ML Assignment No.5 Amit Nitin Jain 37031 TE IT B

In [1]:
```
import pandas as pd
import sklearn
from sklearn.model_selection import train_test_split
import matplotlib.pyplot as plt
from google.colab import files
uploaded = files.upload()
import io
df = pd.read_csv(io.BytesIO(uploaded['Mall_Customers.csv']))    #df=dataframe
df
```

Choose Files No file chosen Upload widget is only available when the cell has been executed in the current browser session. Please rerun this cell to enable.

```
Saving Mall_Customers.csv to Mall_Customers (4).csv
```

Out[1]:

	CustomerID	Genre	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

200 rows × 5 columns

In [2]:
```
df.columns
```

Out[2]:
```
Index(['CustomerID', 'Genre', 'Age', 'Annual Income (k$)',
       'Spending Score (1-100)'],
      dtype='object')
```

In [3]:
```
x=df.iloc[:,[3,4]].values #created array of column no 3 and 4 slice the important featu
x
```

Out[3]:
```
array([[ 15,  39],
       [ 15,  81],
       [ 16,   6],
       [ 16,  77],
       [ 17,  40],
       [ 17,  76],
       [ 18,   6],
       [ 18,  94],
```

```
       [ 19,   3],
       [ 19,  72],
       [ 19,  14],
       [ 19,  99],
       [ 20,  15],
       [ 20,  77],
       [ 20,  13],
       [ 20,  79],
       [ 21,  35],
       [ 21,  66],
       [ 23,  29],
       [ 23,  98],
       [ 24,  35],
       [ 24,  73],
       [ 25,   5],
       [ 25,  73],
       [ 28,  14],
       [ 28,  82],
       [ 28,  32],
       [ 28,  61],
       [ 29,  31],
       [ 29,  87],
       [ 30,   4],
       [ 30,  73],
       [ 33,   4],
       [ 33,  92],
       [ 33,  14],
       [ 33,  81],
       [ 34,  17],
       [ 34,  73],
       [ 37,  26],
       [ 37,  75],
       [ 38,  35],
       [ 38,  92],
       [ 39,  36],
       [ 39,  61],
       [ 39,  28],
       [ 39,  65],
       [ 40,  55],
       [ 40,  47],
       [ 40,  42],
       [ 40,  42],
       [ 42,  52],
       [ 42,  60],
       [ 43,  54],
       [ 43,  60],
       [ 43,  45],
       [ 43,  41],
       [ 44,  50],
       [ 44,  46],
       [ 46,  51],
       [ 46,  46],
       [ 46,  56],
       [ 46,  55],
       [ 47,  52],
       [ 47,  59],
       [ 48,  51],
       [ 48,  59],
       [ 48,  50],
       [ 48,  48],
       [ 48,  59],
       [ 48,  47],
       [ 49,  55],
       [ 49,  42],
       [ 50,  49],
```

```
[ 50,  56],
[ 54,  47],
[ 54,  54],
[ 54,  53],
[ 54,  48],
[ 54,  52],
[ 54,  42],
[ 54,  51],
[ 54,  55],
[ 54,  41],
[ 54,  44],
[ 54,  57],
[ 54,  46],
[ 57,  58],
[ 57,  55],
[ 58,  60],
[ 58,  46],
[ 59,  55],
[ 59,  41],
[ 60,  49],
[ 60,  40],
[ 60,  42],
[ 60,  52],
[ 60,  47],
[ 60,  50],
[ 61,  42],
[ 61,  49],
[ 62,  41],
[ 62,  48],
[ 62,  59],
[ 62,  55],
[ 62,  56],
[ 62,  42],
[ 63,  50],
[ 63,  46],
[ 63,  43],
[ 63,  48],
[ 63,  52],
[ 63,  54],
[ 64,  42],
[ 64,  46],
[ 65,  48],
[ 65,  50],
[ 65,  43],
[ 65,  59],
[ 67,  43],
[ 67,  57],
[ 67,  56],
[ 67,  40],
[ 69,  58],
[ 69,  91],
[ 70,  29],
[ 70,  77],
[ 71,  35],
[ 71,  95],
[ 71,  11],
[ 71,  75],
[ 71,   9],
[ 71,  75],
[ 72,  34],
[ 72,  71],
[ 73,   5],
[ 73,  88],
[ 73,   7],
[ 73,  73],
```

