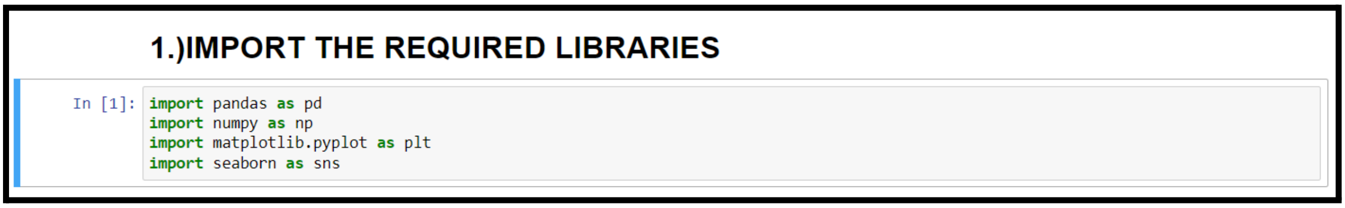
UNIVERSITY ADMIT ELIGIBILITY PREDICTOR

ASSIGNMENT - 4

Date	27th October 2022
Team ID	PNT2022TMID27839
Student Name	Prem B (311519104047)
Domain Name	Education
Project Name	University Admit Eligibility Predictor
Maximum Marks	2 Marks

1.)IMPORT THE REQUIRED LIBRARIES

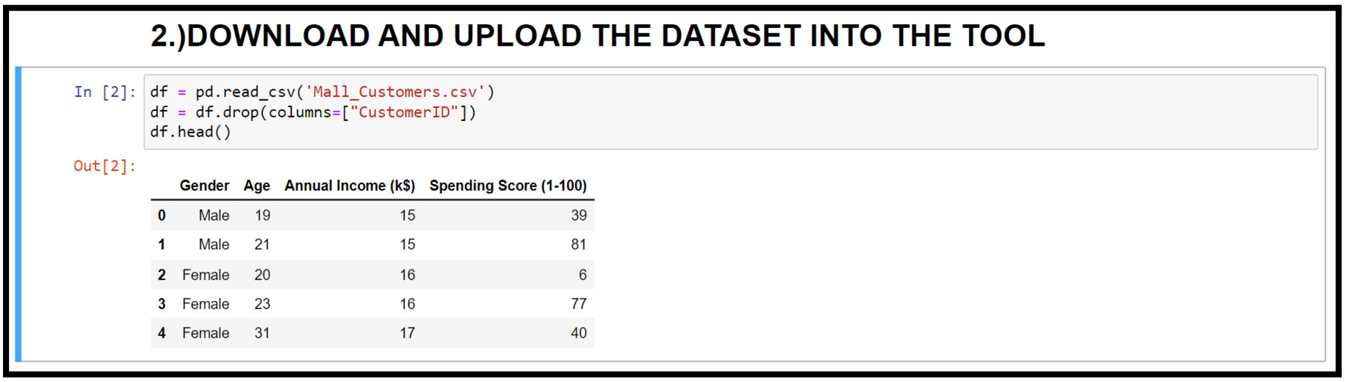


1.)IMPORT THE REQUIRED LIBRARIES

In [1]:

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

2.)DOWNLOAD AND UPLOAD THE DATASET



2.)DOWNLOAD AND UPLOAD THE DATASET INTO THE TOOL

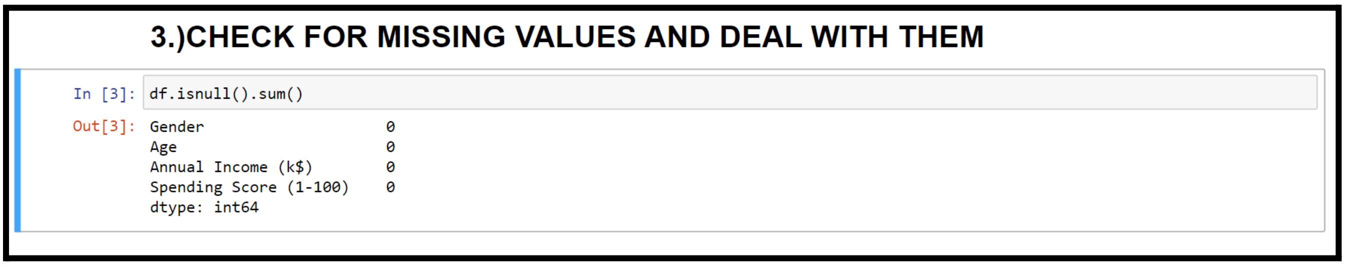
In [2]:

```
df = pd.read_csv('Mall_Customers.csv')
df = df.drop(columns=["CustomerID"])
df.head()
```

Out[2]:

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

3.)CHECK FOR MISSING VALUES AND DEAL WITH THEM

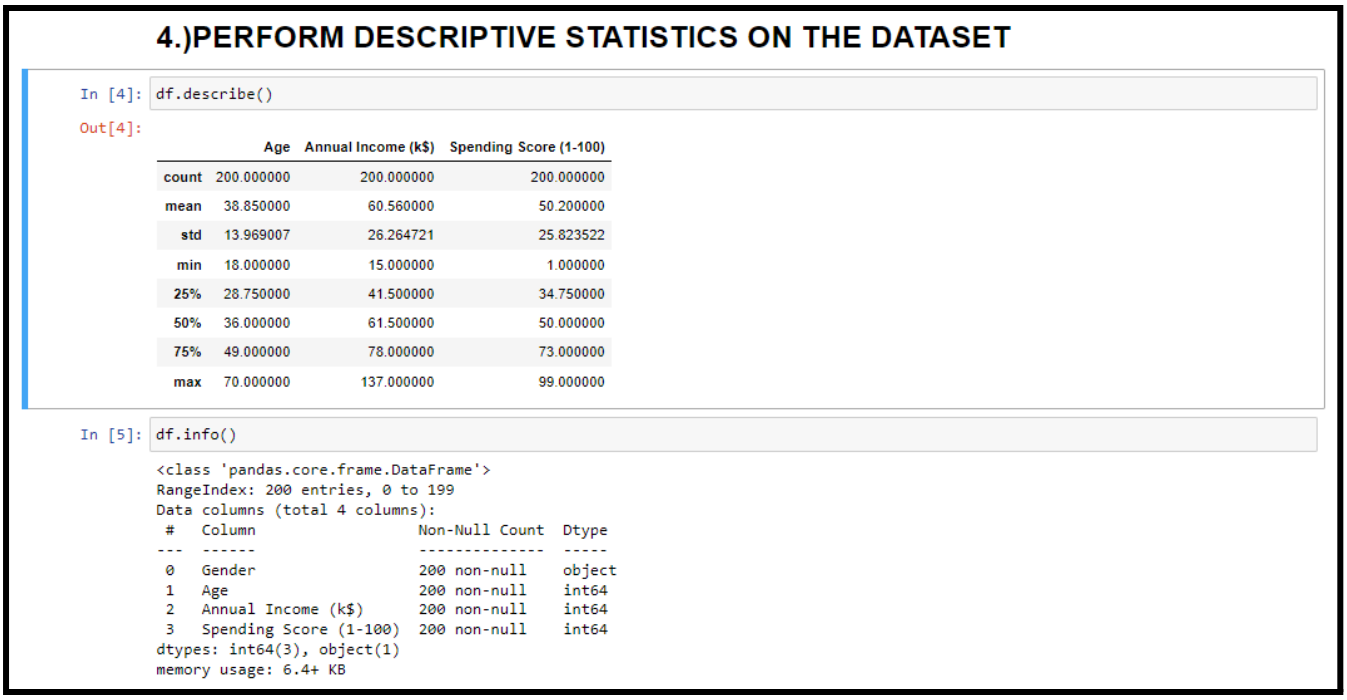


3.)CHECK FOR MISSING VALUES AND DEAL WITH THEM

In [3]:
```
df.isnull().sum()
```

Out[3]:
```
Gender                    0
Age                       0
Annual Income (k$)        0
Spending Score (1-100)    0
dtype: int64
```

