Project Name: Grouping customers based on their purchases using K-means Algorithm

TASK 02

Description: Create a K-means clustering algorithm to group customers of a retail store based on their purchase history.

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

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.mount("/content/drive", force_remount=True)
```

```
import numpy as np
import pandas as pd
```

Data Importing

```
df = pd.read_csv('/content/drive/MyDrive/PP/TASK02PDG/Mall_Customers.csv')
print(df.shape)
print(df.head())
```

```
(200, 5)
   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
```

Data Preprocessing

Mapping Gender values to 0 & 1

```
class_mapping= {'Male':0,'Female':1}
df['Gender_Bin']=df['Gender'].map(class_mapping)
print(df)
```

```
     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
..          ...     ...  ...                 ...                     ...
195         196  Female   35                 120                      79
196         197  Female   45                 126                      28
197         198    Male   32                 126                      74
198         199    Male   32                 137                      18
199         200    Male   30                 137                      83

     Gender_Bin
0             0
1             0
2             1
3             1
```

```
4            1
..         ...
195          1
196          1
197          0
198          0
199          0

[200 rows x 6 columns]
```

```
df.head()
```

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

Next steps: Generate code with df View recommended plots

```
df.drop(['Gender'],axis=1,inplace=True)
df.head()
```

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

Next steps: Generate code with df View recommended plots

```
df.drop(['CustomerID'],axis=1,inplace=True)
df.head()
```

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

Next steps: Generate code with df View recommended plots

Checking for Null values if any

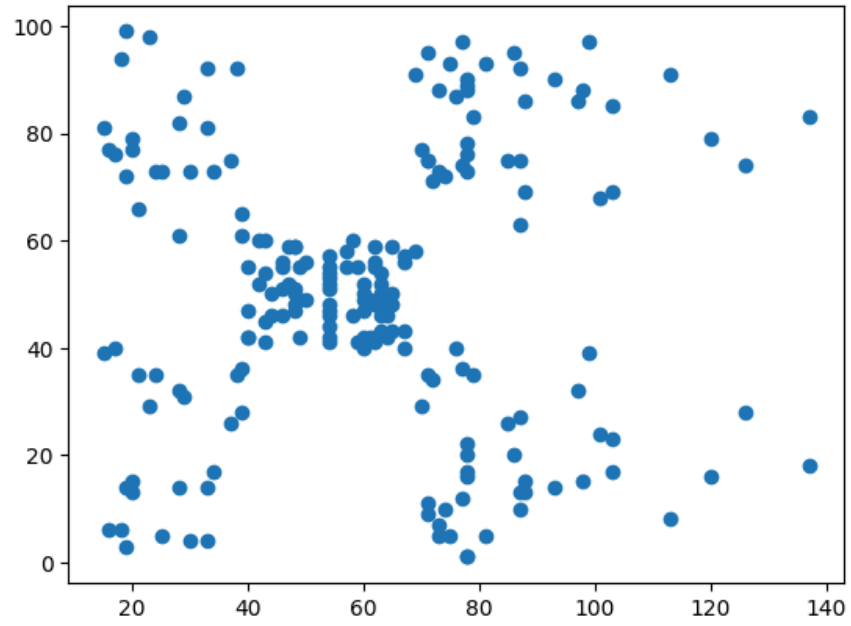
```
# Check for missing values
missing_values = df.isna().sum()
print(missing_values)
```

```
Age                     0
Annual Income (k$)      0
Spending Score (1-100)  0
Gender_Bin              0
dtype: int64
```

Visualizing based on different features

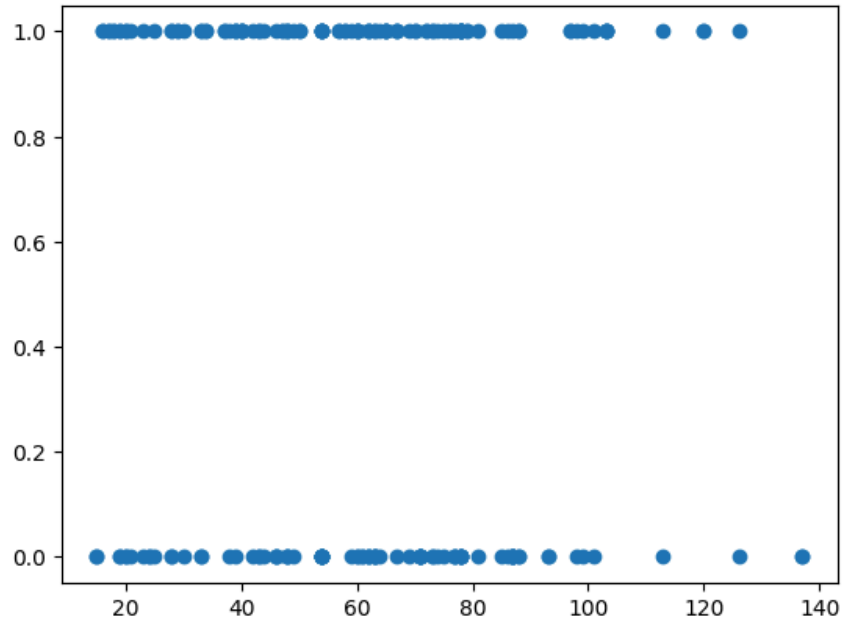
```
import matplotlib.pyplot as plt
plt.scatter(df['Annual Income (k$)'],df['Spending Score (1-100)'])
```

