ASSIGNMENT – 4

PROBLEM STATEMENT: CUSTOMER SEGMENTATION ANALYSIS

ASSIGNMENT DATE	17 OCTOBER 2022
STUDENT NAME	A.GANESHKUMAR
STUDENT ROLL NUMBER	CS19011
MAXIMUM MARKS	2 MARKS

```
import pandas as pd import numpy as np
import matplotlib.pyplot as plt import
seaborn as sns
```

```
from google.colab import files data_to_load = files.upload()
```

```
< IPython.core.display.HTML object >
```

```
Saving Mall_Customers.csv to Mall_Customers.csv
```

```
import io
```

```
df = pd.read_csv(io.BytesIO(data_to_load['Mall_Customers.csv'])) df.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 df.tail()

    CustomerID  Gender  Age  Annual Income (k$)  Spending Score (1100)

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
```

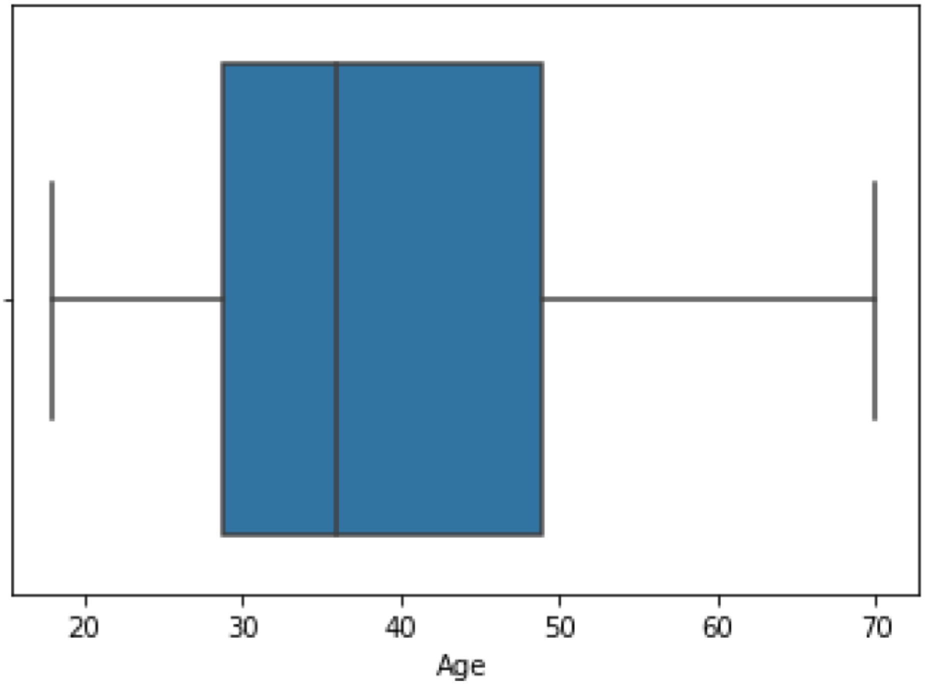
```
83 df.shape
```

```
(200 ,  5)
```

```
df.info()
```

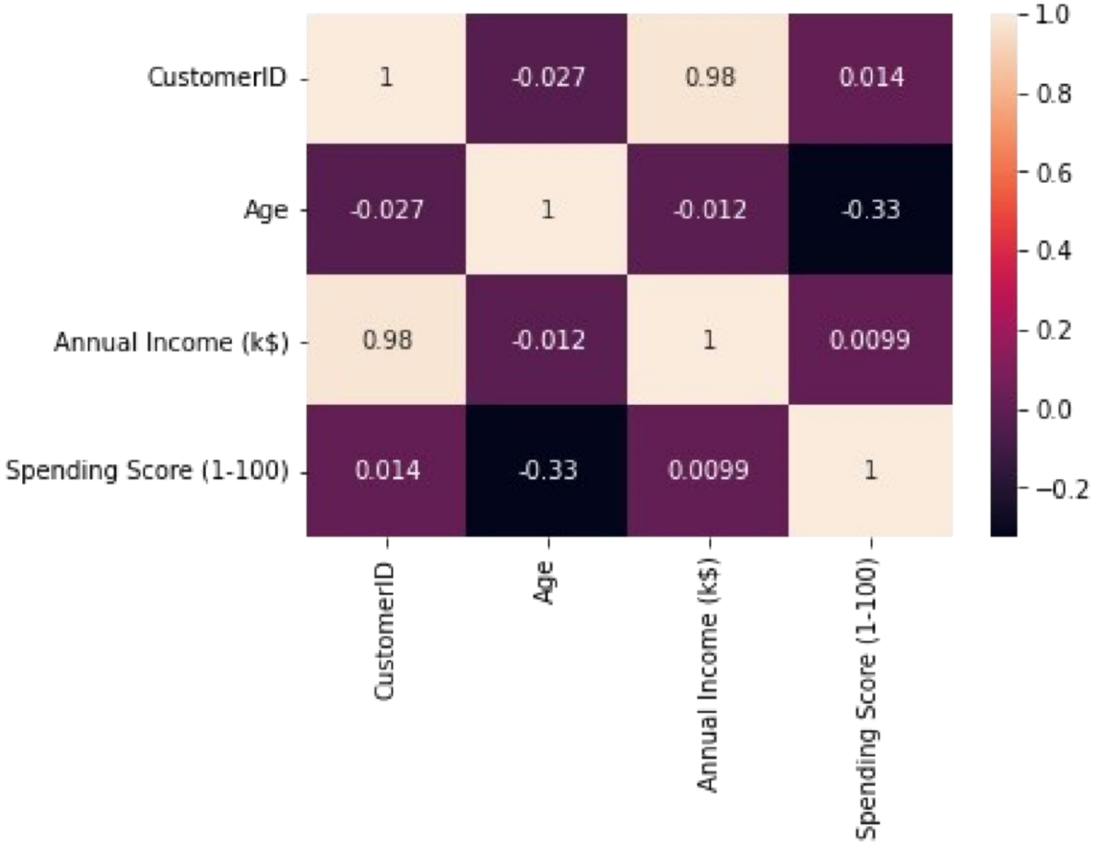
```
< class 'pandas.core.frame.DataFrame' > RangeIndex: 200 entries, 0 to
199

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 sns.boxplot(x=df['Age'])
```

```
< matplotlib.axes._subplots.AxesSubplot at 0x7ff8695244d 0>
```



```
sns.heatmap(df.corr(),annot=True)
```

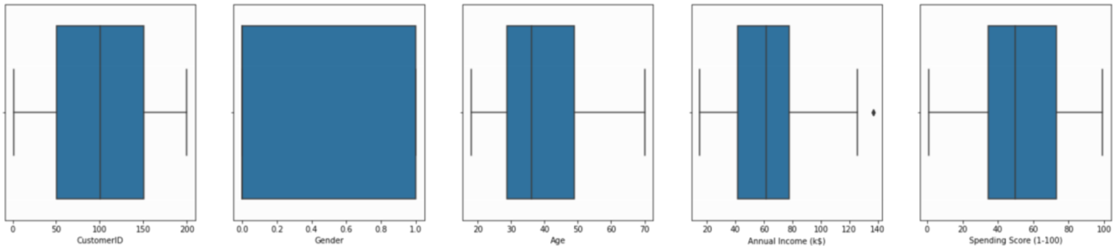
```
< matplotlib.axes._subplots.AxesSubplot at  0x7ff869516990>
```



```
df.describe()

    CustomerID        Age  Annual Income (k$)  Spending Score (1-
100)

count  200.000000  200.000000         200.000000
200.000000

mean   100.500000   38.850000          60.560000
50.200000

std     57.879185   13.969007          26.264721
25.823522

min      1.000000   18.000000          15.000000
1.000000

25%     50.750000   28.750000          41.500000
34.750000

50%    100.500000   36.000000          61.500000
```

```
50.000000

75%    150.250000   49.000000          78.000000

73.000000

max    200.000000   70.000000         137.000000

99.000000 df.describe().T


                    count    mean       std   min    25%    50%  75 %  \

CustomerID            200.0  100.50  57.879185   1.0  50.75  100.5

150.25