4.) PERFORM THE DESCRIPTIVE STATISTICS ON THE DATASET



4.)PERFORM DESCRIPTIVE STATISTICS ON THE DATASET

In [4]:
```
df.describe()
```

Out[4]:

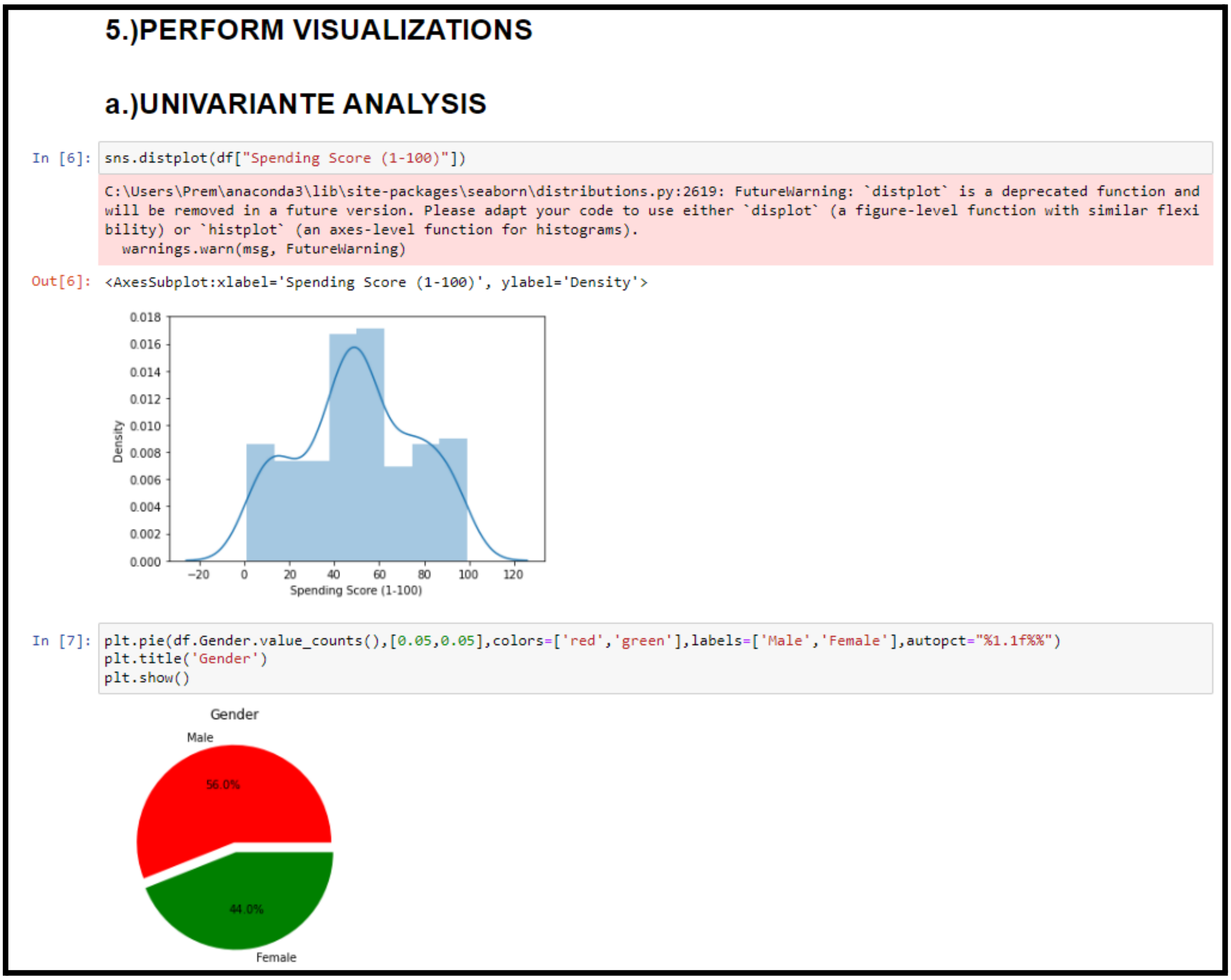
	Age	Annual Income (k$)	Spending Score (1-100)
count	200.000000	200.000000	200.000000
mean	38.850000	60.560000	50.200000
std	13.969007	26.264721	25.823522
min	18.000000	15.000000	1.000000
25%	28.750000	41.500000	34.750000
50%	36.000000	61.500000	50.000000
75%	49.000000	78.000000	73.000000
max	70.000000	137.000000	99.000000

In [5]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 200 entries, 0 to 199
Data columns (total 4 columns):
 #   Column                  Non-Null Count  Dtype 
---  ------                  --------------  ----- 
 0   Gender                  200 non-null    object
 1   Age                     200 non-null    int64 
 2   Annual Income (k$)      200 non-null    int64 
 3   Spending Score (1-100)  200 non-null    int64 
dtypes: int64(3), object(1)
memory usage: 6.4+ KB
```

5.) PERFORM VARIOUS VISUALISATIONS

a.) UNIVARIANTE ANALYSIS



5.)PERFORM VISUALIZATIONS

a.)UNIVARIANTE ANALYSIS

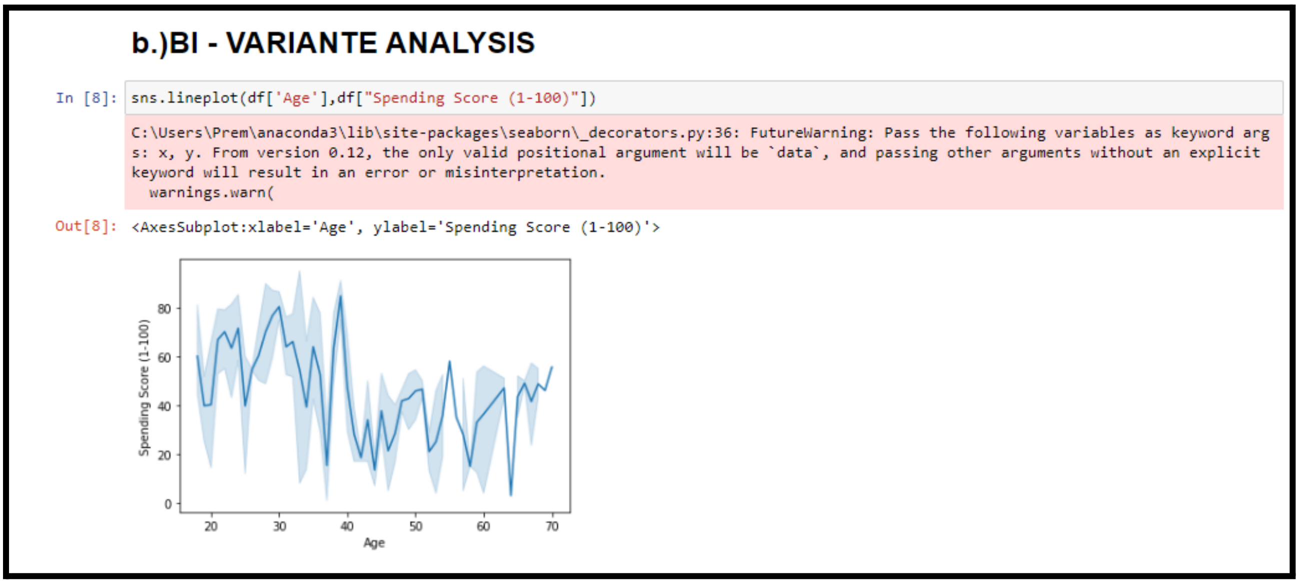
```
In [6]: sns.distplot(df["Spending Score (1-100)"])
```

```
C:\Users\Prem\anaconda3\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a deprecated function and
will be removed in a future version. Please adapt your code to use either `displot` (a figure-level function with similar flexi
bility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
```

```
Out[6]: <AxesSubplot:xlabel='Spending Score (1-100)', ylabel='Density'>
```

```
In [7]: plt.pie(df.Gender.value_counts(),[0.05,0.05],colors=['red','green'],labels=['Male','Female'],autopct="%1.1f%%")
        plt.title('Gender')
        plt.show()
```

b.) BI - VARIANTE ANALYSIS



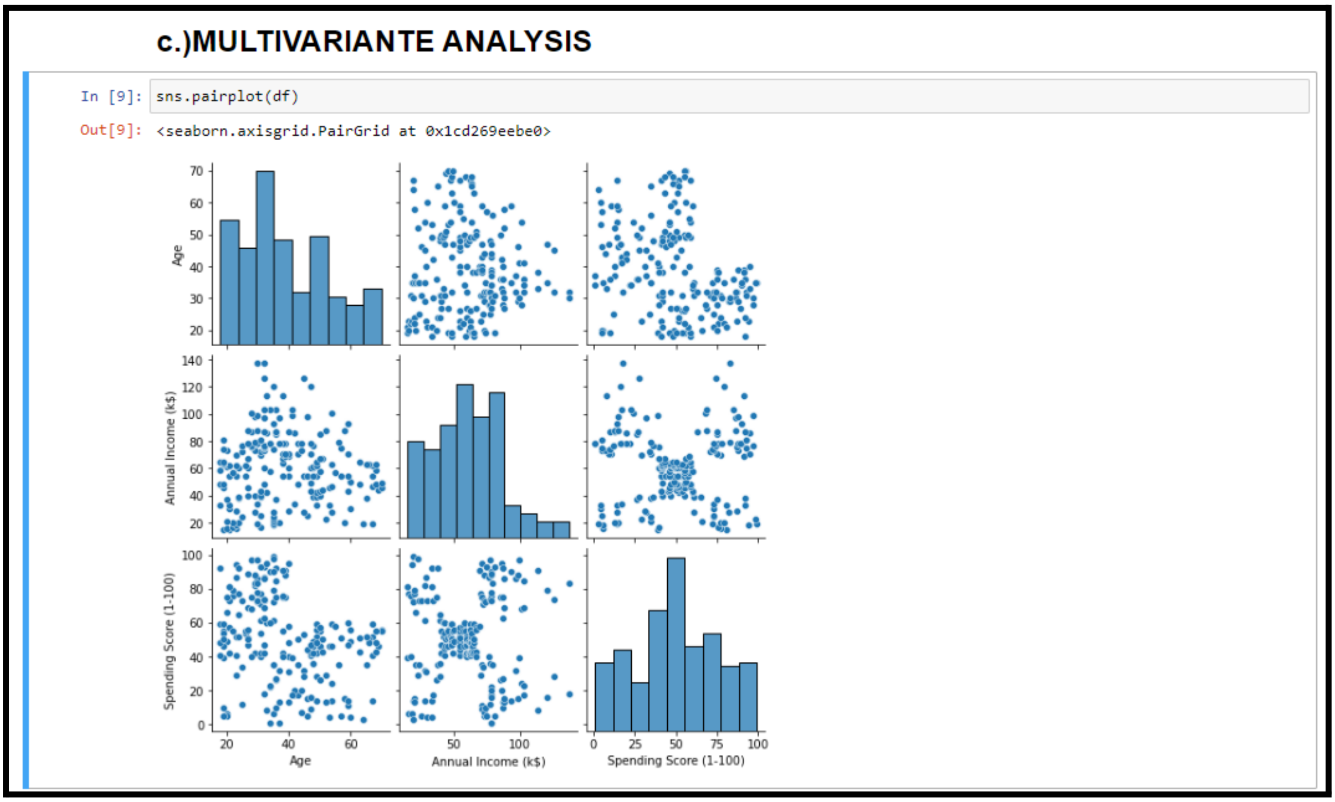
b.)BI - VARIANTE ANALYSIS

```
In [8]: sns.lineplot(df['Age'],df["Spending Score (1-100)"])
```

```
C:\Users\Prem\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variables as keyword arg
s: x, y. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit
keyword will result in an error or misinterpretation.
  warnings.warn(
```

```
Out[8]: <AxesSubplot:xlabel='Age', ylabel='Spending Score (1-100)'>
```

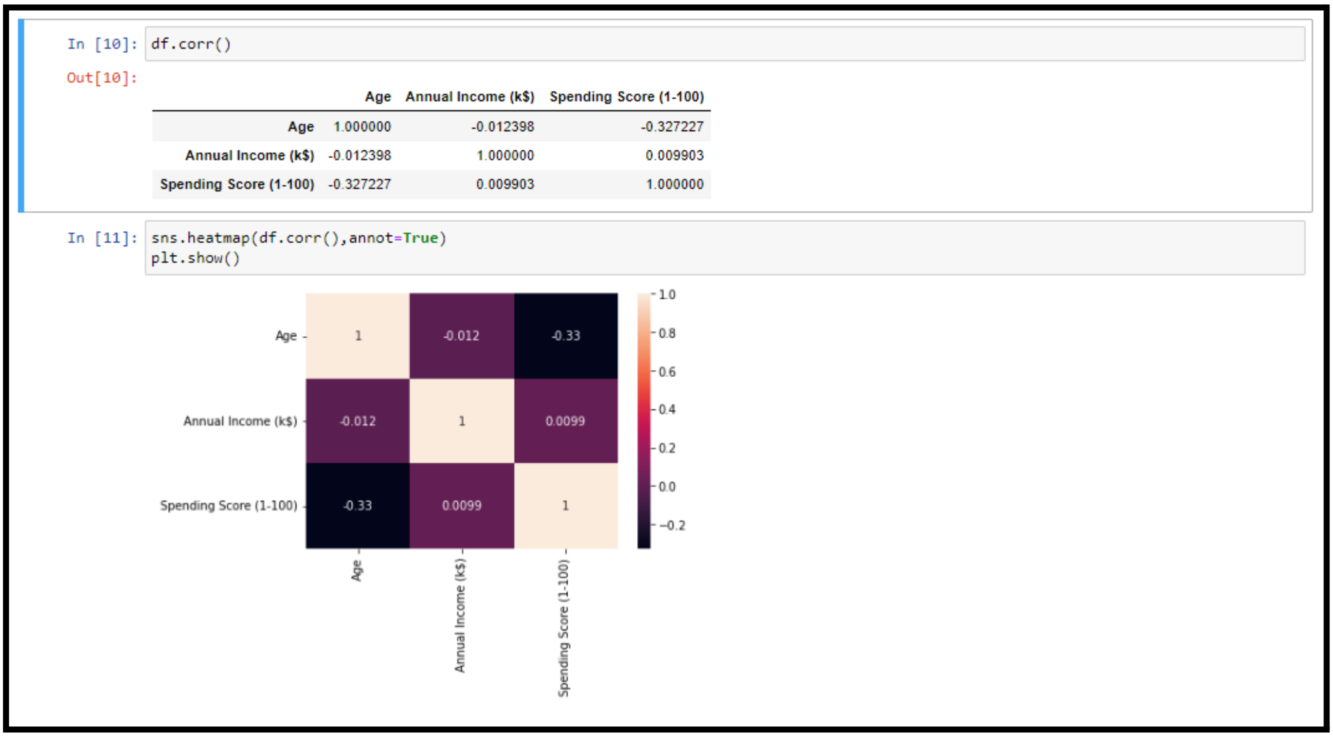
c.) MULTI - VARIANTE ANALYSIS



c.)MULTIVARIANTE ANALYSIS

