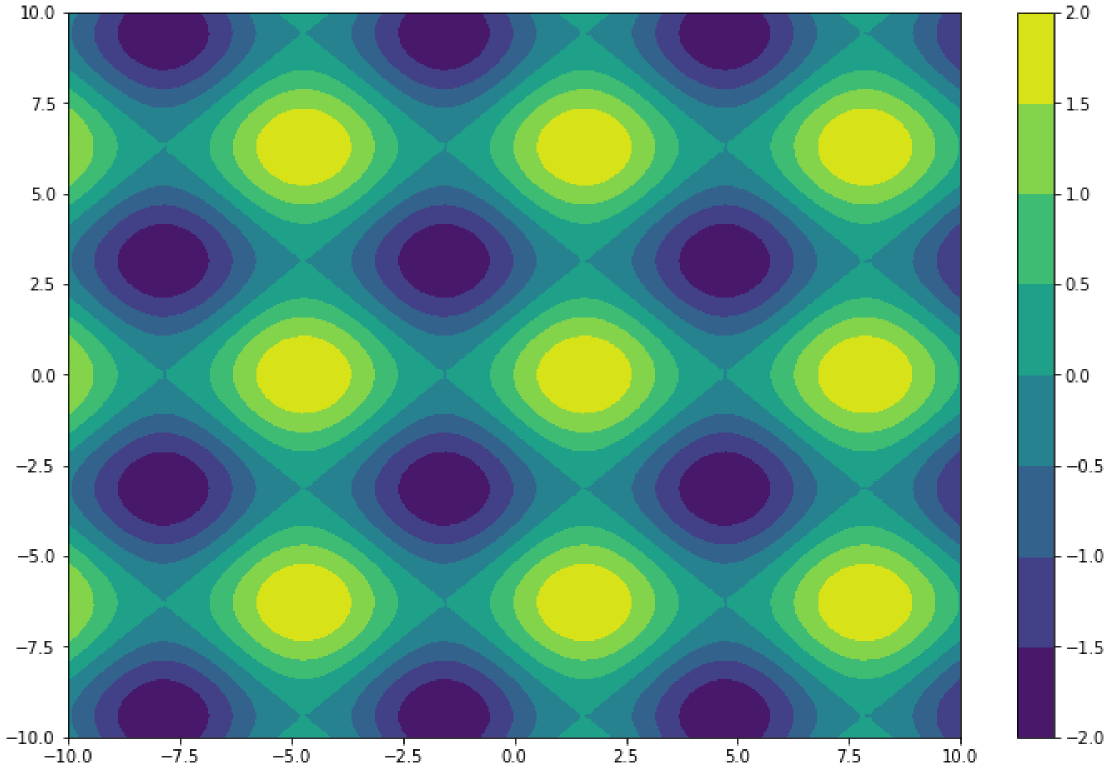
[ ]:

```
<matplotlib.colorbar.Colorbar at 0x7f5e14f202b0>
```



[ ]:
```
z = np.sin(xx) + np.cos(yy)

fig = plt.figure(figsize=(12,8))

ax = plt.subplot()

p = ax.contourf(xx,yy,z,cmap='viridis')
fig.colorbar(p)
```

[ ]:
```
<matplotlib.colorbar.Colorbar at 0x7f5e14d5a2e0>
```



0.0.10 Heatmap

```
delivery = pd.read_csv('(/content/IPL_Ball_by_Ball_2008_2022.csv)')
delivery.head()
```

```
        ID  innings  overs  ballnumber       batter          bowler  \
0  1312200        1      0           1  YBK Jaiswal  Mohammed Shami
1  1312200        1      0           2  YBK Jaiswal  Mohammed Shami
2  1312200        1      0           3   JC Buttler  Mohammed Shami
3  1312200        1      0           4  YBK Jaiswal  Mohammed Shami
4  1312200        1      0           5  YBK Jaiswal  Mohammed Shami

   non-striker extra_type  batsman_run  extras_run  total_run  non_boundary  \
0   JC Buttler        NaN            0           0          0             0
1   JC Buttler    legbyes            0           1          1             0
2  YBK Jaiswal        NaN            1           0          1             0
3   JC Buttler        NaN            0           0          0             0
4   JC Buttler        NaN            0           0          0             0

   isWicketDelivery player_out kind fielders_involved       BattingTeam
0                 0        NaN  NaN               NaN  Rajasthan Royals
1                 0        NaN  NaN               NaN  Rajasthan Royals
```