Age                   200.0   38.85  13.969007  18.0  28.75   36.0

49.00

Annual Income (k$)     200.0   60.56  26.264721  15.0  41.50   61.5

78.00

Spending Score (1-100)  200.0   50.20  25.823522   1.0  34.75   50.0

73.00


                      max  CustomerID             200.0  Age
70.0  Annual Income (k$)      137.0  Spending Score
(1-100)   99.0  df.isna().sum()

CustomerID              0

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

df['Gender'].replace({'Male':1, 'Female':0},inplace=True) df.head()


  CustomerID  Gender  Age  Annual Income (k$)  Spending Score (1-100) 0           1       1   19                  15
39

1           2       1   21               15                    81 2           3       0   20                16                      6 3           4
0   23                 16                      77 4           5       0   31                17                      40 df.Gender.unique()
array([1, 0])

fig,ax = plt.subplots(figsize=(25,5))

plt.subplot(1,5,1) sns.boxplot(x=df["CustomerID"])
plt.subplot(1,5,2) sns.boxplot(x=df["Gender"])

plt.subplot(1,5,3) sns.boxplot(x=df["Age"]) plt.subplot(1,5,4)
sns.boxplot(x=df["Annual Income (k$)"])

plt.subplot(1,5,5)

sns.boxplot(x=df["Spending Score (1-100)"])
```

```
< matplotlib.axes._subplots.AxesSubplot at 0x 7ff866592c10>
```



```
qnt=df.quantile(q=[0.25,0.75]) qnt
```

```
      CustomerID  Gender    Age  Annual Income (k$)  Spending Score

(1-100)

0.25       50.75     0.0  28.75              41.5

34.75

0.75      150.25     1.0  49.00              78.0              73.00
```

```
iqr=qnt.loc[0.75]-qnt.loc[0.25] iqr
```

```
CustomerID             99.50

Gender                 1.00 Age                 20.25
Annual Income (k$)       36.50 Spending Score (1-
100)    38.25 dtype: float64
```

```
lower=qnt.loc[0.25]-(1.5*iqr) lower
```

```
CustomerID            -98.500

Gender                -1.500 Age                -1.625
Annual Income (k$)       -13.250 Spending Score (1-
100)   -22.625 dtype: float64
```

```
upper=qnt.loc[0.75]+(1.5*iqr) upper