```
In [9]: sns.pairplot(df)
```

```
Out[9]: <seaborn.axisgrid.PairGrid at 0x1cd269eebe0>
```



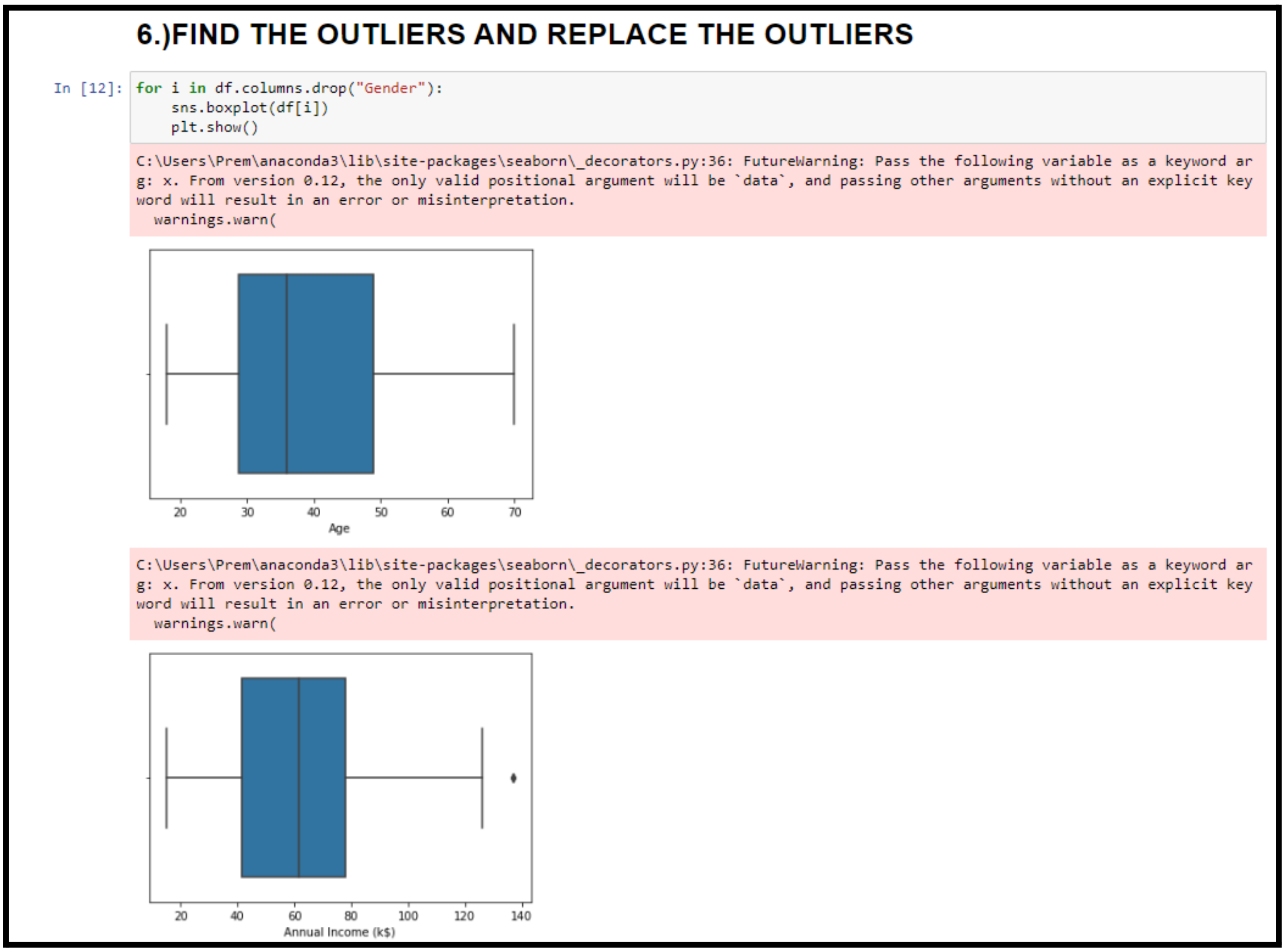
```
In [10]: df.corr()
```

Out[10]:

	Age	Annual Income (k$)	Spending Score (1-100)
Age	1.000000	-0.012398	-0.327227
Annual Income (k$)	-0.012398	1.000000	0.009903
Spending Score (1-100)	-0.327227	0.009903	1.000000

```
In [11]: sns.heatmap(df.corr(),annot=True)
         plt.show()
```

6.) FIND AND REPLACE THE OUTLIERS

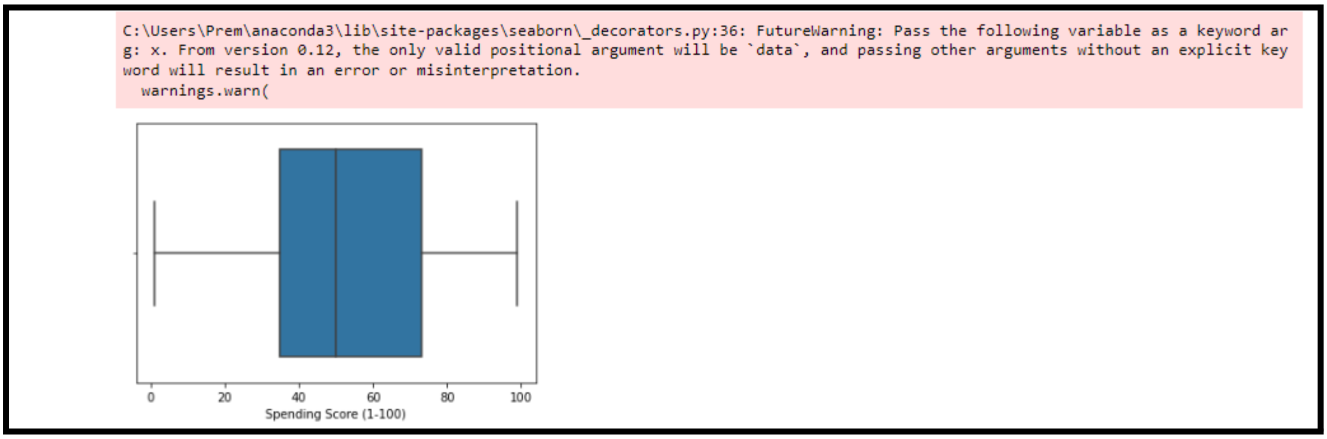


6.)FIND THE OUTLIERS AND REPLACE THE OUTLIERS

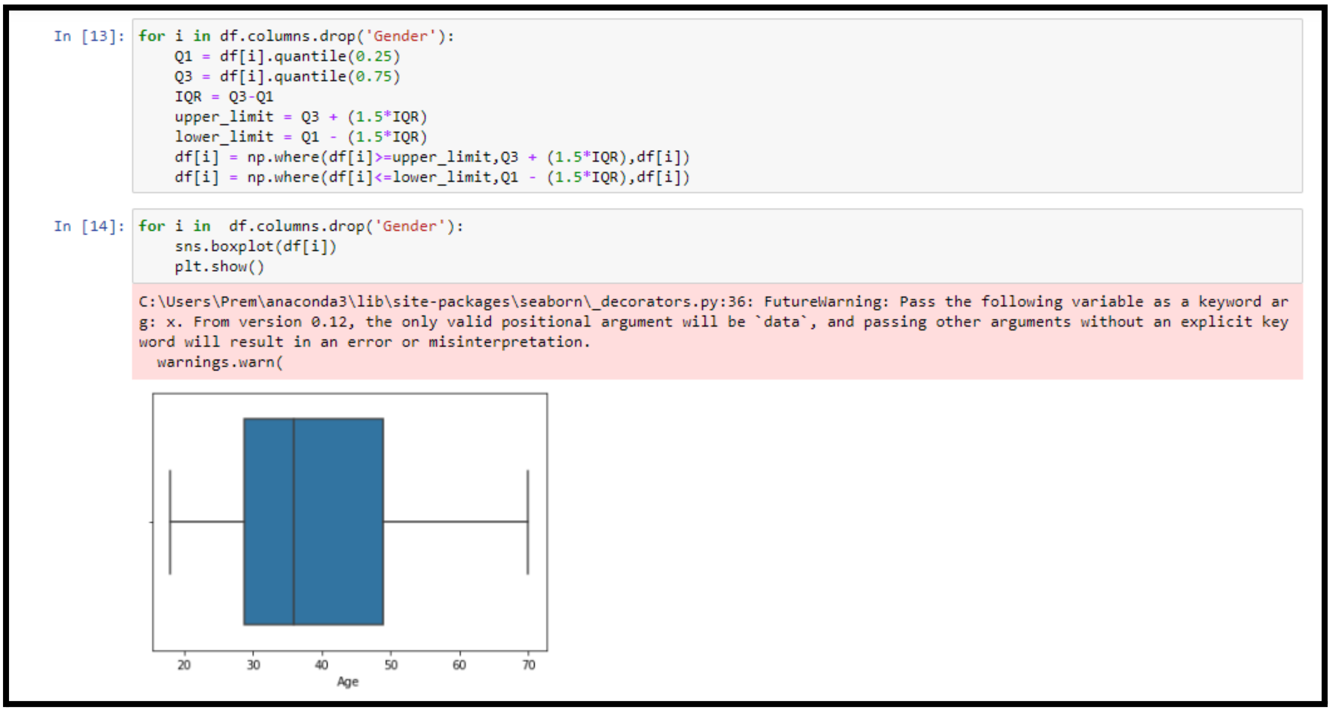
```
In [12]: for i in df.columns.drop("Gender"):
             sns.boxplot(df[i])
             plt.show()
```