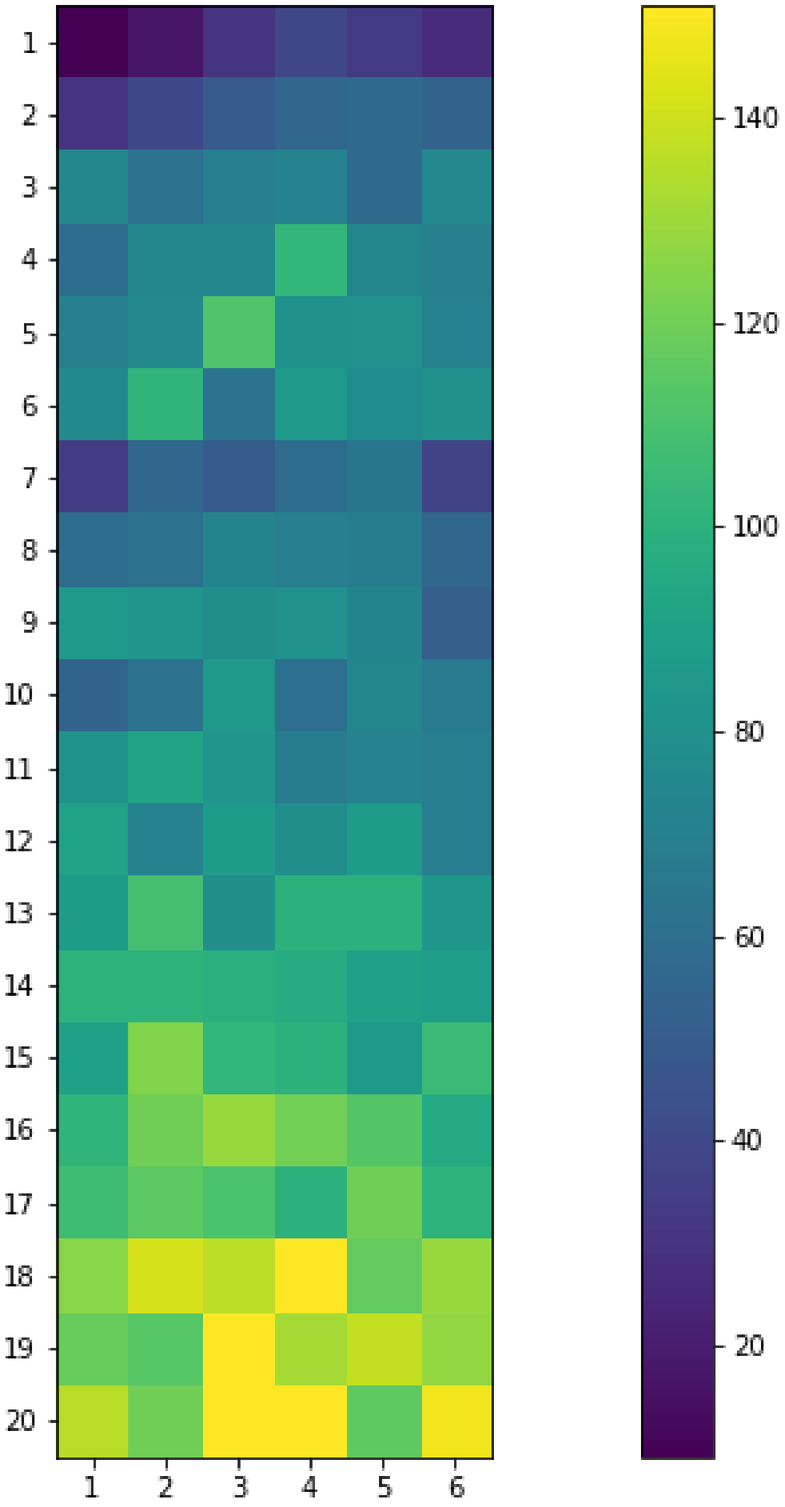
```
2                  0        NaN  NaN              NaN  Rajasthan Royals
3                  0        NaN  NaN              NaN  Rajasthan Royals
4                  0        NaN  NaN              NaN  Rajasthan Royals
```

```
[ ]: temp_df = delivery[(delivery['ballnumber'].isin([1,2,3,4,5,6])) & (delivery['batsman_run']==6)]
```

```
[ ]: grid = temp_df.pivot_table(index='overs',columns='ballnumber',values='batsman_run',aggfunc='count')
```

```
[ ]: plt.figure(figsize=(20,10))
     plt.imshow(grid)
     plt.yticks(delivery['overs'].unique(), list(range(1,21)))
     plt.xticks(np.arange(0,6), list(range(1,7)))
     plt.colorbar()
```

```
[ ]: <matplotlib.colorbar.Colorbar at 0x7f5e12f98cd0>
```

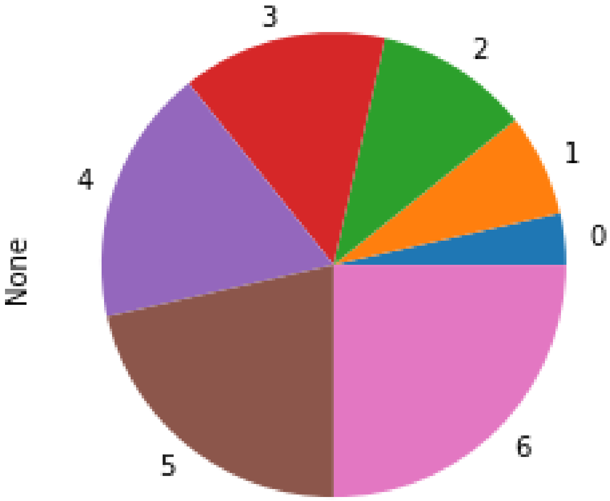

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
1
2
3
4
5
6
140
120
100
80
60
40
20

```
[ ]:
```

0.0.11 Pandas Plot()

```
[ ]: # on a series

     s = pd.Series([1,2,3,4,5,6,7])
     s.plot(kind='pie')
```

```
[ ]: <matplotlib.axes._subplots.AxesSubplot at 0x7f5e12f0a070>
```



```
[ ]: # can be used on a dataframe as well
```

```
[ ]: import seaborn as sns
     tips = sns.load_dataset('tips')
```

```
[ ]: tips['size'] = tips['size'] * 100
```