```

```
CustomerID             299.500
```

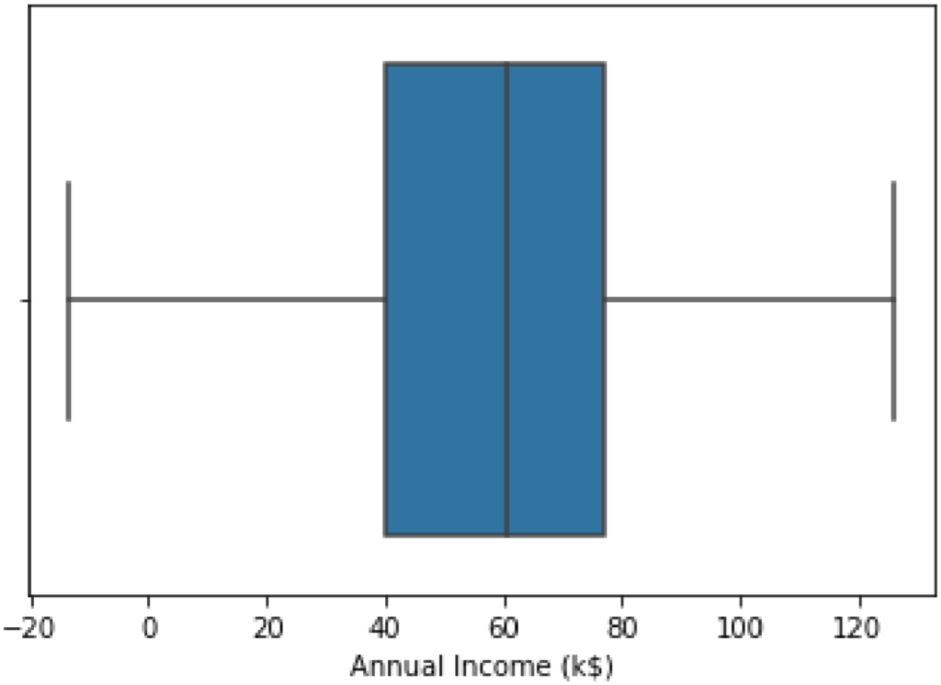
```
Gender                 2.500 Age                  79.375
Annual Income (k$)       132.750 Spending Score (1-
100)    130.375 dtype: float64 df.mean()
```

```
CustomerID            100.50
```

```
Gender                 0.44 Age                  38.85
Annual Income (k$)        60.56 Spending Score (1-
100)     50.20 dtype: float64
```

```
df['Annual Income (k$)']=np.where(df['Annual Income (k$)']>132.750,-

13.250,df['Annual Income (k$)']) sns.boxplot(x=df['Annual Income (k$)'])
```

```
< matplotlib.axes._subplots.AxesSubplot at 0x7ff8664e7ed 0>
```



```
df.head()
```

```
  CustomerID  Gender  Age  Annual Income (k$)  Spending Score (1-100) 0          1       1   19
15.0                    39

1          2       1   21            15.0                     81 2          3       0   20             16.0                     6 3          4
0   23              16.0                     77 4          5       0   31              17.0                   40 df['Gender'] .unique
() array([1, 0])
```

```
from sklearn.preprocessing import MinMaxScaler sc=MinMaxScaler()

data=sc.fit_transform(df.iloc[:,1:]) data
```

```
        array([[1.      , 0.01923077, 0.20287253, 0.3877551 ],       [1.      , 0.05769231,
                                                              0.20287253, 0.81632653],

         [0.     , 0.03846154, 0.21005386, 0.05102041],       [0.      , 0.09615385,
         0.21005386, 0.7755102 ],       [0.      , 0.25     , 0.21723519, 0.39795918],

       [0.      , 0.07692308, 0.21723519, 0.76530612],

       [0.      , 0.32692308, 0.22441652, 0.05102041],

     [0.              , 0.09615385, 0.22441652, 0.94897959],

     [1.              , 0.88461538, 0.23159785, 0.02040816],       [0.      , 0.23076923,
                        0.23159785, 0.7244898 ],       [1.      , 0.94230769, 0.23159785,
                        0.13265306],       [0.      , 0.32692308, 0.23159785, 1.      ],       [0.
