Assignment-4

Assignment Date	26 October 2022
Team ID	PNT2022TMID46353
Student Name	Santhini Devi.S
Student Roll Number	820319104036
Maximum Marks	2 Marks

Problem Statement: Customer Segmentation Analysis

Problem Statement:

You own the mall and want to understand the customers who can quickly converge [Target Customers] so that the insight can be given to the marketing team and plan the strategy accordingly.

Clustering the data and performing classification algorithms

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

1. **Download the dataset: Dataset**
2. **Load the dataset into the tool.**

[5]

```
from google.colab import drive
drive.mount('/content/drive')
```

Mounted at /content/drive

[6]

```
data =pd.read_csv('/content/drive/MyDrive/Mall_Customers.csv')
```

3. Perform Below Visualizations. · Univariate Analysis · Bi- Variate Analysis · Multi-Variate Analysis

[7]

data.head()

	CustomerID	Gender	Age	Annual Income (k$)	Spending Score (1-100)
0	1	Male	19	15	39
1	2	Male	21	15	81
2	3	Female	20	16	6
3	4	Female	23	16	77
4	5	Female	31	17	40

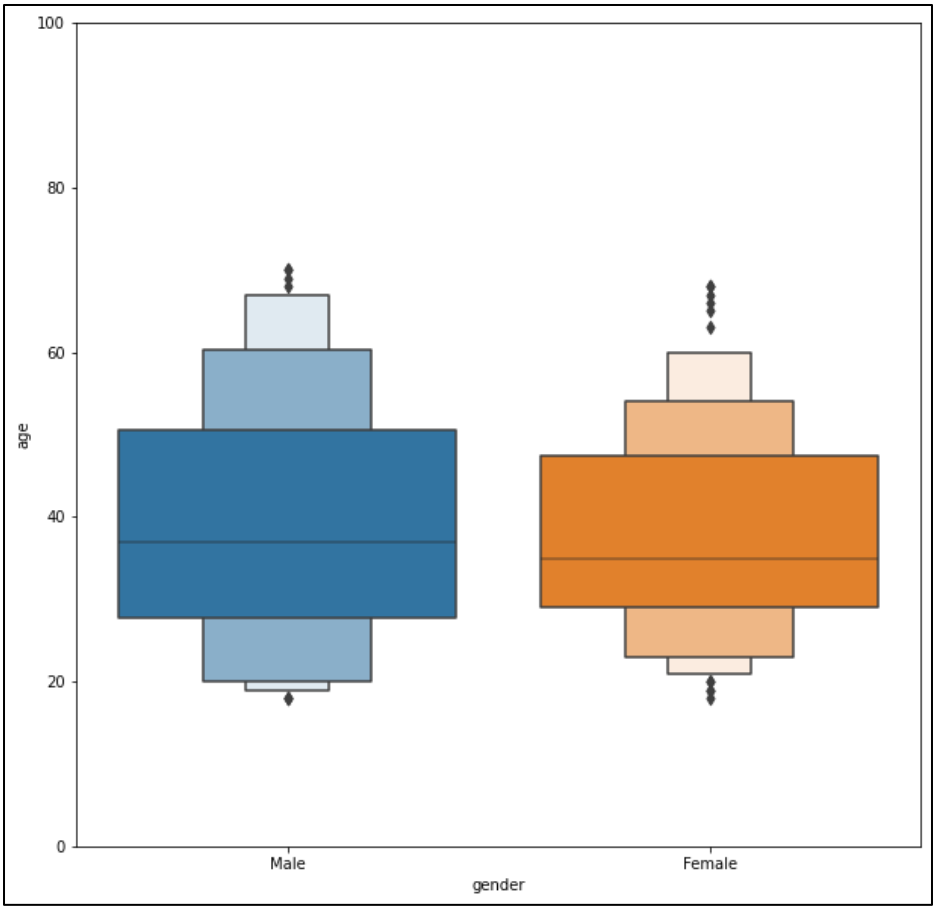
[8]

```
data.rename(columns={"CustomerID":"customer_id","Gender":"gender","Age":"a
ge","Annual Income (k$)":"annual_income",
                    "Spending Score (1-100)":"spending_scores"},inplace=True)
```