```
C:\Users\Prem\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword ar
g: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit key
word will result in an error or misinterpretation.
  warnings.warn(
```

```
C:\Users\Prem\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword ar
g: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit key
word will result in an error or misinterpretation.
  warnings.warn(
```



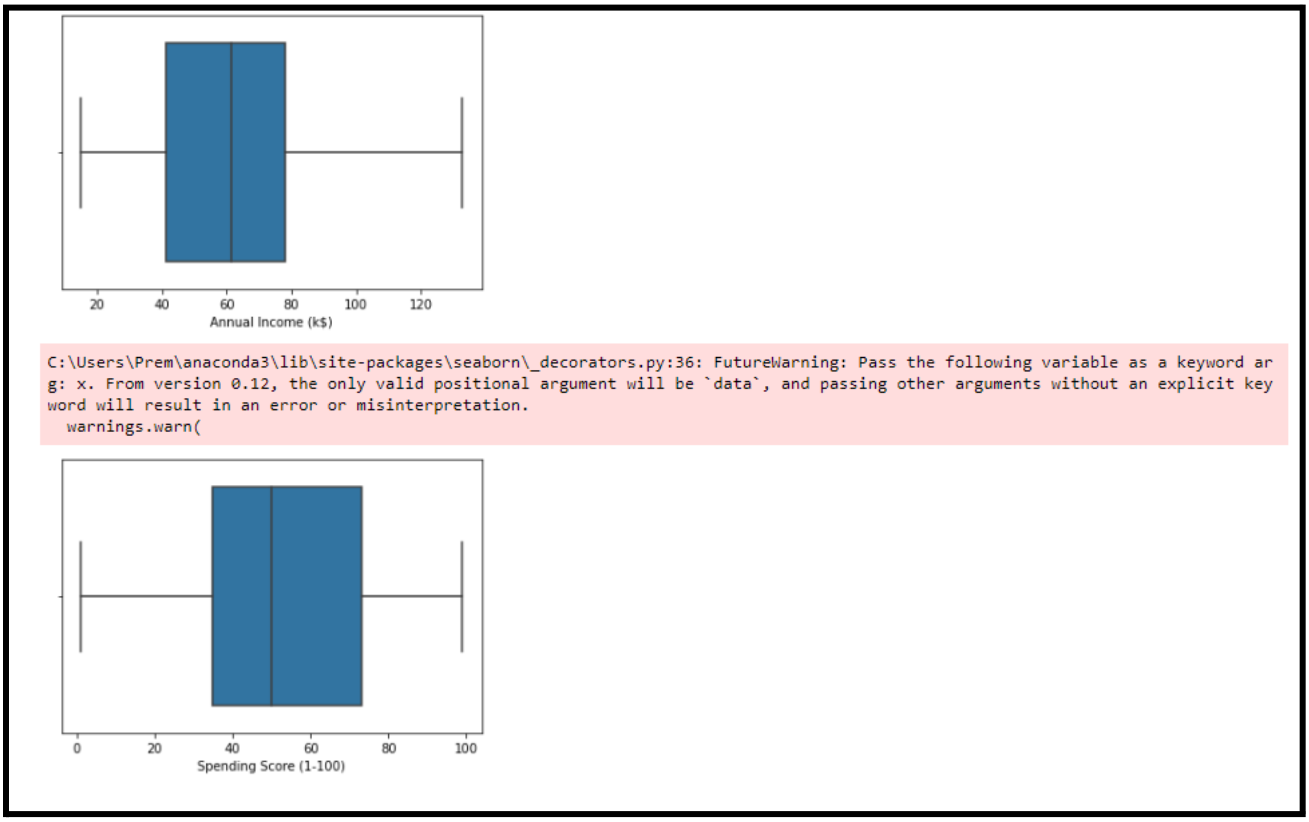
```
C:\Users\Prem\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword ar
g: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit key
word will result in an error or misinterpretation.
  warnings.warn(
```



```
In [13]: for i in df.columns.drop('Gender'):
             Q1 = df[i].quantile(0.25)
             Q3 = df[i].quantile(0.75)
             IQR = Q3-Q1
             upper_limit = Q3 + (1.5*IQR)
             lower_limit = Q1 - (1.5*IQR)
             df[i] = np.where(df[i]>=upper_limit,Q3 + (1.5*IQR),df[i])
             df[i] = np.where(df[i]<=lower_limit,Q1 - (1.5*IQR),df[i])
```

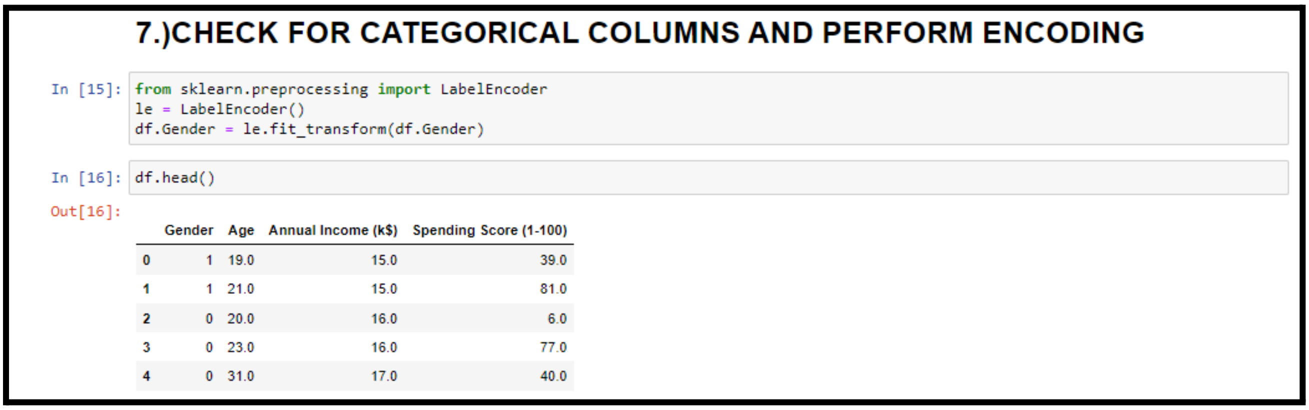
```
In [14]: for i in  df.columns.drop('Gender'):
             sns.boxplot(df[i])
             plt.show()
```

```
C:\Users\Prem\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword ar
g: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit key
word will result in an error or misinterpretation.
  warnings.warn(
```



