Importing the Dependencies

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

Data Collection & Analysis

```
# loading the data from csv file to a Pandas DataFrame
customer_data = pd.read_csv('Mall_Customers.csv')
```

```
# first 5 rows in the dataframe
customer_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

```
# finding the number of rows and columns
customer_data.shape
```

```
(200, 5)
```

```
# getting some informations about the dataset
customer_data.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
```

```
# checking for missing values
customer_data.isnull().sum()
```

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

Choosing the Annual Income Column & Spending Score column

```
X = customer_data.iloc[:,[3,4]].values
```

```
print(X)
```

```
       [ 76  40]
       [ 76  87]
       [ 77  12]
       [ 77  97]
       [ 77  36]
       [ 77  74]
       [ 78  22]
       [ 78  90]
       [ 78  17]
       [ 78  88]
       [ 78  20]
       [ 78  76]
       [ 78  16]
       [ 78  89]
       [ 78   1]
       [ 78  78]
       [ 78   1]
       [ 78  73]
       [ 79  35]
       [ 79  83]
       [ 81   5]
       [ 81  93]
       [ 85  26]
       [ 85  75]
       [ 86  20]
       [ 86  95]
       [ 87  27]
       [ 87  63]
       [ 87  13]
       [ 87  75]
       [ 87  10]
       [ 87  92]
       [ 88  13]
       [ 88  86]
       [ 88  15]
       [ 88  69]
       [ 93  14]
       [ 93  90]
       [ 97  32]
       [ 97  86]
       [ 98  15]
       [ 98  88]
       [ 99  39]
       [ 99  97]
       [101  24]
       [101  68]
       [103  17]
       [103  85]
       [103  23]
       [103  69]
       [113   8]
       [113  91]
       [120  16]
       [120  79]
       [126  28]
       [126  74]
       [137  18]
       [137  83]]
```

Choosing the number of clusters

WCSS -> Within Clusters Sum of Squares

```
# finding wcss value 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_)
```

```
    /usr/local/lib/python3.9/dist-packages/sklearn/cluster/_kmeans.py:870: FutureWarning: The default value of `n_init` will chang
      warnings.warn(
```

```
/usr/local/lib/python3.9/dist-packages/sklearn/cluster/_kmeans.py:870: FutureWarning: The default value of `n_init` will chang
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  warnings.warn(
```
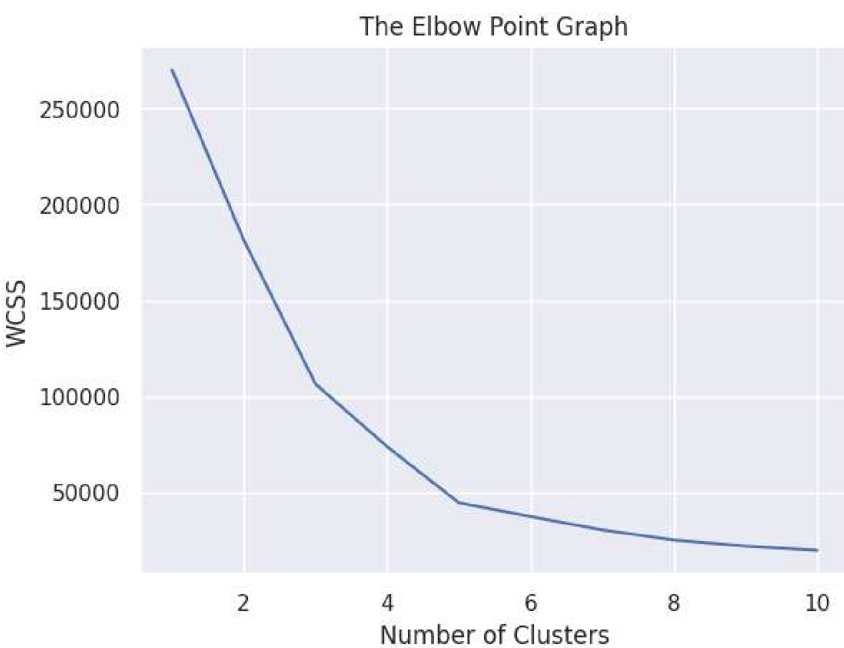

```
# plot an elbow graph

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



Optimum Number of Clusters = 5

Training the k-Means Clustering Model

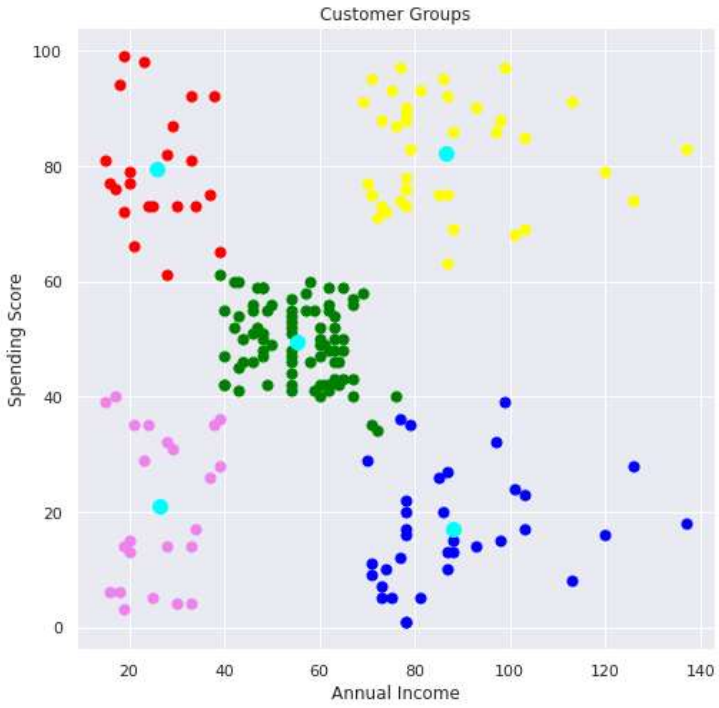
```
kmeans = KMeans(n_clusters=5, init='k-means++', random_state=0)

# return a label for each data point based on their cluster
Y = kmeans.fit_predict(X)

print(Y)
```

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

5 Clusters - 0, 1, 2, 3, 4

Visualizing all the Clusters

```
# plotting all the clusters and their Centroids

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='violet', label='Cluster 4')
plt.scatter(X[Y==4,0], X[Y==4,1], s=50, c='blue', label='Cluster 5')

# plot the centroids
plt.scatter(kmeans.cluster_centers_[:,0], kmeans.cluster_centers_[:,1], s=100, c='cyan', label='Centroids')

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



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