[9]

```
temp = pd.concat([data['age'], data['gender']], axis=1)

f, ax = plt.subplots(figsize=(10,10))
fig = sns.boxenplot(x='gender', y="age", data=data)
fig.axis(ymin=0, ymax=100);
```



ANALYSIS

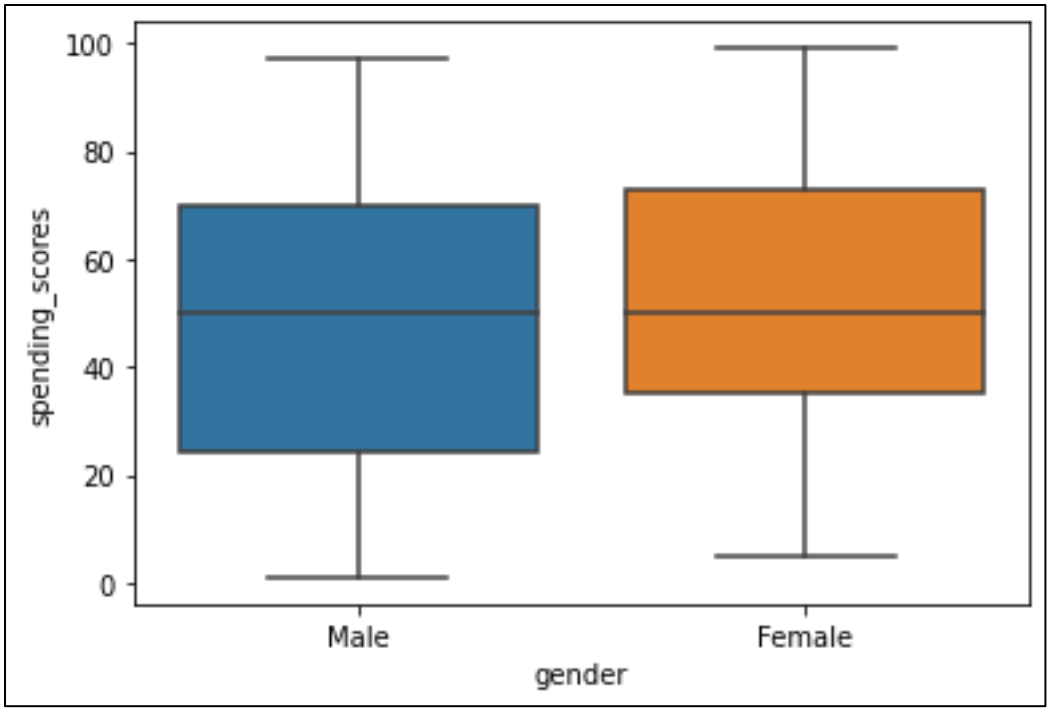
There is no difference in age of rings for male and female (18-70).

Count plot

[10]

sns.boxplot(x=data['gender'],y=data['spending_scores'])