```
C:\Users\Prem\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword ar
g: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit key
word will result in an error or misinterpretation.
  warnings.warn(
```

7.) CHECK FOR CATEGORICAL COLUMNS AND ENCODE THEM



7.)CHECK FOR CATEGORICAL COLUMNS AND PERFORM ENCODING

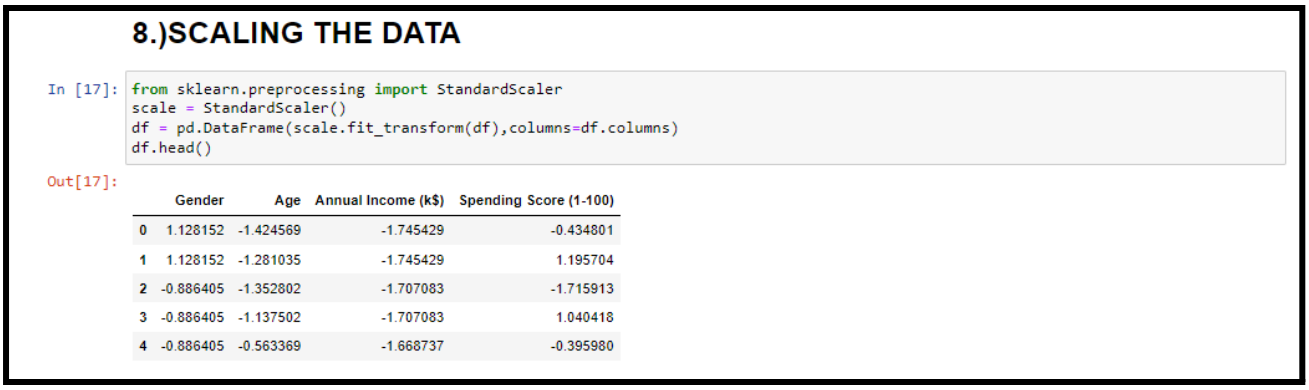
In [15]:
```
from sklearn.preprocessing import LabelEncoder
le = LabelEncoder()
df.Gender = le.fit_transform(df.Gender)
```

In [16]:
```
df.head()
```

Out[16]:

	Gender	Age	Annual Income (k$)	Spending Score (1-100)
0	1	19.0	15.0	39.0
1	1	21.0	15.0	81.0
2	0	20.0	16.0	6.0
3	0	23.0	16.0	77.0
4	0	31.0	17.0	40.0

8.) SCALE THE DATA



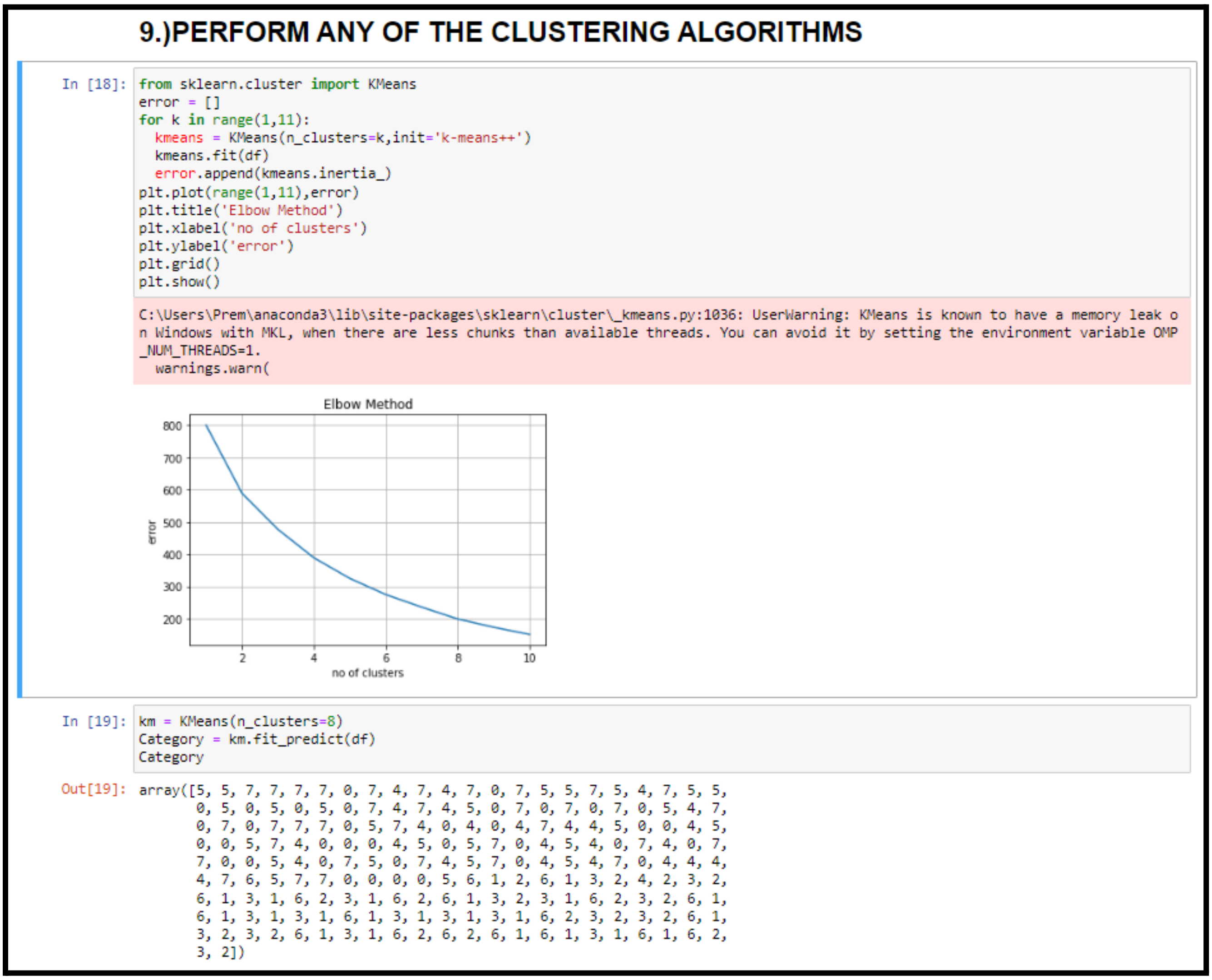
8.)SCALING THE DATA

In [17]:
```
from sklearn.preprocessing import StandardScaler
scale = StandardScaler()
df = pd.DataFrame(scale.fit_transform(df),columns=df.columns)
df.head()
```

Out[17]:

	Gender	Age	Annual Income (k$)	Spending Score (1-100)
0	1.128152	-1.424569	-1.745429	-0.434801
1	1.128152	-1.281035	-1.745429	1.195704
2	-0.886405	-1.352802	-1.707083	-1.715913
3	-0.886405	-1.137502	-1.707083	1.040418
4	-0.886405	-0.563369	-1.668737	-0.395980

9.) PERFORM ANY OF THE CLUSTERING ALGORITHMS



9.)PERFORM ANY OF THE CLUSTERING ALGORITHMS

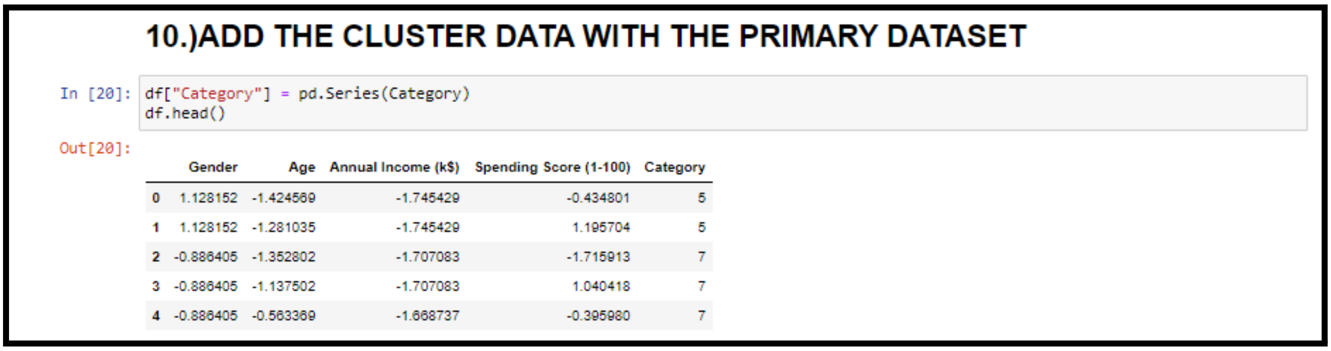
In [18]:
```
from sklearn.cluster import KMeans
error = []
for k in range(1,11):
  kmeans = KMeans(n_clusters=k,init='k-means++')
  kmeans.fit(df)
  error.append(kmeans.inertia_)
plt.plot(range(1,11),error)
plt.title('Elbow Method')
plt.xlabel('no of clusters')
plt.ylabel('error')
plt.grid()
plt.show()
```