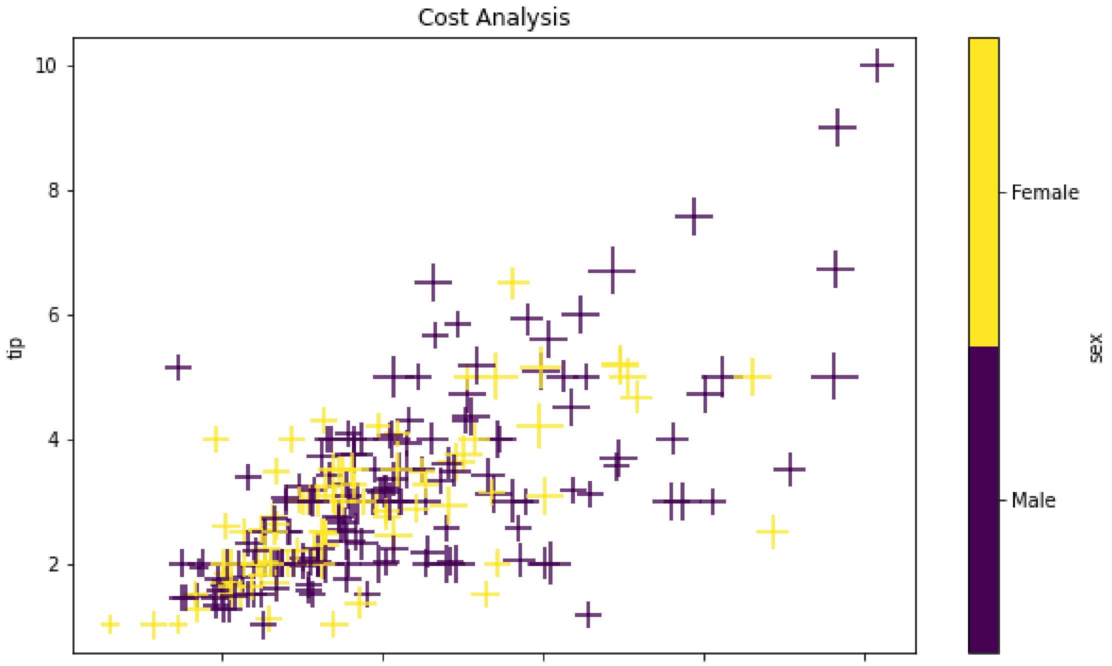
```
[ ]:
```

```
[ ]: tips.head()
```

```
[ ]:    total_bill   tip     sex smoker  day    time  size
     0       16.99  1.01  Female     No  Sun  Dinner   200
     1       10.34  1.66    Male     No  Sun  Dinner   300
     2       21.01  3.50    Male     No  Sun  Dinner   300
     3       23.68  3.31    Male     No  Sun  Dinner   200
     4       24.59  3.61  Female     No  Sun  Dinner   400
```

```
[ ]: # Scatter plot -> labels -> markers -> figsize -> color -> cmap
     tips.plot(kind='scatter',x='total_bill',y='tip',title='Cost␣
      ↪Analysis',marker='+',figsize=(10,6),s='size',c='sex',cmap='viridis')
```

```
[ ]: <matplotlib.axes._subplots.AxesSubplot at 0x7f5e12b4d760>
```

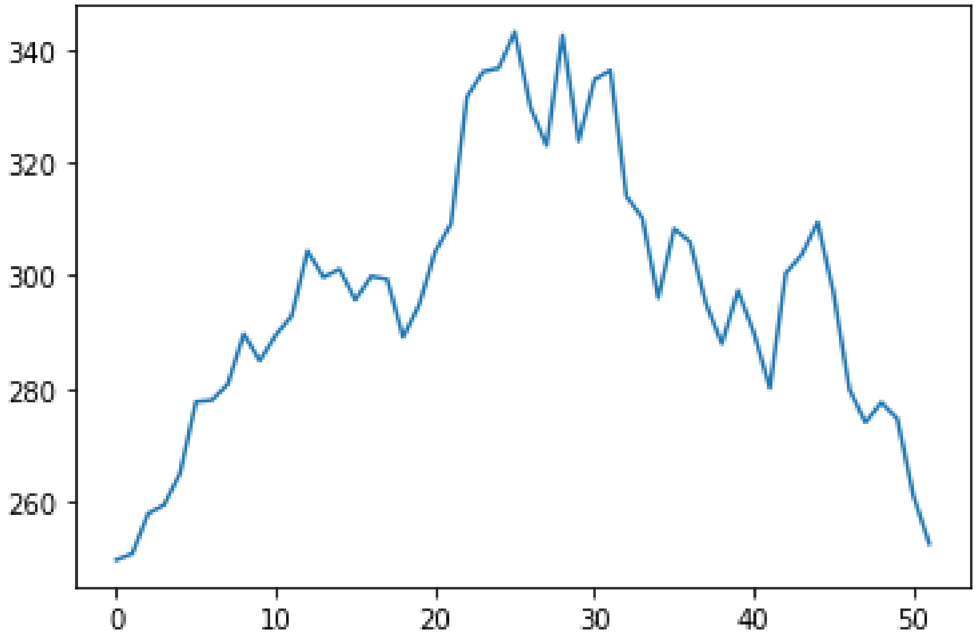


```
[ ]: # 2d plot
     # dataset = 'https://raw.githubusercontent.com/m-mehdi/pandas_tutorials/main/
      ↪weekly_stocks.csv'

     stocks = pd.read_csv('https://raw.githubusercontent.com/m-mehdi/
      ↪pandas_tutorials/main/weekly_stocks.csv')
     stocks.head()
```

```
[ ]:          Date        MSFT          FB        AAPL
     0  2021-05-24  249.679993  328.730011  124.610001
     1  2021-05-31  250.789993  330.350006  125.889999
     2  2021-06-07  257.890015  331.260010  127.349998
     3  2021-06-14  259.429993  329.660004  130.460007
     4  2021-06-21  265.019989  341.369995  133.110001
```

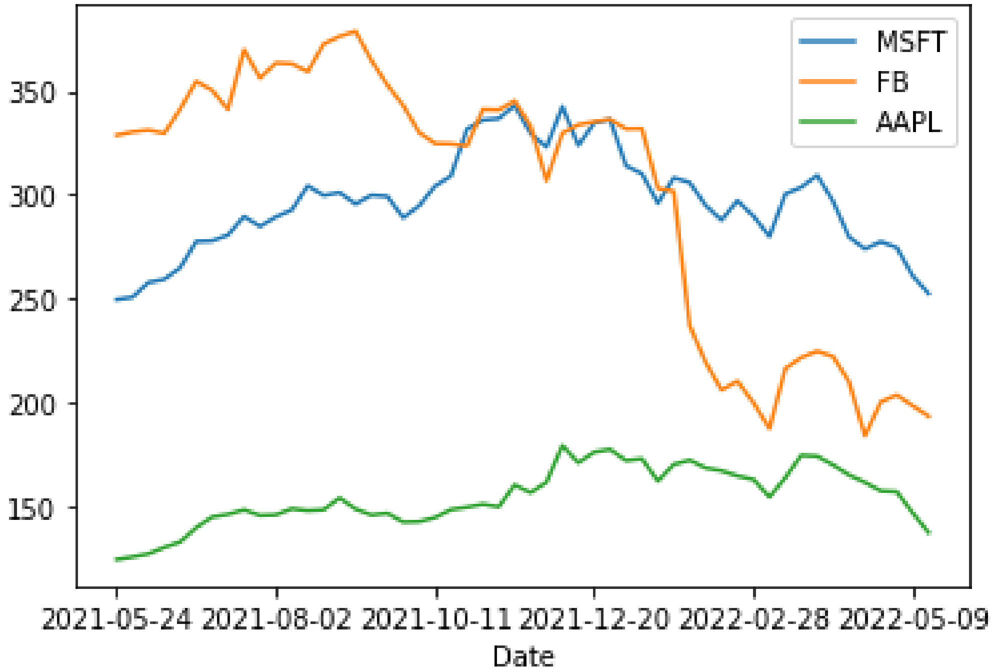
```
[ ]: # line plot
     stocks['MSFT'].plot(kind='line')
```

```
[ ]: <matplotlib.axes._subplots.AxesSubplot at 0x7f5e12a55730>
```



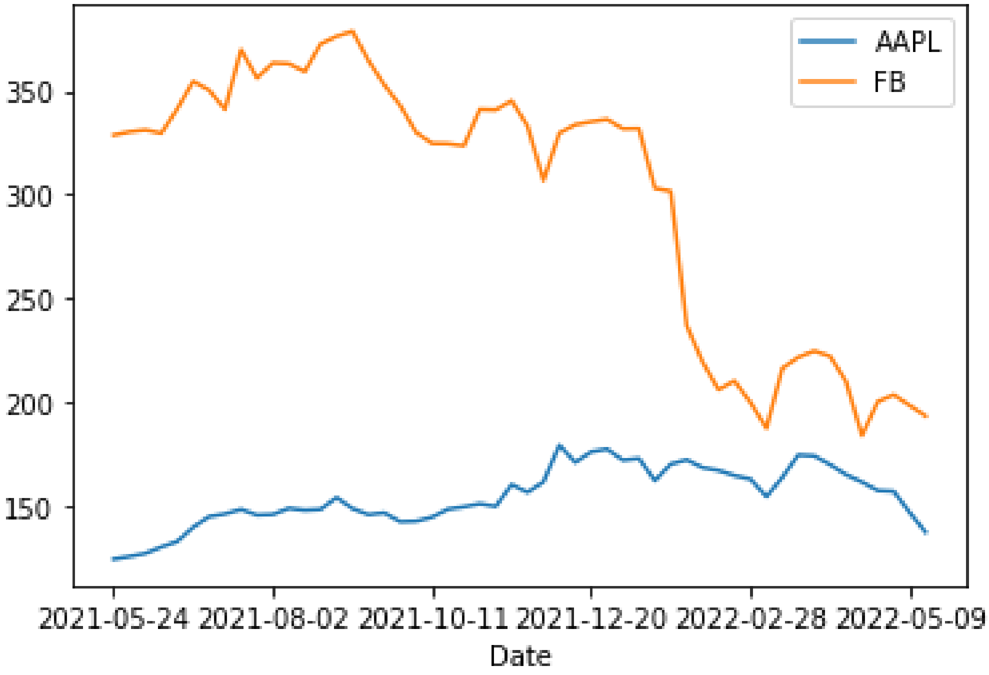
```
[ ]: stocks.plot(kind='line',x='Date')
```

```
[ ]: <matplotlib.axes._subplots.AxesSubplot at 0x7f5e129f15e0>
```



```
[ ]: stocks[['Date','AAPL','FB']].plot(kind='line',x='Date')
```

```
[ ]: <matplotlib.axes._subplots.AxesSubplot at 0x7f5e12950fa0>
```