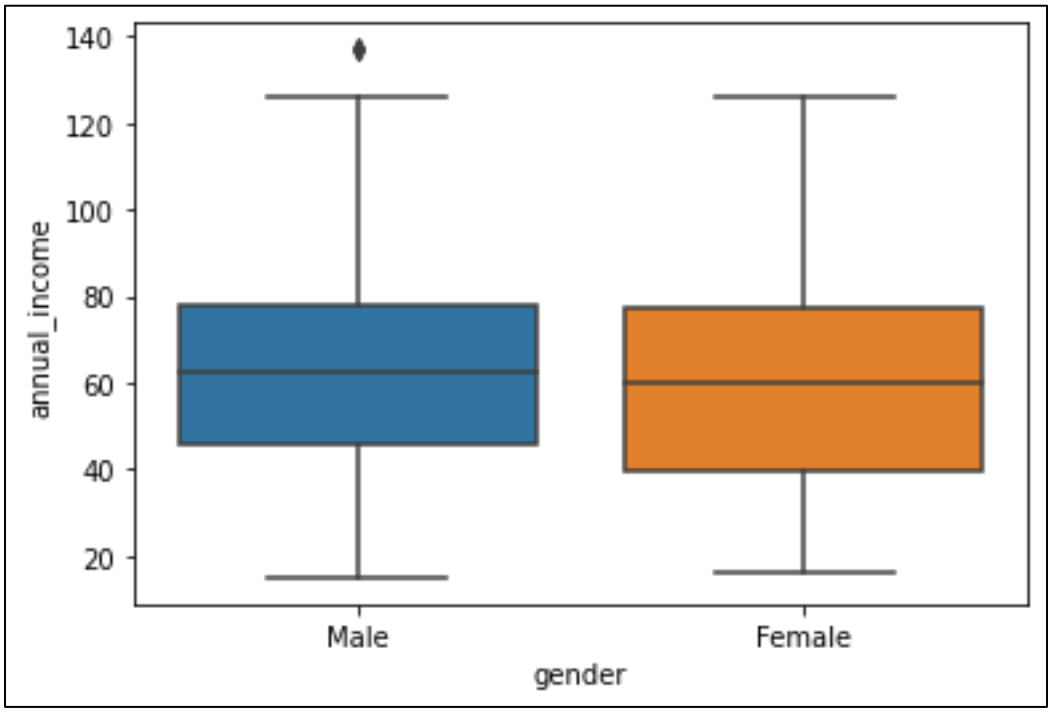
<matplotlib.axes._subplots.AxesSubplot at 0x7f801df52310>



[11]

sns.boxplot(x=data['gender'],y=data['annual_income'])

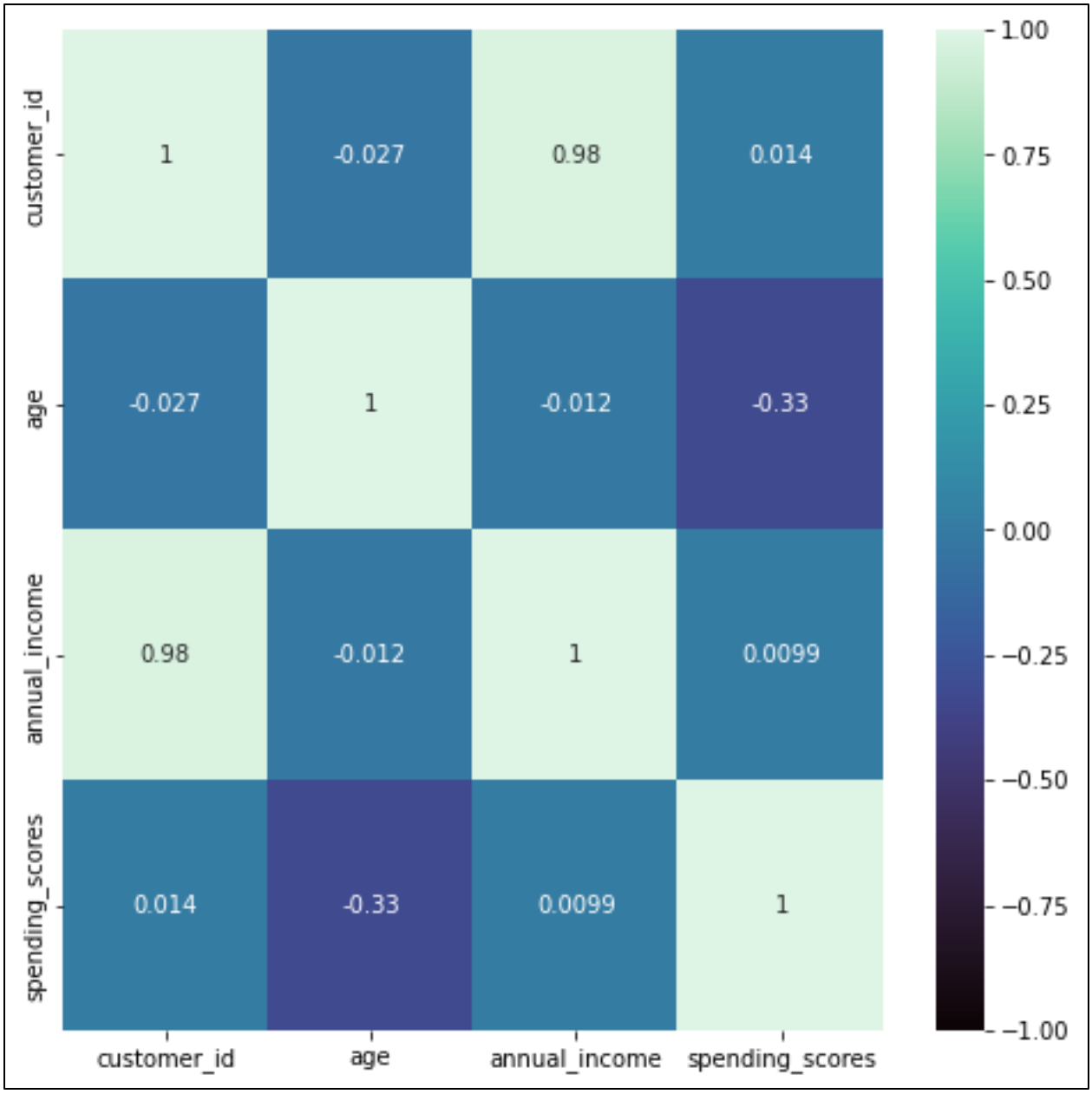
<matplotlib.axes._subplots.AxesSubplot at 0x7f801da98610>



Coorelation Plot

[12]

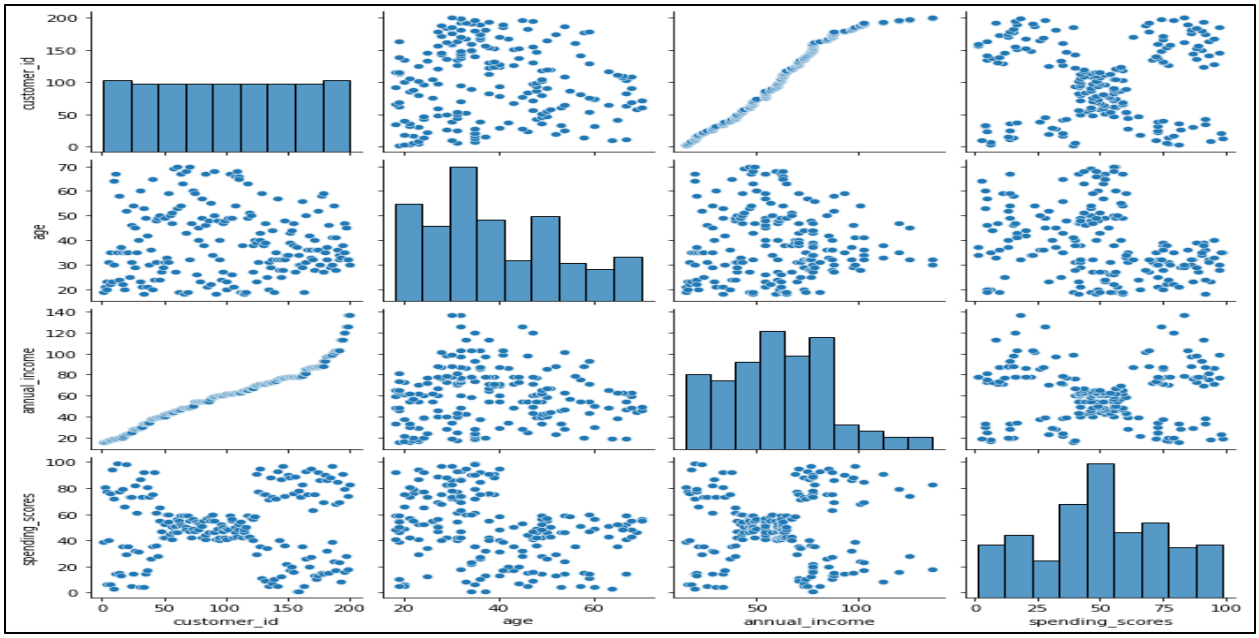
```
corr=data.corr()
plt.figure(figsize=(8,8))
sn=sns.heatmap(corr,vmin=-1,center=0, annot = True, cmap = 'mako')
```



[13]

```
sns.pairplot(data)
```

<seaborn.axisgrid.PairGrid at 0x7f801d90d890>



4. Perform descriptive statistics on the dataset.

[14]

data.head(10)

	customer_id	gender	age	annual_income	spending_scores
0	1	Male	19	15	39
1	2	Male	21	15	81
2	3	Female	20	16	6
3	4	Female	23	16	77
4	5	Female	31	17	40
5	6	Female	22	17	76
6	7	Female	35	18	6
7	8	Female	23	18	94
8	9	Male	64	19	3
9	10	Female	30	19	72

[15]

data.shape

(200, 5)

[16]

data.describe()

	customer_id	age	annual_income	spending_scores
count	200.000000	200.000000	200.000000	200.000000
mean	100.500000	38.850000	60.560000	50.200000
std	57.879185	13.969007	26.264721	25.823522
min	1.000000	18.000000	15.000000	1.000000
25%	50.750000	28.750000	41.500000	34.750000
50%	100.500000	36.000000	61.500000	50.000000
75%	150.250000	49.000000	78.000000	73.000000
max	200.000000	70.000000	137.000000	99.000000

[17]

data.info()

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 200 entries, 0 to 199
Data columns (total 5 columns):
 #   Column          Non-Null Count  Dtype
---  ------          --------------  -----
 0   customer_id     200 non-null    int64
 1   gender          200 non-null    object
 2   age             200 non-null    int64
 3   annual_income   200 non-null    int64
 4   spending_scores 200 non-null    int64
dtypes: int64(4), object(1)
memory usage: 7.9+ KB
```

5. Check for Missing values and deal with them.

[18]

```
data[data.duplicated()]
```

[19]

```
data.isna().sum()
```

```
customer_id        0
gender             0
age                0
annual_income      0
spending_scores    0
dtype: int64
```

There is no missing values and duplicates in dataframe

6. Find the outliers and replace them outliers

[20]

```
for i in data:
    if data[i].dtype=='int64':
        q1=data[i].quantile(0.25)
        q3=data[i].quantile(0.75)
        iqr=q3-q1
        upper=q3+1.5*iqr
        lower=q1-1.5*iqr
        data[i]=np.where(data[i] >upper, upper, data[i])
        data[i]=np.where(data[i] <lower, lower, data[i])
```

After removing outliers, boxplot will be like

[21]

```
plt.boxplot(data['age'])
```

```
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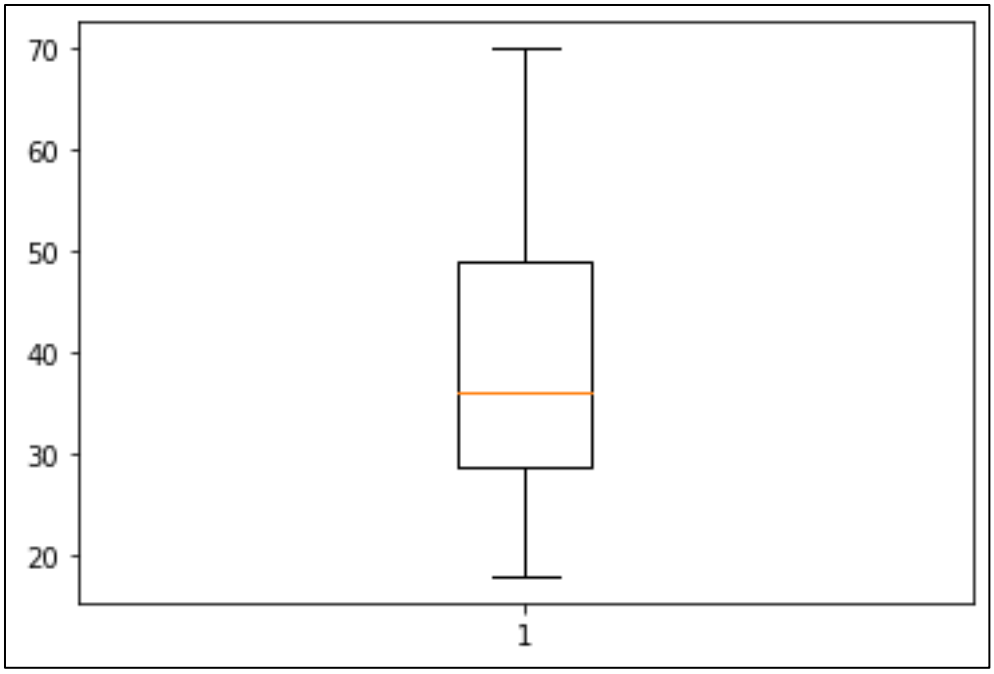
  <matplotlib.lines.Line2D at 0x7f801b8fca50>],
 'caps': [<matplotlib.lines.Line2D at 0x7f801b8fcf90>,
  <matplotlib.lines.Line2D at 0x7f801b901510>],
 'boxes': [<matplotlib.lines.Line2D at 0x7f801b8f6ed0>],
 'medians': [<matplotlib.lines.Line2D at 0x7f801b901a90>],
```

'fliers': [<matplotlib.lines.Line2D at 0x7f801b901fd0>],
'means': []}



[22]

plt.boxplot(data['annual_income'])

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'caps': [<matplotlib.lines.Line2D at 0x7f801b8a0f90>,
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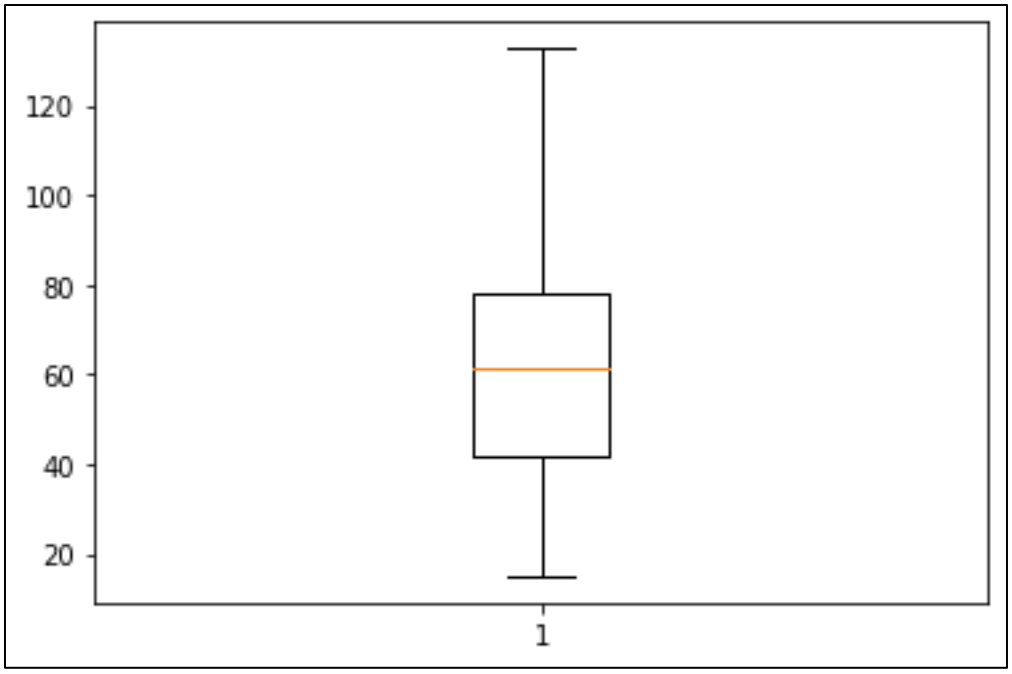

[23]