                        , 0.76923077, 0.23877917, 0.14285714],       [0.      , 0.11538462,
                        0.23877917, 0.7755102 ],       [1.      , 0.36538462, 0.23877917,
                        0.12244898],

     [1.     , 0.07692308, 0.23877917, 0.79591837],       [0.      , 0.32692308, 0.2459605
                                              , 0.34693878],

            [1.      , 0.03846154, 0.2459605 , 0.66326531],       [1.      , 0.65384615,
                                   0.26032316, 0.28571429],

     [0.              , 0.32692308, 0.26032316, 0.98979592],

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       [1.      , 0.13461538, 0.26750449, 0.73469388],

     [0.              , 0.53846154, 0.27468582, 0.04081633],

     [1.              , 0.25     , 0.27468582, 0.73469388],       [0.      , 0.69230769,
                        0.2962298 , 0.13265306],

       [1.      , 0.21153846, 0.2962298 , 0.82653061],

       [0.        , 0.51923077, 0.2962298 , 0.31632653],         [1.         , 0.32692308,
     0.2962298 , 0.6122449 ],       [0.      , 0.42307692, 0.30341113, 0.30612245],

     [0.              , 0.09615385, 0.30341113, 0.87755102],

     [1.              , 0.80769231, 0.31059246, 0.03061224],

     [0.              , 0.05769231, 0.31059246, 0.73469388],

     [1.              , 0.67307692, 0.33213645, 0.03061224],

       [1.      , 0.      , 0.33213645, 0.92857143],

       [0.      , 0.59615385, 0.33213645, 0.13265306],

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       [0.      , 0.23076923, 0.33931777, 0.73469388],

       [0.      , 0.34615385, 0.36086176, 0.25510204],

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     [1.             , 0.11538462, 0.36804309, 0.92857143],

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     0.6122449 ],

       [0.      , 0.59615385, 0.37522442, 0.2755102 ],      [0.      , 0.11538462, 0.37522442, 0.65306122],

       [0.      , 0.61538462, 0.38240575, 0.55102041],

       [0.      , 0.17307692, 0.38240575, 0.46938776],

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       [1.      , 0.01923077, 0.42549372, 0.55102041],

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     [0.             , 0.69230769, 0.43267504, 0.59183673],

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       [1.      , 0.01923077, 0.43985637, 0.59183673],

        [0.      , 0.26923077, 0.43985637, 0.46938776],      [1.      , 1.      , 0.4470377
                                                                       , 0.55102041],
          [0.       , 0.55769231, 0.4470377 , 0.41836735],       [0.       , 0.80769231,
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       [0.        , 0.44230769, 0.80610413, 0.3877551 ],        [1.        , 0.23076923,
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0.83482944, 0.2244898 ],        [0.        , 0.26923077, 0.83482944,
0.69387755],

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[0.        , 0.55769231, 0.95691203, 0.15306122],        [0.        , 0.32692308, 0.95691203,
0.79591837],        [0.        , 0.51923077, 1.        , 0.2755102 ],        [1.        , 0.26923077, 1.
, 0.74489796],

[1.        , 0.26923077, 0.        , 0.17346939],        [1.        , 0.23076923, 0.        ,
0.83673469]]) from sklearn.cluster import KMeans

TWSS=[] k=list(range(2,9))

for i in k:     kmeans=KMeans(n_clusters=i,init='k-means++')

    kmeans.fit(data)
    TWSS.append(kmeans.inertia_)
```
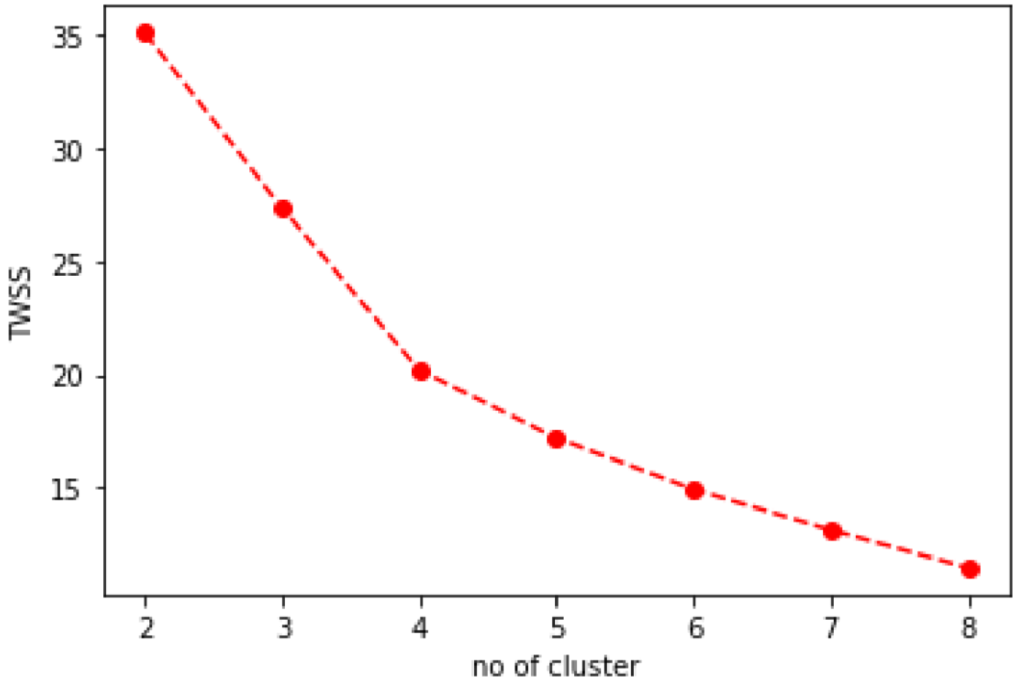

```
TWSS
```

```
[35.09354046290808 ,

 27.37315679730296,

 20.211573858371988,

 17.210964888908972,

 14.941607138943485,

 13.153866803186235,

 11.485368243450253]
```

```
plt.plot(k,TWSS,'ro--') plt.xlabel('no of cluster')
plt.ylabel('TWSS')
```

```
Text(0, 0.5, 'TWSS')
```



```
model=KMeans(n_clusters=4) model.fit(data)
```

```
KMeans(n_clusters=4)
```

```
mb=pd.Series(model.labels_) df.head(3)
```

```
   CustomerID  Gender  Age  Annual Income (k$)  Spending Score (1-100) 0          1       1   19
15.0                   39
```

```
1          2      1   21            15.0                   81 2          3       0   20             16.0                     6 df.tail()

    CustomerID  Gender  Age  Annual Income (k$)  Spending Score (1100)

195                    196      0   35           120.00

79

196                    197      0   45           126.00

28

197                    198      1   32           126.00

74

198                    199      1   32           -13.25

18

199                    200      1   30           -13.25                  83
```

```
x=df.drop(columns=['CustomerID', 'Gender'],axis=1) x.head()
```

```
   Age  Annual Income (k$)  Spending Score (1-100) 0    19              15.0
39

1    21             15.0                   81 2    20              16.0                     6 3    23
16.0                      77 4    31              17.0                      40
```

```
y=df['Gender'] y
```

```
0           1

1           1

2           0

3           0

4           0      ..

195         0

196         0

197         1

198         1

199         1
```

```
Name: Gender, Length: 200, dtype: int64 from sklearn.model_selection import train_test_split

x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.2) from sklearn.ensemble import

RandomForestClassifier


rf=RandomForestClassifier() rf.fit(x_train,y_train)
RandomForestClassifier()

pred=rf.predict(x_test)

from sklearn.metrics import accuracy_score accuracy_score(y_test,pred)

0.575

from sklearn import metrics metrics.confusion_matrix(y_test,pred)

array([[17,  8],       [ 9,
6]])
```