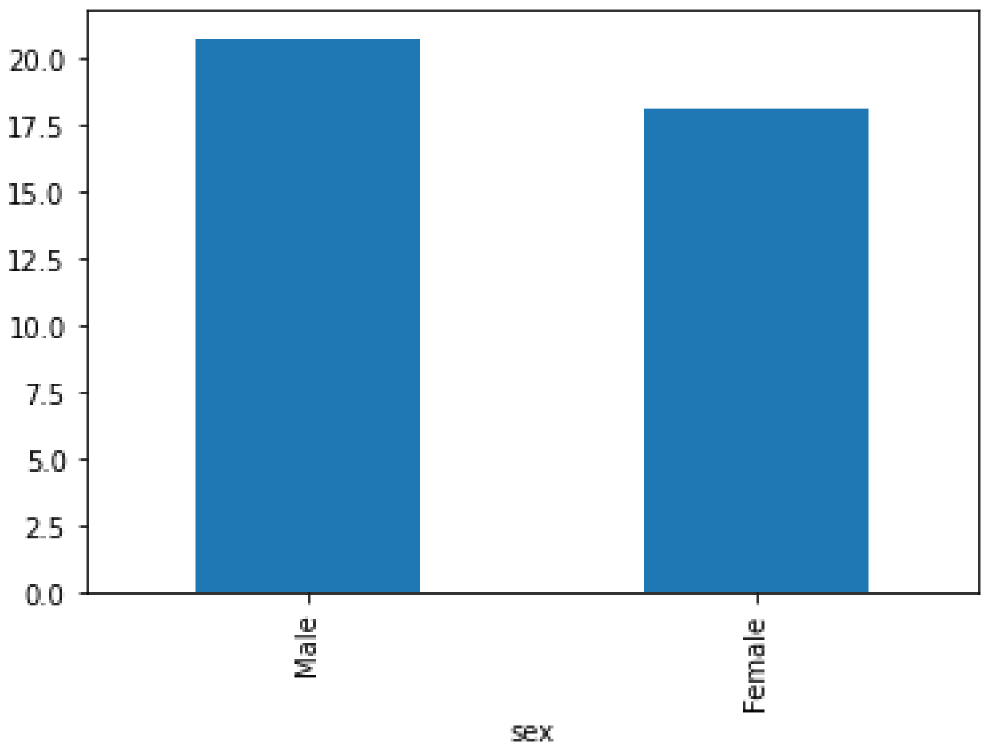


```
[ ]: # bar chart -> single -> horizontal -> multiple
     # using tips
     temp = pd.read_csv('/content/batsman_season_record.csv')
     temp.head()
```

```
[ ]:          batsman  2015  2016  2017
     0  AB de Villiers   513   687   216
     1       DA Warner   562   848   641
     2        MS Dhoni   372   284   290
     3       RG Sharma   482   489   333
     4         V Kohli   505   973   308
```

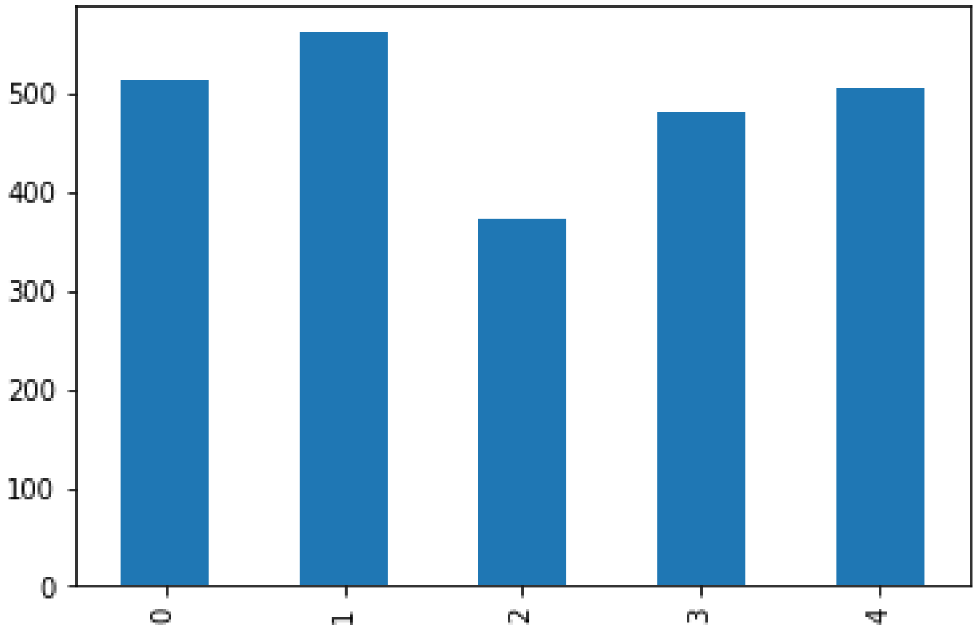
```
[ ]: tips.groupby('sex')['total_bill'].mean().plot(kind='bar')
```

```
[ ]: <matplotlib.axes._subplots.AxesSubplot at 0x7f5e12350550>
```