```
C:\Users\Prem\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:1036: UserWarning: KMeans is known to have a memory leak o
n Windows with MKL, when there are less chunks than available threads. You can avoid it by setting the environment variable OMP
_NUM_THREADS=1.
  warnings.warn(
```

In [19]:
```
km = KMeans(n_clusters=8)
Category = km.fit_predict(df)
Category
```

Out[19]:
```
array([5, 5, 7, 7, 7, 7, 0, 7, 4, 7, 4, 7, 0, 7, 5, 5, 7, 5, 4, 7, 5, 5,
       0, 5, 0, 5, 0, 5, 0, 7, 4, 7, 4, 5, 0, 7, 0, 7, 0, 7, 0, 5, 4, 7,
       0, 7, 0, 7, 7, 7, 0, 5, 7, 4, 0, 4, 0, 4, 7, 4, 4, 5, 0, 0, 4, 5,
       0, 0, 5, 7, 4, 0, 0, 0, 4, 5, 0, 5, 7, 0, 4, 5, 4, 0, 7, 4, 0, 7,
       7, 0, 0, 5, 4, 0, 7, 5, 0, 7, 4, 5, 7, 0, 4, 5, 4, 7, 0, 4, 4, 4,
       4, 7, 6, 5, 7, 7, 0, 0, 0, 0, 5, 6, 1, 2, 6, 1, 3, 2, 4, 2, 3, 2,
       6, 1, 3, 1, 6, 2, 3, 1, 6, 2, 6, 1, 3, 2, 3, 1, 6, 2, 3, 2, 6, 1,
       6, 1, 3, 1, 3, 1, 6, 1, 3, 1, 3, 1, 3, 1, 6, 2, 3, 2, 3, 2, 6, 1,
       3, 2, 3, 2, 6, 1, 3, 1, 6, 2, 6, 2, 6, 1, 6, 1, 3, 1, 6, 1, 6, 2,
       3, 2])
```

10.) ADDING THE CLUSTER WITH THE PRIMARY DATASET



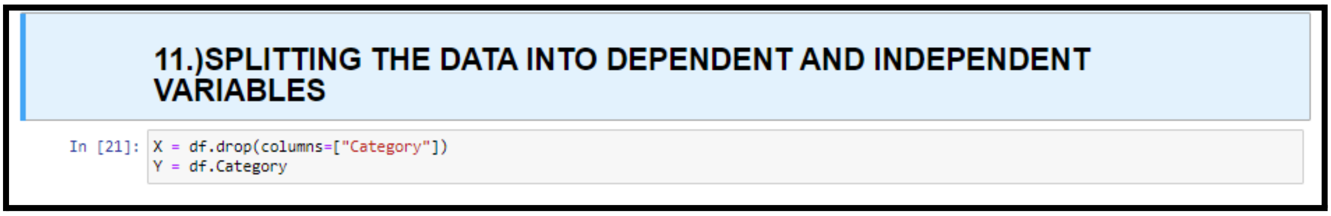
10.)ADD THE CLUSTER DATA WITH THE PRIMARY DATASET

In [20]:
```
df["Category"] = pd.Series(Category)
df.head()
```

Out[20]:

	Gender	Age	Annual Income (k$)	Spending Score (1-100)	Category
0	1.128152	-1.424569	-1.745429	-0.434801	5
1	1.128152	-1.281035	-1.745429	1.195704	5
2	-0.886405	-1.352802	-1.707083	-1.715913	7
3	-0.886405	-1.137502	-1.707083	1.040418	7
4	-0.886405	-0.563369	-1.668737	-0.395980	7

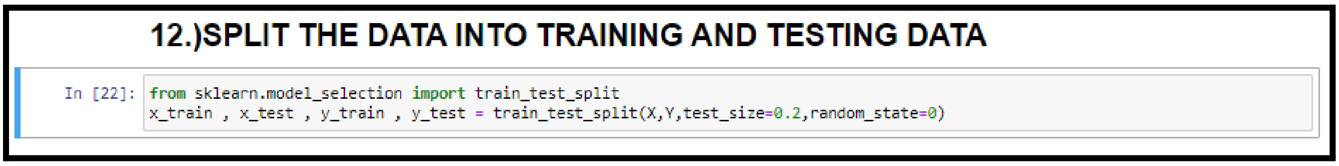
11.) SPLITTING THE DATA INTO DEPENDENT AND INDEPENDENT VARIABLES



11.)SPLITTING THE DATA INTO DEPENDENT AND INDEPENDENT VARIABLES

```
In [21]: X = df.drop(columns=["Category"])
         Y = df.Category
```

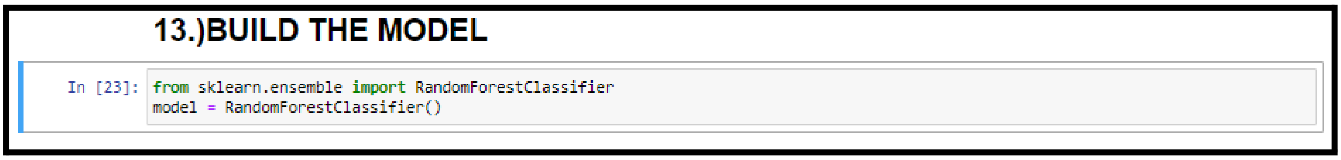
12.) SPLIT THE DATA INTO TRAINING AND TESTING DATA



12.)SPLIT THE DATA INTO TRAINING AND TESTING DATA

```
In [22]: 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,random_state=0)
```

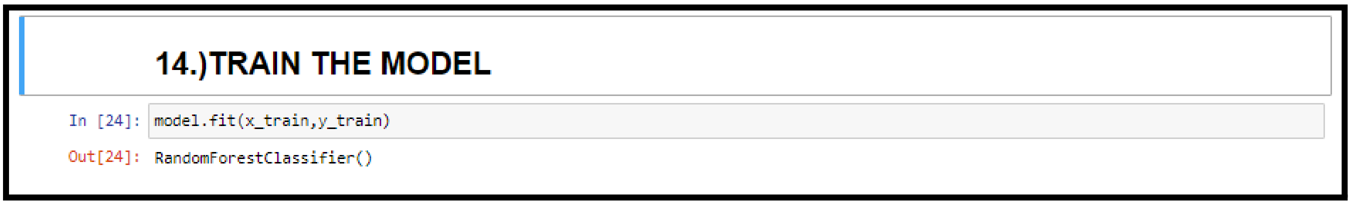
13.) BUILD THE MODEL



13.)BUILD THE MODEL

