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

```python
df=pd.read_csv("/content/Mall_Customers.csv")
```

```python
df
```

	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

```python
x=df.iloc[:,3:]#all rows and 3 onwards columns
print("The X value is:",x)
```

```
The X value is:      Annual Income (k$)  Spending Score (1-100)
0                    15                  39
1                    15                  81
2                    16                   6
3                    16                  77
4                    17                  40
..                  ...                 ...
195                 120                  79
196                 126                  28
197                 126                  74
198                 137                  18
199                 137                  83

[200 rows x 2 columns]
```

```python
from sklearn.cluster import KMeans,AgglomerativeClustering
```

```python
km=KMeans(n_clusters=3)
km.fit_predict(x)
```

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

```python
SSE=[]
for i in range(1,16):
  km=KMeans(n_clusters=i)
  km.fit_predict(x)
  SSE.append(km.inertia_)
```

```
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  warnings.warn(
```

```
SSE
```

```
[269981.28,
 181363.59595959593,
 106348.37306211122,
 73679.78903948836,
 44448.4554479337,
 37233.814510710006,
 30273.394312070042,
 25018.781613414067,
 21818.114588452176,
 19681.25582847105,
 17508.97057740007,
 15993.9422660915,
 14367.900783072084,
 13204.839599686027,
 11630.993181818183]
```
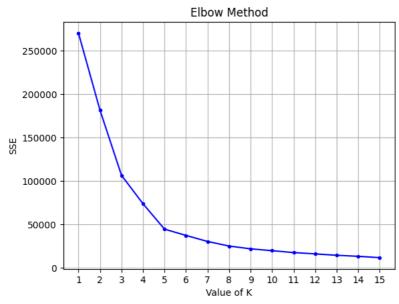
```python
import matplotlib.pyplot as plt
```

```python
plt.title("Elbow Method")
plt.xlabel("Value of K")
plt.ylabel("SSE")
plt.grid()
plt.xticks(range(1,16))
plt.plot(range(1,16),SSE,marker=".",color="blue")
```

```
[<matplotlib.lines.Line2D at 0x7d95d502d0f0>]
```



```python
from sklearn.metrics import silhouette_score
```

```python
SILOUT=[]
for i in range(2,16):#for finding nearest value we need to start from 2
```
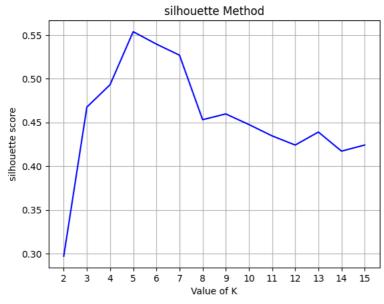
```
km=KMeans(n_clusters=i)
labels=km.fit_predict(x)
score=silhouette_score(x,labels)
SILOUT.append(score)
```

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

```
plt.title("silhouette Method")
plt.xlabel("Value of K")
plt.ylabel("silhouette score")
plt.grid()
plt.xticks(range(2,16))
plt.plot(range(2,16),SILOUT,color="blue")
```

```
[<matplotlib.lines.Line2D at 0x7d95d50ce5c0>]
```



```
km=KMeans(n_clusters=5,random_state=0)
km.fit_predict(x)
```

```
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:870: FutureWarning: The default value of `n_init` will change fro
  warnings.warn(
array([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, 4, 1,
       4, 3, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 2, 0, 2, 1, 2, 0, 2, 0, 2, 0, 2,
       1, 2, 0, 2, 0, 2, 0, 2, 0, 2, 1, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2,
       0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2,
       0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2,
       0, 2], dtype=int32)
```

```
plt.figure(figsize=(16,9))
plt.subplot(1,2,1)
plt.title("Unclustered Data")
plt.xlabel("Annual Income")
plt.ylabel("Spending Score")
plt.scatter(x['Annual Income (k$)'],x['Spending Score (1-100)'])

plt.subplot(1,2,2)
plt.title("clustered Data")
plt.xlabel("Annual Income")
plt.ylabel("Spending Score")
plt.scatter(x['Annual Income (k$)'],x['Spending Score (1-100)'],c=labels)
```

<matplotlib.collections.PathCollection at 0x7d95d4e2c580>