costumer-clustering

December 1, 2023

1 Customer classification on the basis of spending and earning

1.1 1) Importing libraries

```
[1]: from sklearn.cluster import KMeans
     import pandas as pd
     from sklearn.preprocessing import MinMaxScaler
     from matplotlib import pyplot as plt
```

1.2 2) Loading data

```
[17]: df= pd.read_csv('Mall.csv')
      df
```

```
[17]:      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

      [200 rows x 5 columns]
```

```
[18]: df.info
```

```
[18]: <bound method DataFrame.info of      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

[200 rows x 5 columns]>
```

1.3 3) Elbow methode

[20]:

```python
sse = []
k_rng = range(1,10)
for k in k_rng:
    km = KMeans(n_clusters=k)
    km.fit(df[['Annual Income (k$)','Spending Score (1-100)']])
    sse.append(km.inertia_)
sse
```

```
C:\Users\luhar\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:1416:
FutureWarning: The default value of `n_init` will change from 10 to 'auto' in
1.4. Set the value of `n_init` explicitly to suppress the warning
  super()._check_params_vs_input(X, default_n_init=10)
C:\Users\luhar\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:1416:
FutureWarning: The default value of `n_init` will change from 10 to 'auto' in
1.4. Set the value of `n_init` explicitly to suppress the warning
  super()._check_params_vs_input(X, default_n_init=10)
C:\Users\luhar\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:1416:
FutureWarning: The default value of `n_init` will change from 10 to 'auto' in
1.4. Set the value of `n_init` explicitly to suppress the warning
  super()._check_params_vs_input(X, default_n_init=10)
C:\Users\luhar\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:1416:
FutureWarning: The default value of `n_init` will change from 10 to 'auto' in
1.4. Set the value of `n_init` explicitly to suppress the warning
  super()._check_params_vs_input(X, default_n_init=10)
C:\Users\luhar\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:1416:
FutureWarning: The default value of `n_init` will change from 10 to 'auto' in
1.4. Set the value of `n_init` explicitly to suppress the warning
  super()._check_params_vs_input(X, default_n_init=10)
C:\Users\luhar\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:1416:
FutureWarning: The default value of `n_init` will change from 10 to 'auto' in
1.4. Set the value of `n_init` explicitly to suppress the warning
  super()._check_params_vs_input(X, default_n_init=10)
C:\Users\luhar\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:1416:
FutureWarning: The default value of `n_init` will change from 10 to 'auto' in
1.4. Set the value of `n_init` explicitly to suppress the warning
```

```
  super()._check_params_vs_input(X, default_n_init=10)
C:\Users\luhar\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:1416:
FutureWarning: The default value of `n_init` will change from 10 to 'auto' in
1.4. Set the value of `n_init` explicitly to suppress the warning
  super()._check_params_vs_input(X, default_n_init=10)
C:\Users\luhar\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:1416:
FutureWarning: The default value of `n_init` will change from 10 to 'auto' in
1.4. Set the value of `n_init` explicitly to suppress the warning
  super()._check_params_vs_input(X, default_n_init=10)
```

[20]:

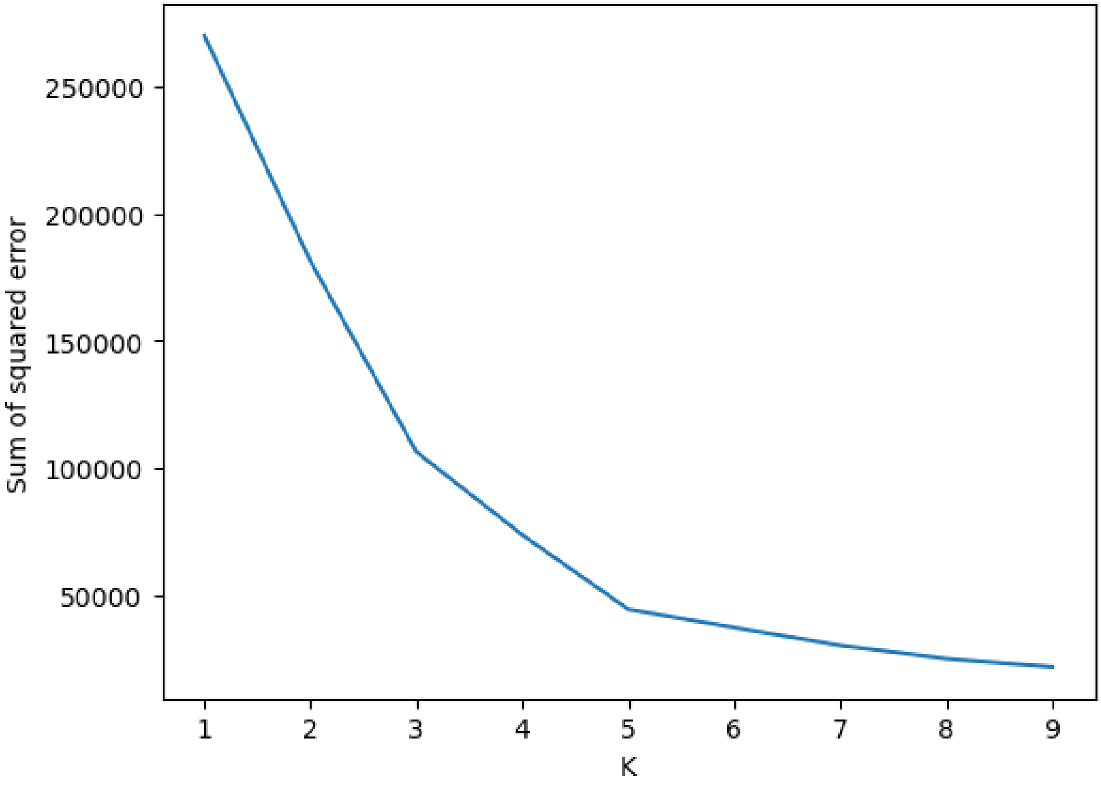
```
[269981.28,
 181363.59595959596,
 106348.37306211119,
 73679.78903948834,
 44448.45544793371,
 37265.86520484346,
 30241.343617936585,
 25011.839349156595,
 21818.114588452183]
```

[21]:

```
plt.xlabel('K')
plt.ylabel('Sum of squared error')
plt.plot(k_rng,sse)
```

[21]:

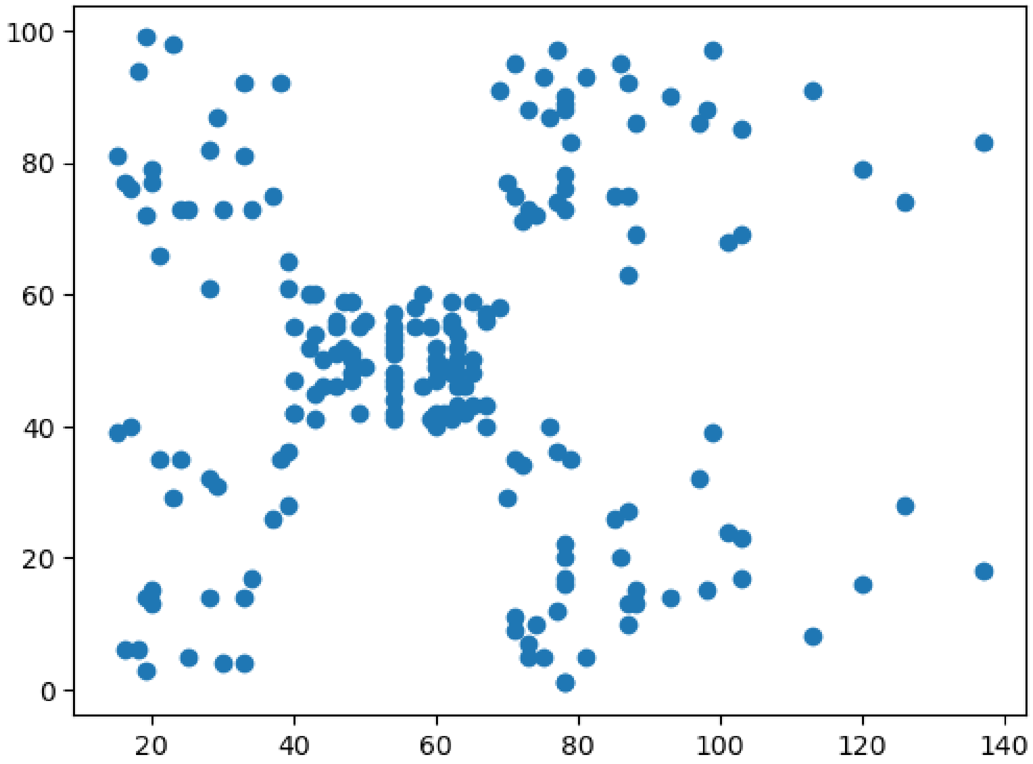
```
[<matplotlib.lines.Line2D at 0x15b42fa78e0>]
```



1.4 Clustering

[22]:
```
plt.scatter(df['Annual Income (k$)'],df['Spending Score (1-100)'])
```

[22]:
```
<matplotlib.collections.PathCollection at 0x15b41d236a0>
```



[23]:
```
km = KMeans(n_clusters=5)
y_predicted = km.fit_predict(df[['Annual Income (k$)','Spending Score␣
 ↪(1-100)']])
y_predicted
```

```
C:\Users\luhar\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:1416:
FutureWarning: The default value of `n_init` will change from 10 to 'auto' in
1.4. Set the value of `n_init` explicitly to suppress the warning
  super()._check_params_vs_input(X, default_n_init=10)
```

[23]:
```
array([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, 0,
       4, 2, 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, 3, 1, 0, 1, 3, 1, 3, 1,
       0, 1, 3, 1, 3, 1, 3, 1, 3, 1, 0, 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, 1, 3, 1, 3, 1, 3, 1, 3, 1, 3, 1, 3, 1,
       3, 1])
```

```
[24]: df['cluster']=y_predicted
      df.head()
```