```
plt.boxplot(data['spending_scores'])
```

```
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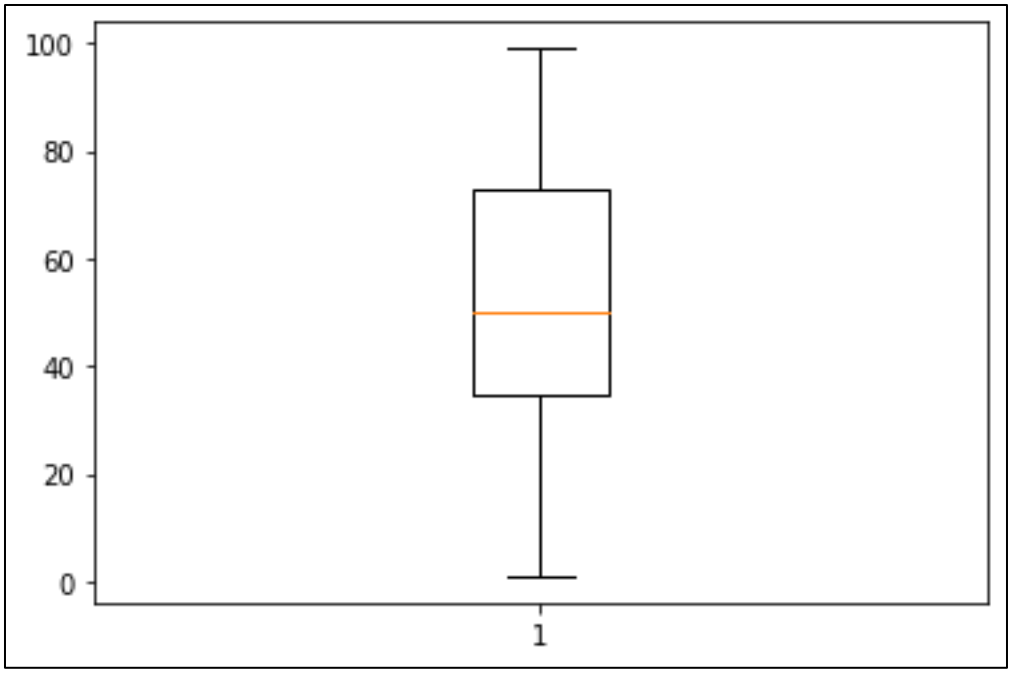
 'means': []}
```



7. Check for Categorical columns and perform encoding.

[24]

```
from sklearn.preprocessing import LabelEncoder
encoder=LabelEncoder()
data['gender']=encoder.fit_transform(data['gender'])
```

[25]

data.head()

	customer_id	gender	age	annual_income	spending_scores
0	1.0	1	19.0	15.0	39.0
1	2.0	1	21.0	15.0	81.0
2	3.0	0	20.0	16.0	6.0
3	4.0	0	23.0	16.0	77.0
4	5.0	0	31.0	17.0	40.0

8. Scaling the data

[26]

```
from sklearn.preprocessing import StandardScaler
df=StandardScaler()
data1=df.fit_transform(data)
```

[27]

```
data1
```

```
array([[-1.7234121 ,  1.12815215, -1.42456879, -1.74542941, -0.43480148],
       [-1.70609137,  1.12815215, -1.28103541, -1.74542941,  1.19570407],
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       [-1.67144992, -0.88640526, -1.13750203, -1.70708307,  1.04041783],
       [-1.6541292 , -0.88640526, -0.56336851, -1.66873673, -0.39597992],
       [-1.63680847, -0.88640526, -1.20926872, -1.66873673,  1.00159627],
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       [-1.60216702, -0.88640526, -1.13750203, -1.6303904 ,  1.70038436],
       [-1.5848463 ,  1.12815215,  1.80493225, -1.59204406, -1.83237767],
       [-1.56752558, -0.88640526, -0.6351352 , -1.59204406,  0.84631002],
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```

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```

9. Perform any of the clustering algorithms

[28]

```
from sklearn.cluster import KMeans
```

[29]

```
data.drop('customer_id',axis=1,inplace=True)
```

[30]

```
km = KMeans(n_clusters=3, random_state=0)
```

[31]

```
data['Group or Cluster'] = km.fit_predict(data)
```

[32]

data.head()

	gender	age	annual_income	spending_scores	Group or Cluster
0	1	19.0	15.0	39.0	2
1	1	21.0	15.0	81.0	2
2	0	20.0	16.0	6.0	2
3	0	23.0	16.0	77.0	2
4	0	31.0	17.0	40.0	2

[33]