```
<matplotlib.collections.PathCollection at 0x7f7c547af9a0>
```



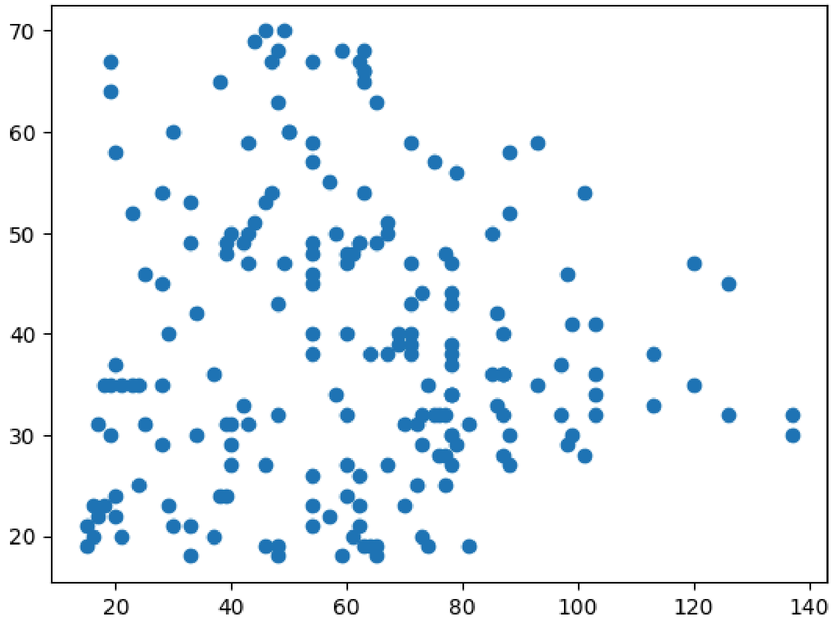

```
import matplotlib.pyplot as plt
plt.scatter(df['Annual Income (k$)'],df['Gender_Bin'])
```

```
<matplotlib.collections.PathCollection at 0x7f7c524fcf10>
```




```
import matplotlib.pyplot as plt
plt.scatter(df['Annual Income (k$)'],df['Age'])
```

```
<matplotlib.collections.PathCollection at 0x7f7c5256f130>
```



Checking for how many clusters will be there

```
#checking number of clusters
from sklearn.cluster import KMeans
wcss=[]

for i in range(1,11):
  kmeans=KMeans(n_clusters=i)
  kmeans.fit_predict(df)
  kmeans.inertia_
  wcss.append(kmeans.inertia_)
```

```
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:870: FutureWarning: The default value of `n_init` will chang
  warnings.warn(
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:870: FutureWarning: The default value of `n_init` will chang
  warnings.warn(
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:870: FutureWarning: The default value of `n_init` will chang
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  warnings.warn(
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:870: FutureWarning: The default value of `n_init` will chang
  warnings.warn(
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:870: FutureWarning: The default value of `n_init` will chang
  warnings.warn(
```

```
wcss
```

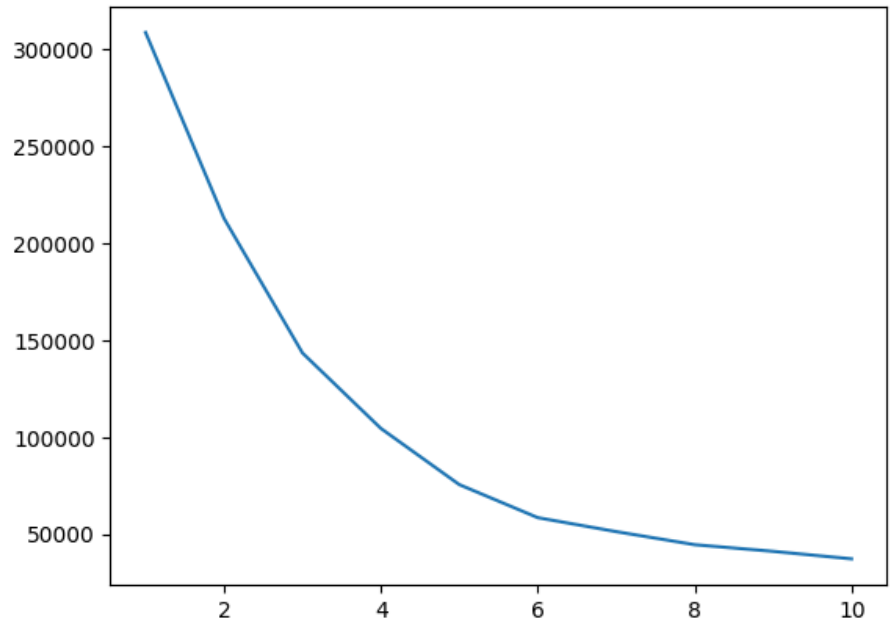
```
[308862.06,
 212889.44245524303,
 143391.59236035674,
 104414.67534220169,
 75399.61541401484,
```

```
58348.641363315044,
51132.703212576904,
44392.11566567935,
40956.7798934218,
37084.6755930271]
```

Graph showing total clusters at L-Bow point (i.e. 4)

```
plt.plot(range(1,11),wcss)
```

```
[<matplotlib.lines.Line2D at 0x7f7c49d1d060>]
```




```
X=df.iloc[:,:].values
kmeans=KMeans(n_clusters=4)
y_means=kmeans.fit_predict(X)
y_means
```

```
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:870: FutureWarning: The default value of `n_init` will chang
  warnings.warn(
array([1, 1, 2, 1, 1, 1, 2, 1, 2, 1, 2, 1, 2, 1, 2, 1, 2, 1, 2, 1,
       2, 1, 2, 1, 2, 1, 2, 1, 2, 1, 2, 1, 2, 1, 2, 1, 2, 1, 2, 1,
       2, 1, 2, 1, 1, 1, 2, 1, 1, 2, 2, 2, 2, 2, 1, 2, 2, 1, 2, 2, 2, 1,
       2, 2, 1, 1, 2, 2, 2, 2, 2, 1, 2, 2, 1, 2, 2, 1, 2, 2, 1, 2, 2, 1,
       1, 2, 2, 1, 2, 2, 2, 1, 2, 1, 2, 1, 1, 2, 2, 1, 2, 1, 2, 2, 2, 2,
       2, 1, 2, 1, 1, 1, 2, 2, 2, 2, 1, 2, 3, 3, 0, 3, 0, 3, 0, 3, 0, 3,
       0, 3, 0, 3, 0, 3, 0, 3, 0, 3, 0, 3, 0, 3, 0, 3, 0, 3, 0, 3, 0, 3,
       0, 3, 0, 3, 0, 3, 0, 3, 0, 3, 0, 3, 0, 3, 0, 3, 0, 3, 0, 3, 0, 3,
       0, 3, 0, 3, 0, 3, 0, 3, 0, 3, 0, 3, 0, 3, 0, 3, 0, 3, 0, 3, 0, 3,
       0, 3], dtype=int32)
```

```
X[y_means == 0] #Showing Datapoints which comes under cluster number 0
```

```
array([[ 23,  70,  29,   1],
       [ 43,  71,  35,   0],
       [ 59,  71,  11,   0],
       [ 47,  71,   9,   0],
       [ 25,  72,  34,   1],
       [ 20,  73,   5,   0],
       [ 44,  73,   7,   1],
       [ 19,  74,  10,   0],
       [ 57,  75,   5,   1],
       [ 28,  76,  40,   1],
       [ 25,  77,  12,   0],
       [ 48,  77,  36,   0],
       [ 34,  78,  22,   1],
```

```
[ 43,  78,  17,   0],
[ 44,  78,  20,   1],
[ 47,  78,  16,   1],
[ 37,  78,   1,   0],
[ 34,  78,   1,   0],
[ 56,  79,  35,   1],
[ 19,  81,   5,   0],
[ 50,  85,  26,   0],
[ 42,  86,  20,   0],
[ 36,  87,  27,   1],
[ 40,  87,  13,   0],
[ 36,  87,  10,   0],
[ 52,  88,  13,   1],
[ 58,  88,  15,   0],
[ 59,  93,  14,   0],
[ 37,  97,  32,   1],
[ 46,  98,  15,   0],
[ 41,  99,  39,   1],
[ 54, 101,  24,   1],
[ 41, 103,  17,   1],
[ 34, 103,  23,   1],
[ 33, 113,   8,   0],
[ 47, 120,  16,   1],
[ 45, 126,  28,   1],
[ 32, 137,  18,   0]])
```

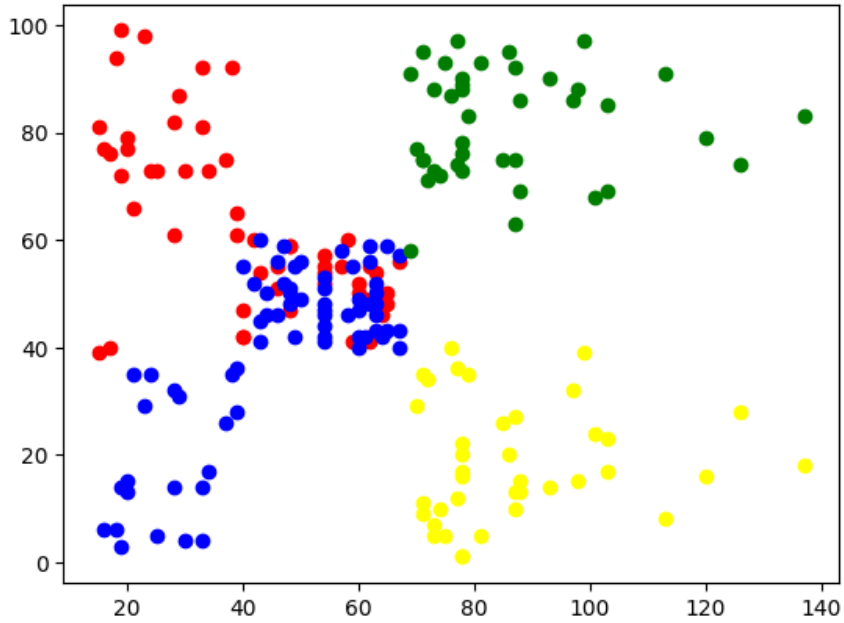
```
X[y_means == 0,0] #X[y_means == A,B] --> A is Cluster number, B is particular column of data under Cluster A
```

```
array([23, 43, 59, 47, 25, 20, 44, 19, 57, 28, 25, 48, 34, 43, 44, 47, 37,
       34, 56, 19, 50, 42, 36, 40, 36, 52, 58, 59, 37, 46, 41, 54, 41, 34,
       33, 47, 45, 32])
```

Clusters done accordingly

```
plt.scatter(X[y_means == 0,1],X[y_means == 0,2],color='yellow') #Taking Annual Income and Spending score
plt.scatter(X[y_means == 1,1],X[y_means == 1,2],color='red')
plt.scatter(X[y_means == 2,1],X[y_means == 2,2],color='blue')
plt.scatter(X[y_means == 3,1],X[y_means == 3,2],color='green')
```

```
<matplotlib.collections.PathCollection at 0x7f7c4705bb50>
```




```
from mpl_toolkits.mplot3d import Axes3D

# Create a 3D plot
fig = plt.figure(figsize=(10, 7))
```

```
ax = fig.add_subplot(111, projection='3d')

# Plot the data points for each cluster
ax.scatter(X[y_means == 0, 1], X[y_means == 0, 2], X[y_means == 0, 3], color='yellow')
ax.scatter(X[y_means == 1, 1], X[y_means == 1, 2], X[y_means == 1, 3], color='red')
ax.scatter(X[y_means == 2, 1], X[y_means == 2, 2], X[y_means == 2, 3], color='blue')
ax.scatter(X[y_means == 3, 1], X[y_means == 3, 2], X[y_means == 3, 3], color='green')

# Set the labels for the axes
ax.set_xlabel('Annual Income (k$)')
ax.set_ylabel('Spending Score (1-100)')
ax.set_zlabel('Gender')

# Show the plot
plt.show()
```