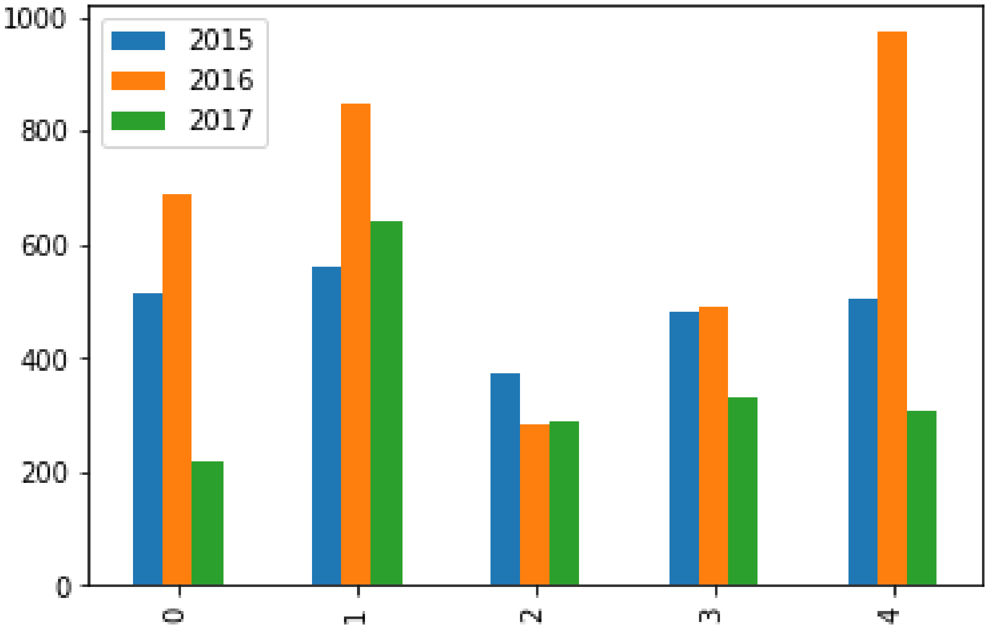
```
[ ]: temp['2015'].plot(kind='bar')
```

```
[ ]: <matplotlib.axes._subplots.AxesSubplot at 0x7f5e123ceaf0>
```



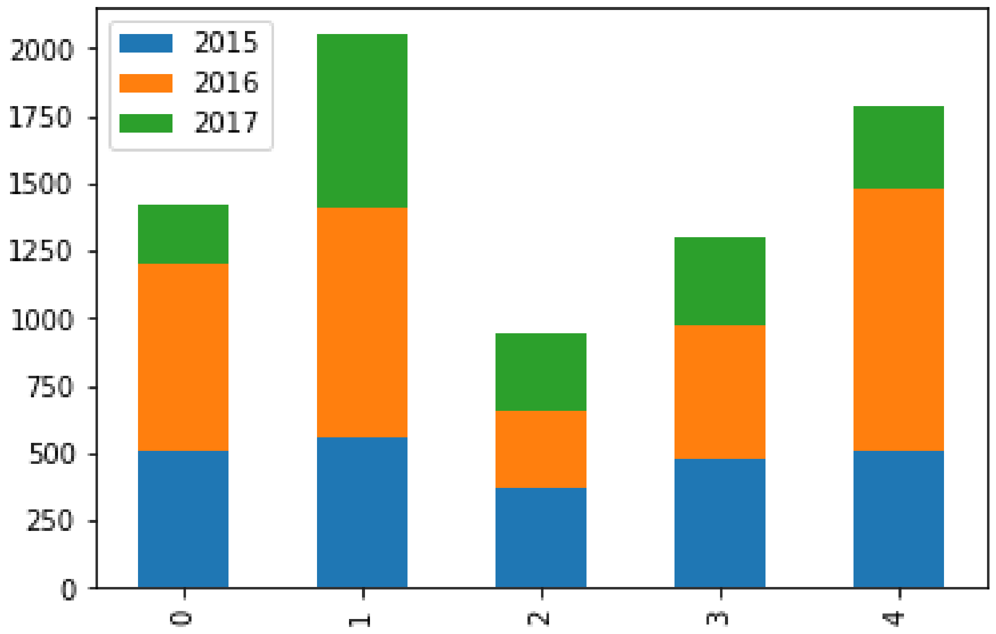
```
[ ]: temp.plot(kind='bar')
```

```
[ ]: <matplotlib.axes._subplots.AxesSubplot at 0x7f5e1228fac0>
```