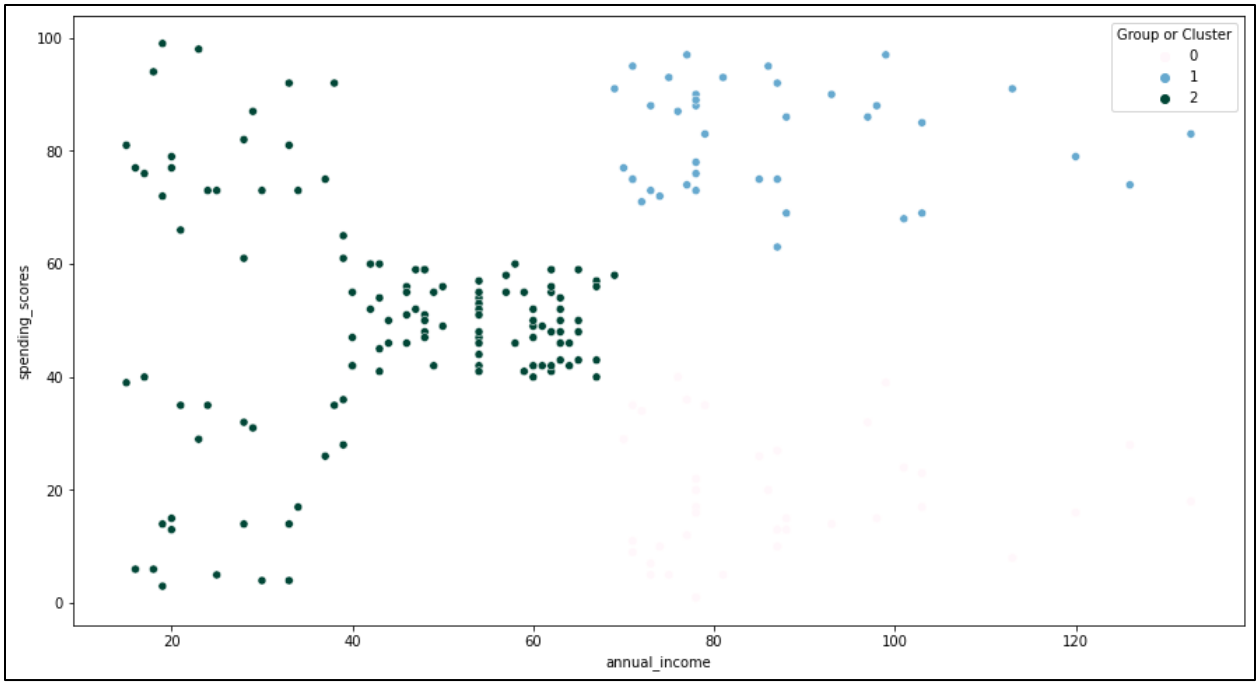
data['Group or Cluster'].value_counts()

2 123
1 39
0 38
Name: Group or Cluster, dtype: int64

[34]

```
import matplotlib.pyplot as plt

fig,ax = plt.subplots(figsize=(15,8))
sns.scatterplot(x=data['annual_income'],
                y=data['spending_scores'],
                hue=data['Group or Cluster'],
                palette='PuBuGn')
plt.show()
```



[35]

```
from sklearn.metrics import silhouette_score, silhouette_samples
score = silhouette_score(data,
                         km.labels_,
                         metric='euclidean')
score
```

0.3842057644019546

[36]

```
import matplotlib.pyplot as plt
from yellowbrick.cluster import SilhouetteVisualizer

fig, ax = plt.subplots(2, 2, figsize=(20,20))
for i in [2, 3, 4, 5]:
    '''
    Create KMeans instance for different number of clusters
    '''
    km = KMeans(n_clusters=i,
                init='k-means++',
                n_init=10,
                max_iter=100,
```

```
            random_state=0)
    q, mod = divmod(i, 2)
    '''
    Create SilhouetteVisualizer instance with KMeans instance
    Fit the visualizer
    '''
    visualizer = SilhouetteVisualizer(km,
                                      colors='yellowbrick',
                                      ax=ax[q-1][mod])
    visualizer.fit(data)
```