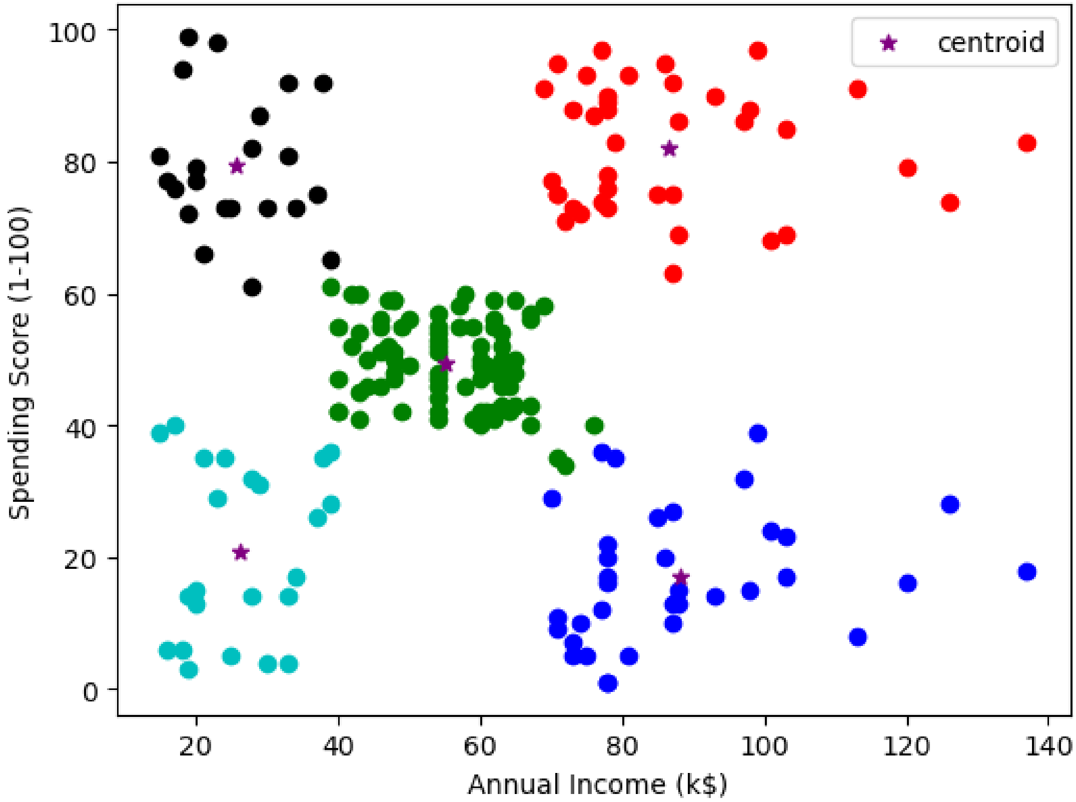
```
[24]:    CustomerID  Gender  Age  Annual Income (k$)  Spending Score (1-100)  \
      0           1    Male   19                  15                      39
      1           2    Male   21                  15                      81
      2           3  Female   20                  16          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

         cluster
      0        4
      1        2
      2        4
      3        2
      4        4
```

```
[25]: km.cluster_centers_
```

```
[25]: array([[55.2962963 , 49.51851852],
             [86.53846154, 82.12820513],
             [25.72727273, 79.36363636],
             [88.2       , 17.11428571],
             [26.30434783, 20.91304348]])
```

```
[26]: df1 = df[df.cluster==0]
      df2 = df[df.cluster==1]
      df3 = df[df.cluster==2]
      df4 = df[df.cluster==3]
      df5 = df[df.cluster==4]
      plt.scatter(df1['Annual Income (k$)'],df1['Spending Score␣
       ↪(1-100)'],color='green')
      plt.scatter(df2['Annual Income (k$)'],df2['Spending Score (1-100)'],color='red')
      plt.scatter(df3['Annual Income (k$)'],df3['Spending Score␣
       ↪(1-100)'],color='black')
      plt.scatter(df4['Annual Income (k$)'],df4['Spending Score␣
       ↪(1-100)'],color='blue')
      plt.scatter(df5['Annual Income (k$)'],df5['Spending Score (1-100)'],color='c')
      plt.scatter(km.cluster_centers_[:,0],km.cluster_centers_[:
       ↪,1],color='purple',marker='*',label='centroid')
      plt.xlabel(' Annual Income (k$)')
      plt.ylabel('Spending Score (1-100)')
      plt.legend()
```

```
[26]: <matplotlib.legend.Legend at 0x15b42f0e1c0>
```



1.5 Model Interpretation

1.5.1 Cluster 1 which is in blue color is a group of customers earning high but spending less

1.5.2 cluster 2 which is green Color is a group with average in terms of earning and spending

1.5.3 cluster 3 red color is earning high and also spending high [TARGET SET]

1.5.4 cluster 4 black color earning less but spending more

1.5.5 Cluster 5 cyan color Earning less , spending less

```
[ ]:
```