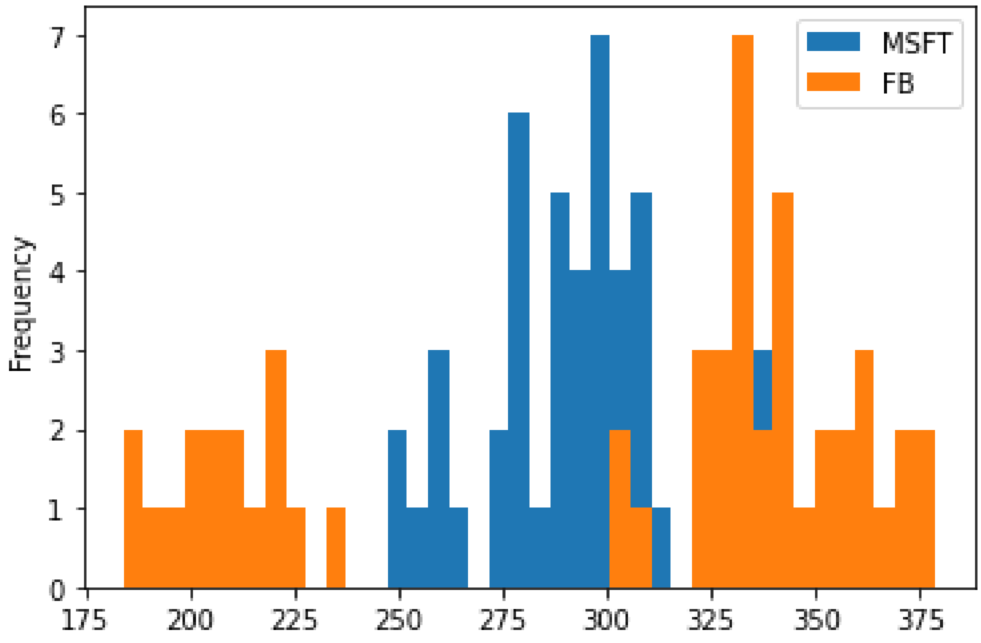
```
[ ]: # stacked bar chart
     temp.plot(kind='bar',stacked=True)
```

```
[ ]: <matplotlib.axes._subplots.AxesSubplot at 0x7f5e12216e50>
```



[ ]:
```
# histogram
# using stocks

stocks[['MSFT','FB']].plot(kind='hist',bins=40)
```

[ ]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f5e150247f0>
```

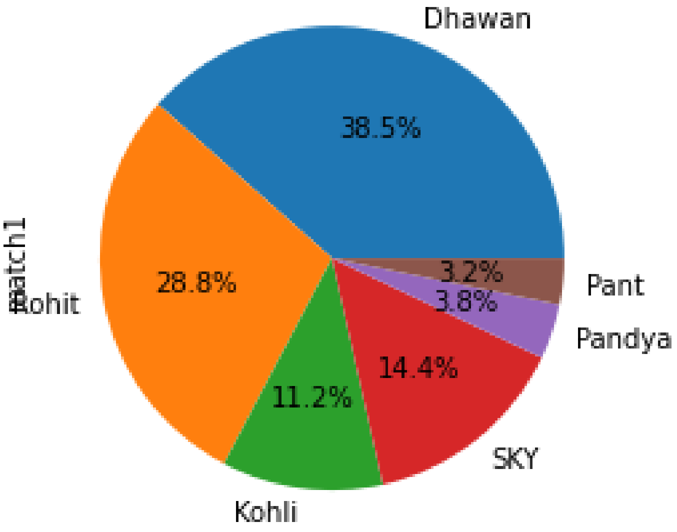


```
[ ]: # pie -> single and multiple
     df = pd.DataFrame(
         {
             'batsman':['Dhawan','Rohit','Kohli','SKY','Pandya','Pant'],
             'match1':[120,90,35,45,12,10],
             'match2':[0,1,123,130,34,45],
             'match3':[50,24,145,45,10,90]
         }
     )

     df.head()
```

```
[ ]:   batsman  match1  match2  match3
     0  Dhawan     120       0      50
     1   Rohit      90       1      24
     2   Kohli      35     123     145
     3     SKY      45     130      45
     4  Pandya      12      34      10
```

```
[ ]: df['match1'].plot(kind='pie',labels=df['batsman'].values,autopct='%0.1f%%')
```

```
[ ]: <matplotlib.axes._subplots.AxesSubplot at 0x7f5e11e50790>
```

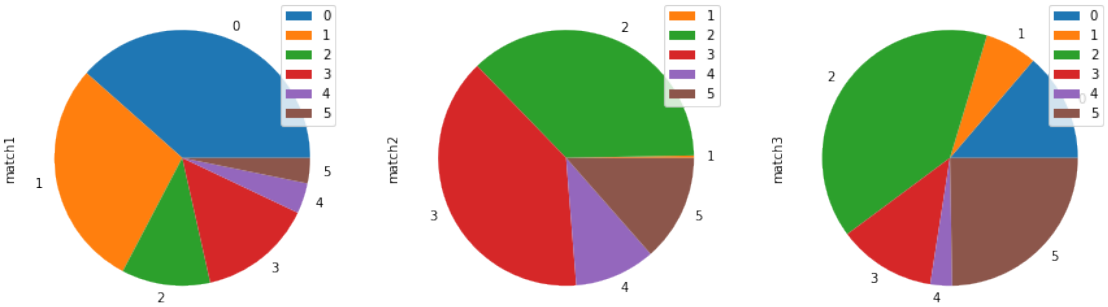


[ ]:

```
# multiple pie charts

df[['match1','match2','match3']].plot(kind='pie',subplots=True,figsize=(15,8))
```

[ ]:

```
array([<matplotlib.axes._subplots.AxesSubplot object at 0x7f5e11cc1b50>,
       <matplotlib.axes._subplots.AxesSubplot object at 0x7f5e11c628b0>,
       <matplotlib.axes._subplots.AxesSubplot object at 0x7f5e11c7ff10>],
      dtype=object)
```

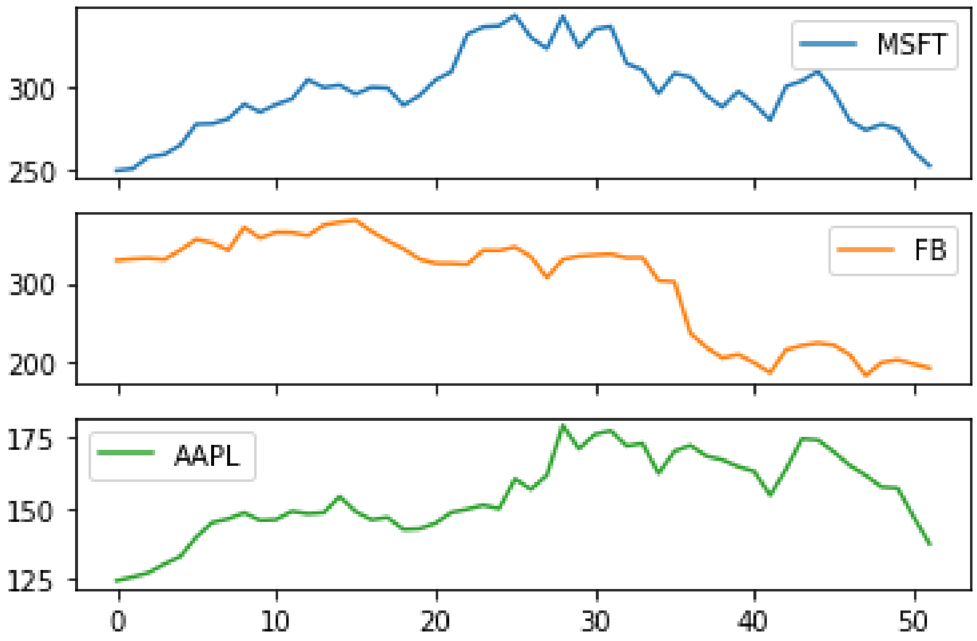


[ ]:

```
# multiple separate graphs together
# using stocks

stocks.plot(kind='line',subplots=True)
```

[ ]:

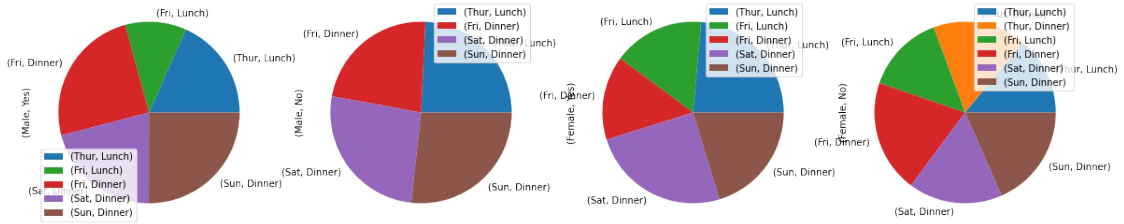
```
array([<matplotlib.axes._subplots.AxesSubplot object at 0x7f5e11a2f7f0>,
       <matplotlib.axes._subplots.AxesSubplot object at 0x7f5e11a50640>,
       <matplotlib.axes._subplots.AxesSubplot object at 0x7f5e119f0d00>],
      dtype=object)
```



```
[ ]: # on multiindex dataframes
     # using tips
```

```
[ ]: tips.
      ↪pivot_table(index=['day','time'],columns=['sex','smoker'],values='total_bill',aggfunc='mean
      ↪plot(kind='pie',subplots=True,figsize=(20,10))
```

```
[ ]: array([<matplotlib.axes._subplots.AxesSubplot object at 0x7f5e116a8cd0>,
            <matplotlib.axes._subplots.AxesSubplot object at 0x7f5e115363d0>,
            <matplotlib.axes._subplots.AxesSubplot object at 0x7f5e114d2a90>,
            <matplotlib.axes._subplots.AxesSubplot object at 0x7f5e1150b040>],
           dtype=object)
```



```
[ ]: tips
[ ]:      total_bill   tip     sex smoker   day    time  size
     0         16.99  1.01  Female     No   Sun  Dinner   200
     1         10.34  1.66    Male     No   Sun  Dinner   300
     2         21.01  3.50    Male     No   Sun  Dinner   300
     3         23.68  3.31    Male     No   Sun  Dinner   200
     4         24.59  3.61  Female     No   Sun  Dinner   400
     ..          …     …      …      …     …      …     …
     239       29.03  5.92    Male     No   Sat  Dinner   300
     240       27.18  2.00  Female    Yes   Sat  Dinner   200
     241       22.67  2.00    Male    Yes   Sat  Dinner   200
     242       17.82  1.75    Male     No   Sat  Dinner   200
     243       18.78  3.00  Female     No  Thur  Dinner   200

     [244 rows x 7 columns]
```

```
[ ]: stocks.plot(kind='scatter3D')
```

```
---------------------------------------------------------------------------
ValueError                                Traceback (most recent call last)
<ipython-input-321-4e91fa40f850> in <module>
----> 1 stocks.plot(kind='scatter3D')

/usr/local/lib/python3.8/dist-packages/pandas/plotting/_core.py in␣
 ↪__call__(self, *args, **kwargs)
    903
    904         if kind not in self._all_kinds:
--> 905             raise ValueError(f"{kind} is not a valid plot kind")
    906
    907         # The original data structured can be transformed before passed
 ↪to the

ValueError: scatter3D is not a valid plot kind
```

```
[ ]:
```