Customer Segmentation using k-means clustering

June 1, 2025

[1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.cluster import KMeans
```

1 Data collection and analysis

[3]:
```
df = pd.read_csv('Mall_Customers.csv')
```

[4]:
```
df.head()
```

[4]:
```
   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
```

[5]:
```
df.shape
```

[5]:
```
(200, 5)
```

[6]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 200 entries, 0 to 199
Data columns (total 5 columns):
 #   Column                  Non-Null Count  Dtype
---  ------                  --------------  -----
 0   CustomerID              200 non-null    int64
 1   Gender                  200 non-null    object
 2   Age                     200 non-null    int64
 3   Annual Income (k$)      200 non-null    int64
 4   Spending Score (1-100)  200 non-null    int64
dtypes: int64(4), object(1)
memory usage: 7.9+ KB
```

[7]:

```
df.isnull().sum()
```

[7]:

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

[8]:

```
x = df.iloc[:,[3,4]].values
print(x)
```

```
[[ 15  39]
 [ 15  81]
 [ 16   6]
 [ 16  77]
 [ 17  40]
 [ 17  76]
 [ 18   6]
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 [ 87  13]
 [ 87  75]
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```

```
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 [103  17]
 [103  85]
 [103  23]
 [103  69]
 [113   8]
 [113  91]
 [120  16]
 [120  79]
 [126  28]
 [126  74]
 [137  18]
 [137  83]]
```
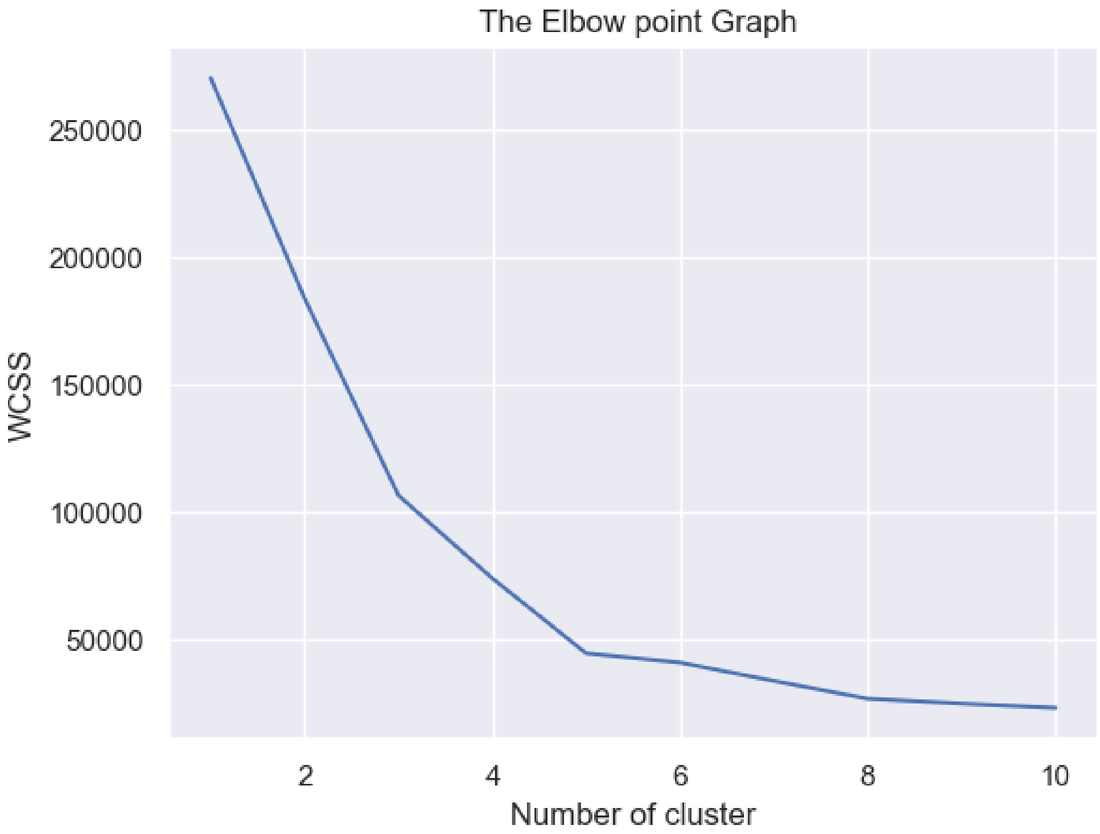

2 Choosing the number of cluster

[10]:

```python
#finding wcss values for different number of clusters



wcss = []

for i in range(1,11):
    kmeans = KMeans(n_clusters=i, init= 'k-means++', random_state=42)
    kmeans.fit(x)
    wcss.append(kmeans.inertia_)
```

[12]:

```python
#plot a elbow graph

sns.set()
plt.plot(range(1,11),wcss)
plt.title(' The Elbow point Graph')
plt.xlabel('Number of cluster')
plt.ylabel('WCSS')
plt.show()
```



3 optimum Number of Clusters = 5

#Training the K-means Clustering model

```
[15]: kmeans = KMeans(n_clusters=5, init='k-means++', random_state=0)