```
In [23]: from sklearn.ensemble import RandomForestClassifier
         model = RandomForestClassifier()
```

14.) TRAIN THE MODEL

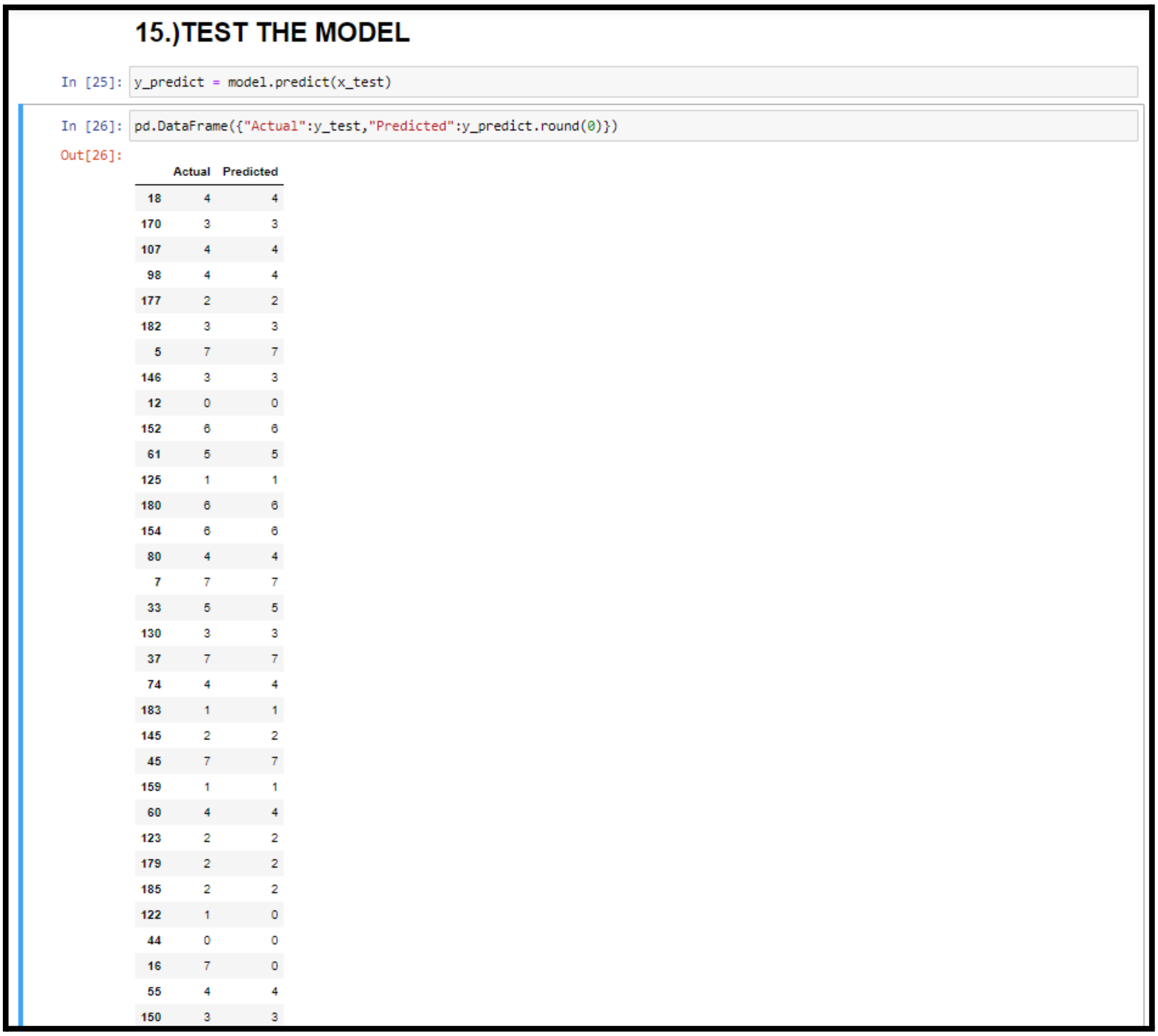


14.)TRAIN THE MODEL

```
In [24]: model.fit(x_train,y_train)

Out[24]: RandomForestClassifier()
```

15.) TEST THE MODEL



15.)TEST THE MODEL

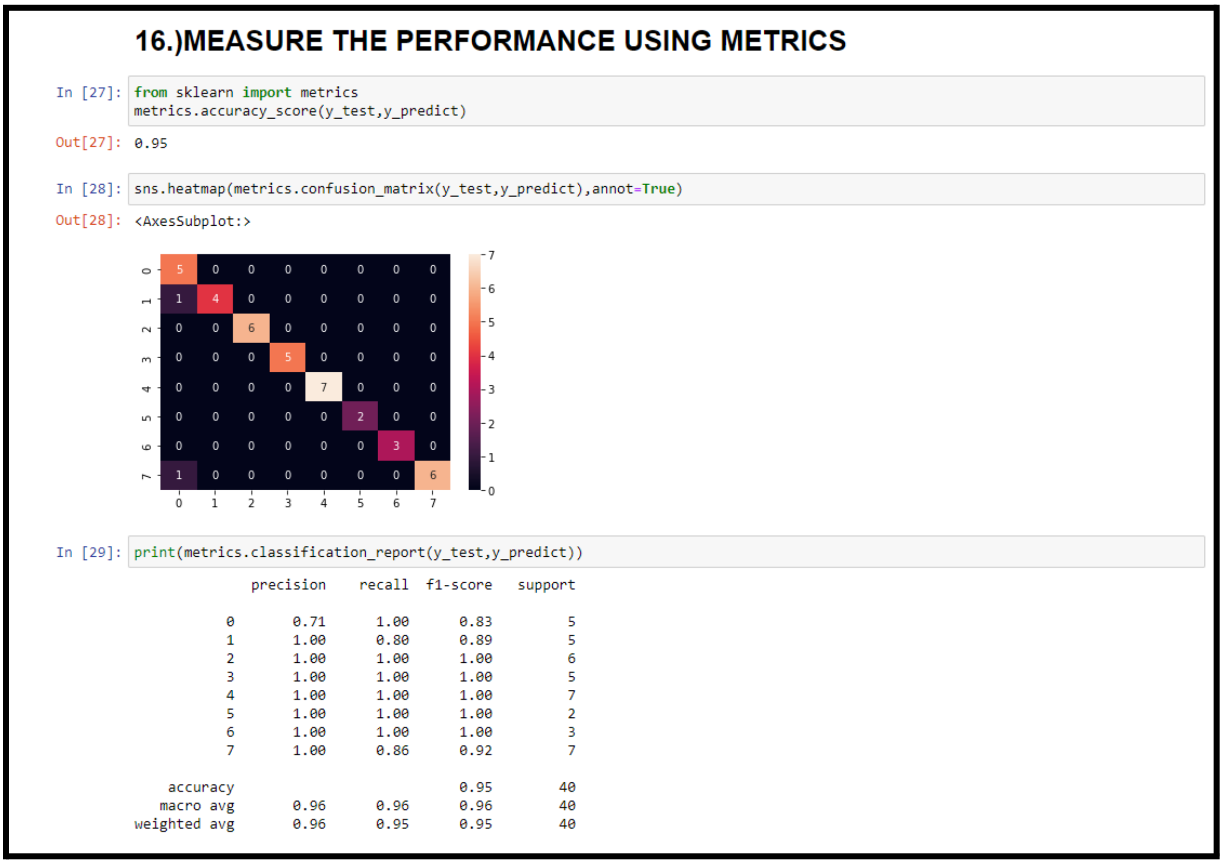
```
In [25]: y_predict = model.predict(x_test)
```

```
In [26]: pd.DataFrame({"Actual":y_test,"Predicted":y_predict.round(0)})
```

Out[26]:

	Actual	Predicted
18	4	4
170	3	3
107	4	4
98	4	4
177	2	2
182	3	3
5	7	7
146	3	3
12	0	0
152	6	6
61	5	5
125	1	1
180	6	6
154	6	6
80	4	4
7	7	7
33	5	5
130	3	3
37	7	7
74	4	4
183	1	1
145	2	2
45	7	7
159	1	1
60	4	4
123	2	2
179	2	2
185	2	2
122	1	0
44	0	0
16	7	0
55	4	4
150	3	3

16.) MEASURE THE PERFORMANCE USING METRICS



16.)MEASURE THE PERFORMANCE USING METRICS

In [27]:
```
from sklearn import metrics
metrics.accuracy_score(y_test,y_predict)
```
Out[27]:
```
0.95
```

In [28]:
```
sns.heatmap(metrics.confusion_matrix(y_test,y_predict),annot=True)
```
Out[28]:
```
<AxesSubplot:>
```

	0	1	2	3	4	5	6	7
0	5	0	0	0	0	0	0	0
1	1	4	0	0	0	0	0	0
2	0	0	6	0	0	0	0	0
3	0	0	0	5	0	0	0	0
4	0	0	0	0	7	0	0	0
5	0	0	0	0	0	2	0	0
6	0	0	0	0	0	0	3	0
7	1	0	0	0	0	0	0	6

In [29]:
```
print(metrics.classification_report(y_test,y_predict))
```
```
              precision    recall  f1-score   support

           0       0.71      1.00      0.83         5
           1       1.00      0.80      0.89         5
           2       1.00      1.00      1.00         6
           3       1.00      1.00      1.00         5
           4       1.00      1.00      1.00         7
           5       1.00      1.00      1.00         2
           6       1.00      1.00      1.00         3
           7       1.00      0.86      0.92         7

    accuracy                           0.95        40
   macro avg       0.96      0.96      0.96        40
weighted avg       0.96      0.95      0.95        40
```