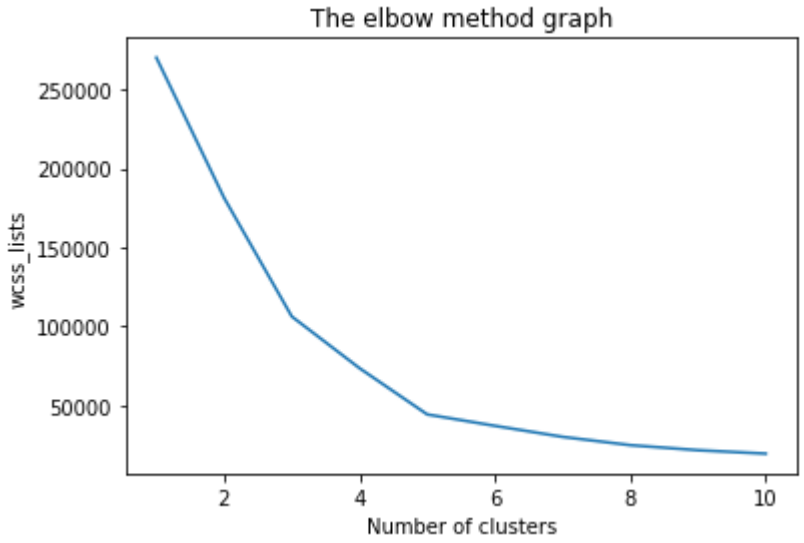
```
[ 74,  10],
[ 74,  72],
[ 75,   5],
[ 75,  93],
[ 76,  40],
[ 76,  87],
[ 77,  12],
[ 77,  97],
[ 77,  36],
[ 77,  74],
[ 78,  22],
[ 78,  90],
[ 78,  17],
[ 78,  88],
[ 78,  20],
[ 78,  76],
[ 78,  16],
[ 78,  89],
[ 78,   1],
[ 78,  78],
[ 78,   1],
[ 78,  73],
[ 79,  35],
[ 79,  83],
[ 81,   5],
[ 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]])
```

K-Means Clustering algorithm Finding the optimal number of clusters using the elbow method

The elbow method uses the Wcss concept to draw the plot by plotting WCSS values on the Y-axis and the number of clusters on the X-axis. So we are going to calculate the value for WCSS for different k values ranging from 1 to 10

In [4]:
```
#finding optimal no of clusters using  Elbow method
from sklearn.cluster import KMeans #kmeans class: cluster library to form the clusterd.
wcss_list=[]    #initializing the list for the values of WCSS
# using for loop for the iterations from 1 to 10
for i in range(1,11):
  kmeans=KMeans(n_clusters=i,init='k-means++')  # a"init" argument is the method for in
  #kmeans algorithm fits to the X dataset
  kmeans.fit(x)
  #kmeans inertia_attribute is : Sum of squared distances of samples to their closet cl
  wcss_list.append(kmeans.inertia_)
```

In [5]:
```
plt.plot(range(1,11),wcss_list)
plt.title('The elbow method graph')
plt.xlabel('Number of clusters')
plt.ylabel('wcss_lists')
plt.show()
```



The point at which the elbow shape is created is 5, that is, our K value or an optimal number of clusters is 5. Now let's train the model on the dataset with a number of clusters 5.

In [6]:
```
wcss_list
```

Out[6]:
```
[269981.28,
 181363.59595959593,
 106348.37306211122,
 73679.78903948836,
 44448.4554479337,
 37233.814510710006,
 30259.65720728547,
 25022.48500453035,
 21826.93630323166,
 19657.78360870395]
```

In [7]:

```
#Step- 3: Training the K-means algorithm on the training dataset
#training the k means model on the dataset
kmeans=KMeans(n_clusters=5,init='k-means++')
y_predict=kmeans.fit_predict(x)        #, we have created the dependent variable y_pred
kmeans
```

Out[7]:
```
KMeans(n_clusters=5)
```

In [8]:
```
#predict cluster for x(diagram) #k-1
y_predict
```

Out[8]:
```
array([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, 2,
       0, 3, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2,
       2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2,
       2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2,
       2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 1, 4, 1, 2, 1, 4, 1, 4, 1,
       2, 1, 4, 1, 4, 1, 4, 1, 4, 1, 2, 1, 4, 1, 4, 1, 4, 1, 4, 1, 4, 1,
       4, 1, 4, 1, 4, 1, 4, 1, 4, 1, 4, 1, 4, 1, 4, 1, 4, 1, 4, 1, 4, 1,
       4, 1, 4, 1, 4, 1, 4, 1, 4, 1, 4, 1, 4, 1, 4, 1, 4, 1, 4, 1, 4, 1,
       4, 1], dtype=int32)
```

In [9]:
```
#visulazing the cluster

plt.scatter(x[y_predict== 0,0],x[y_predict== 0,1],c='blue',label='Cluster 1')  #for clu
plt.scatter(x[y_predict== 1,0],x[y_predict== 1,1],c='green',label='Cluster 2')  #for cl
plt.scatter(x[y_predict== 2,0],x[y_predict== 2,1],c='red',label='Cluster 3')  #for clus
plt.scatter(x[y_predict== 3,0],x[y_predict== 3,1],c='cyan',label='Cluster 4')  #for clu
plt.scatter(x[y_predict== 4,0],x[y_predict== 4,1],c='magenta',label='Cluster 5')  #for
plt.scatter(kmeans.cluster_centers_[:, 0],kmeans.cluster_centers_[:, 1],c='yellow',labe
plt.title('Clusters of cluster')
plt.xlabel('Annual Income')
plt.ylabel('Spending score')
plt.legend()
plt.show()
```