      #return a label for each data point based on their cluster

      Y = kmeans.fit_predict(x)
      print(Y)
```

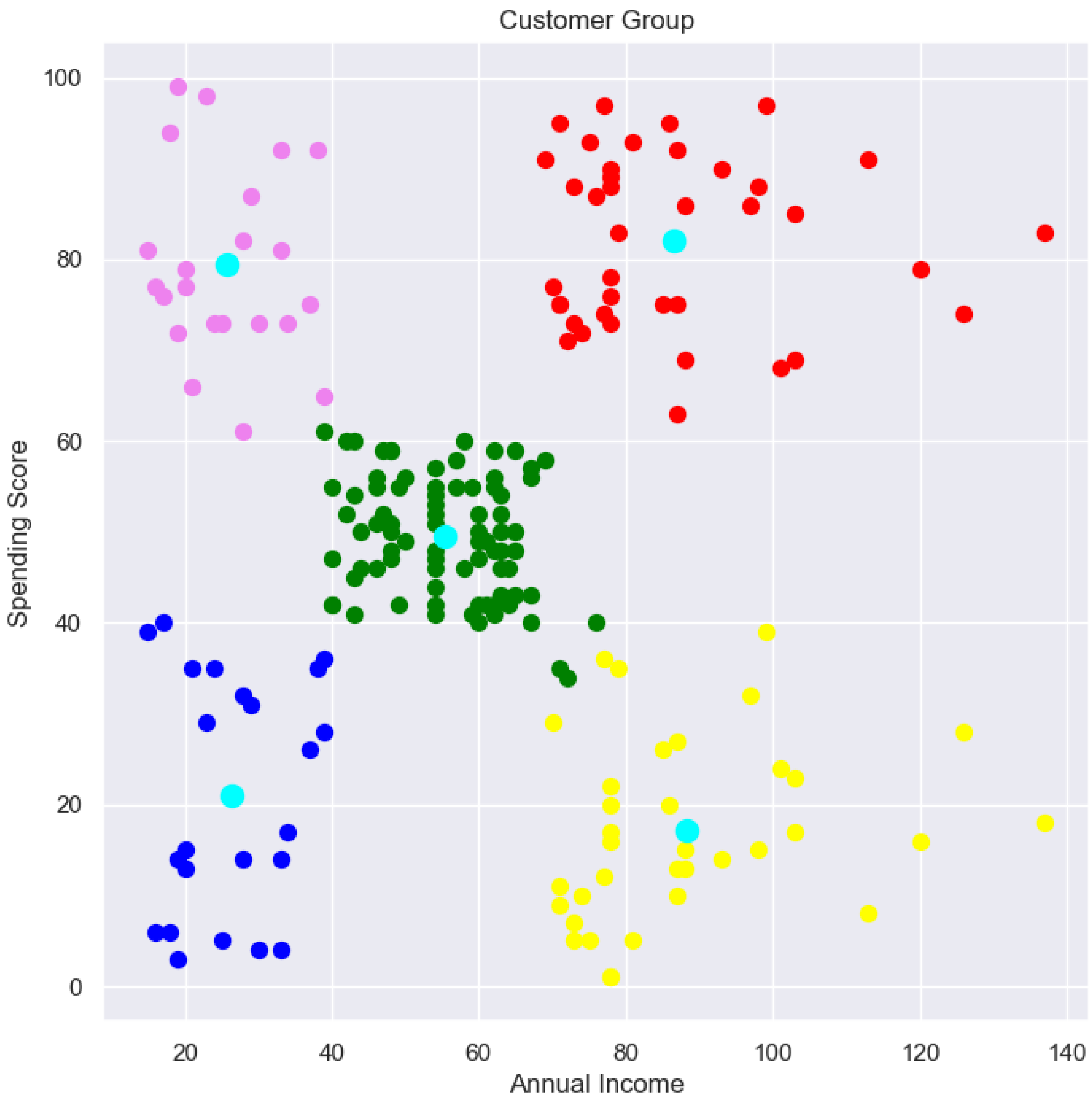
```
[3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3
 4 3 4 3 4 3 0 3 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 0 0 0 0 0 0 0 0 0 0 0 0 1 2 1 0 1 2 1 2 1 0 1 2 1 2 1 2 1 2 1 0 1 2 1 2 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 2 1 2
 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1]
```

4 Visualizing all the cluster

#ploting all the cluster all their centroids

[22]:

```
plt.figure(figsize=(8,8))
plt.scatter(x[Y==0,0],x[Y==0,1], s=50, c='green', label='Cluster 1')
plt.scatter(x[Y==1,0],x[Y==1,1], s=50, c='red', label='Cluster 2')
plt.scatter(x[Y==2,0],x[Y==2,1], s=50, c='yellow', label='Cluster 3')
plt.scatter(x[Y==3,0],x[Y==3,1], s=50, c='blue', label='Cluster 4')
plt.scatter(x[Y==4,0],x[Y==4,1], s=50, c='violet', label='Cluster 5')



plt.scatter(kmeans.cluster_centers_[:,0], kmeans.cluster_centers_[:,1], s=100,␣
  ↪c='cyan', label = 'centroids')

plt.title('Customer Group')
plt.xlabel('Annual Income')
plt.ylabel('Spending Score')
plt.show()
```


Customer Group
Spending Score
0
20
40
60
80
100
Annual Income
20
40
60
80
100
120
140

[ ]: