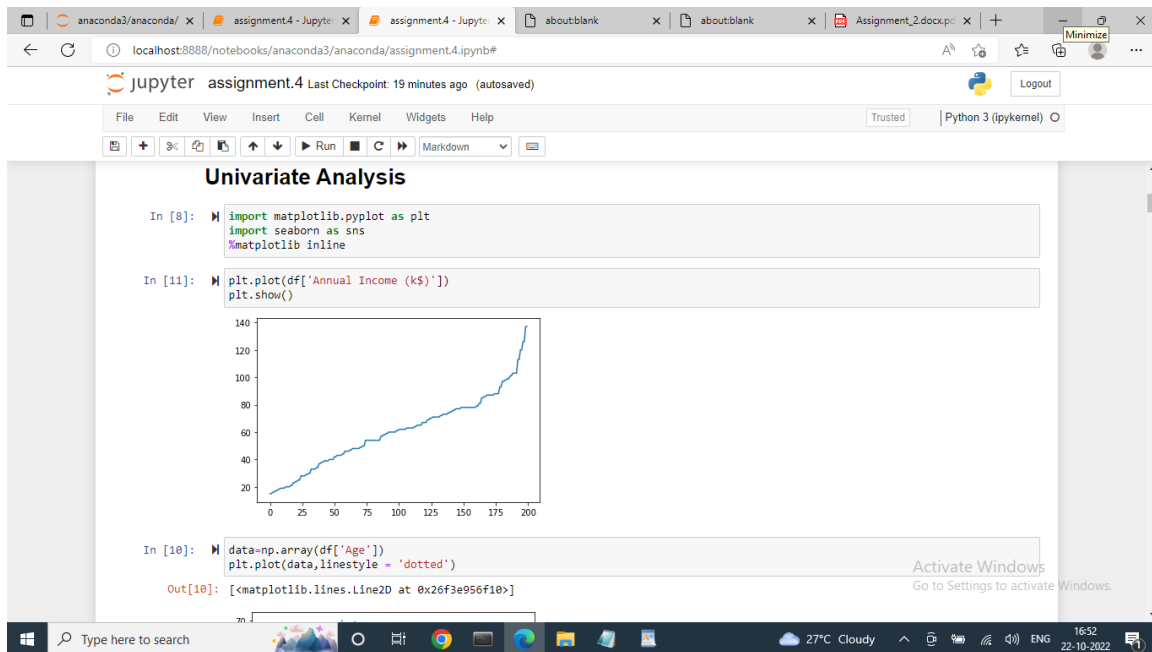
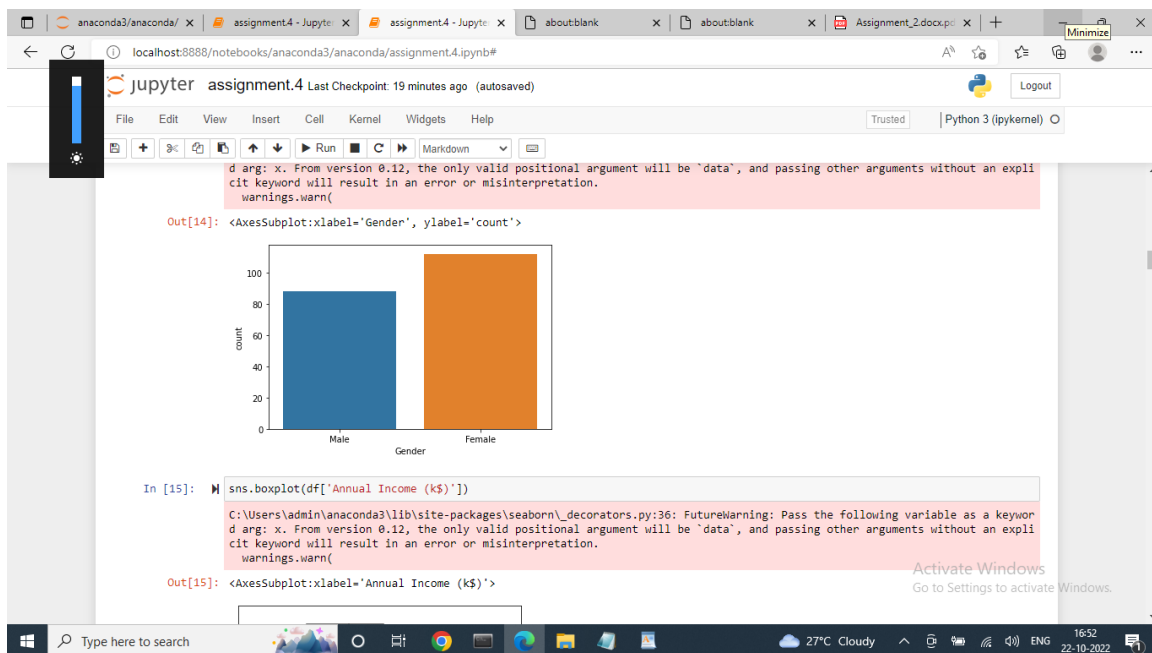
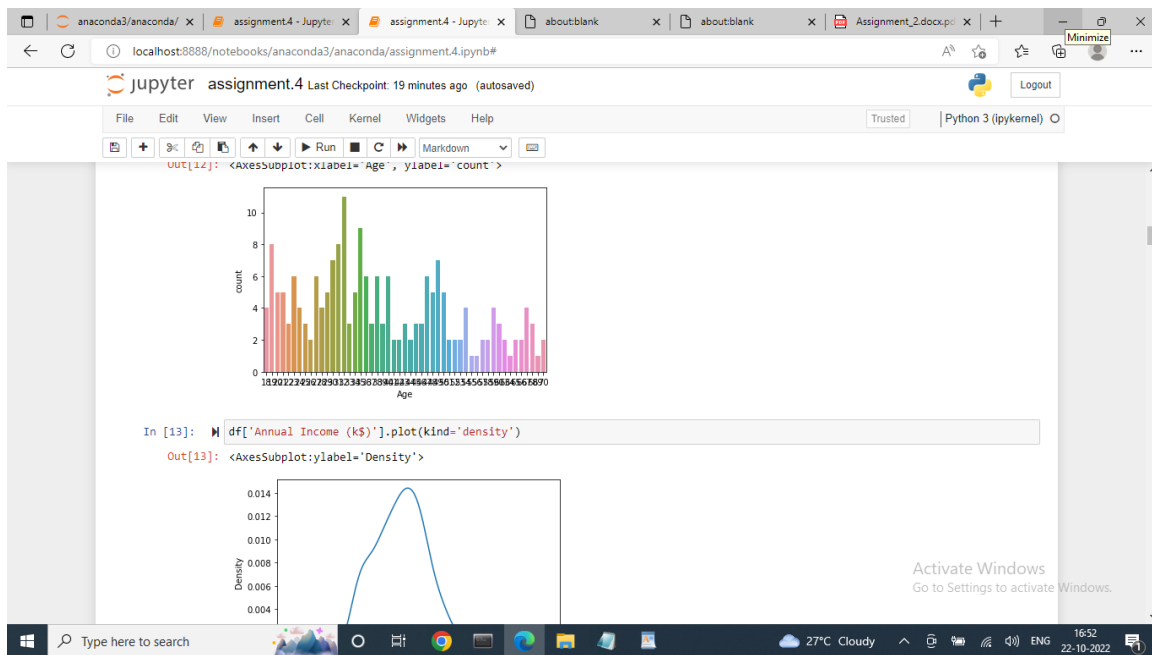


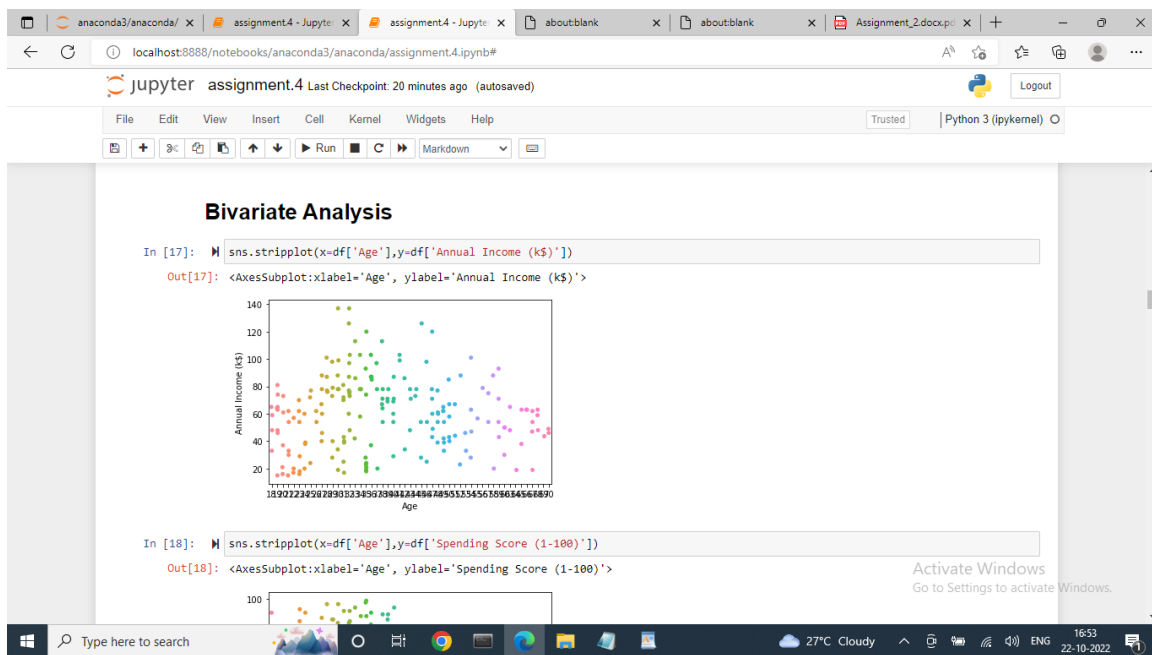
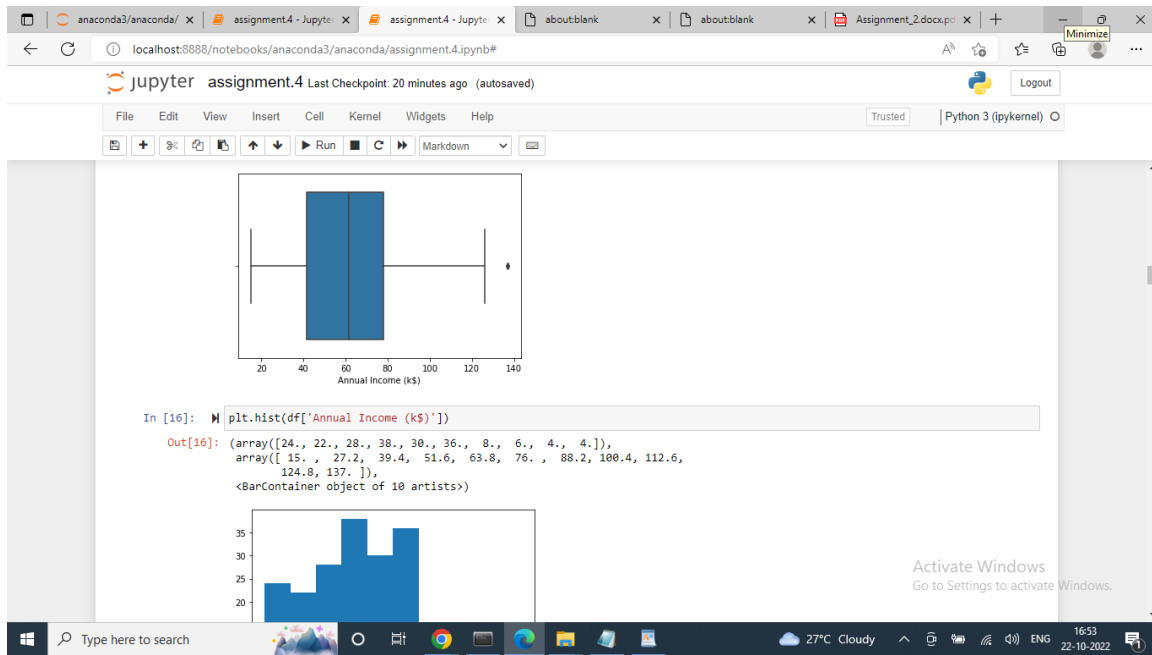
# ASSIGNMENT-4

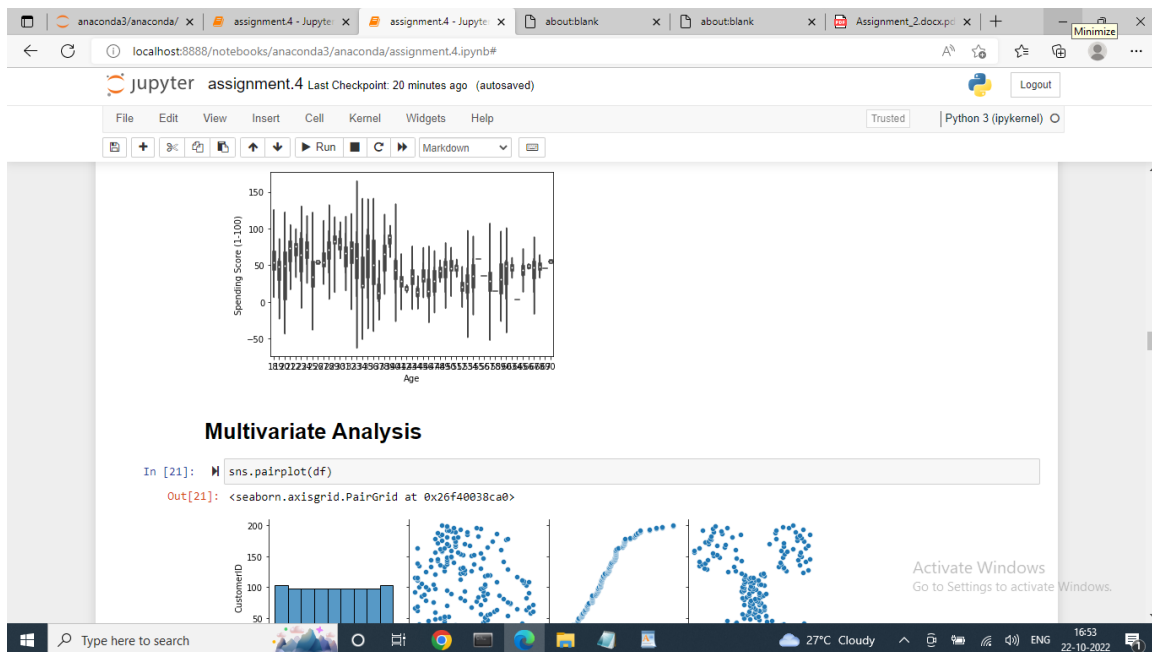
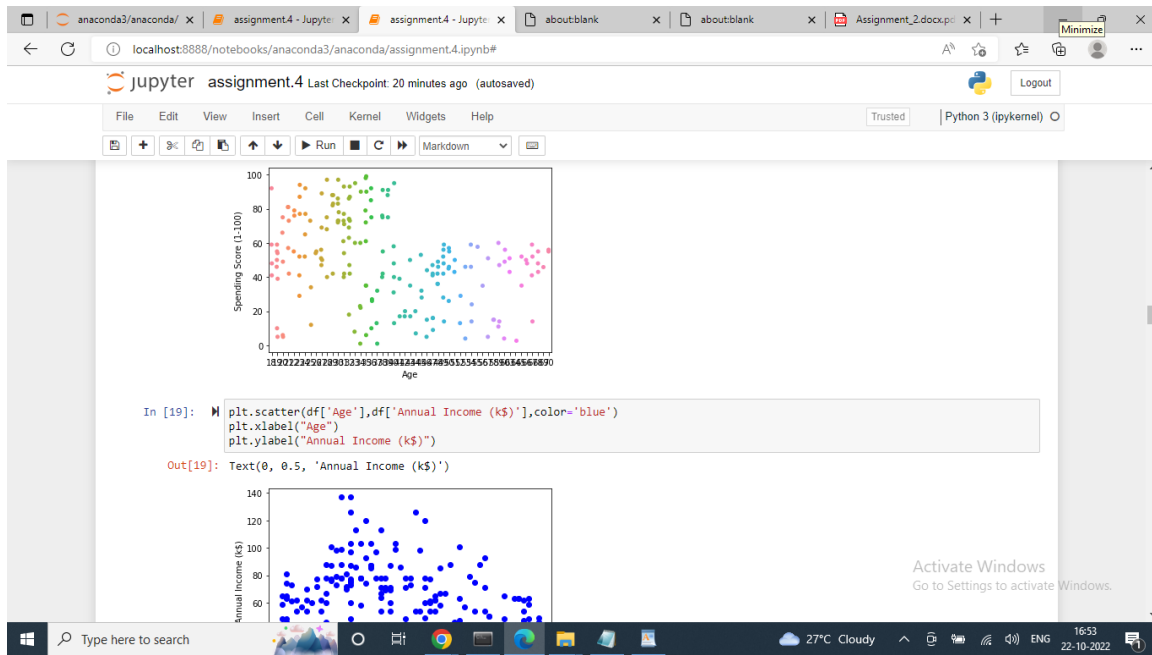
## APPLIED DATA SCIENCE

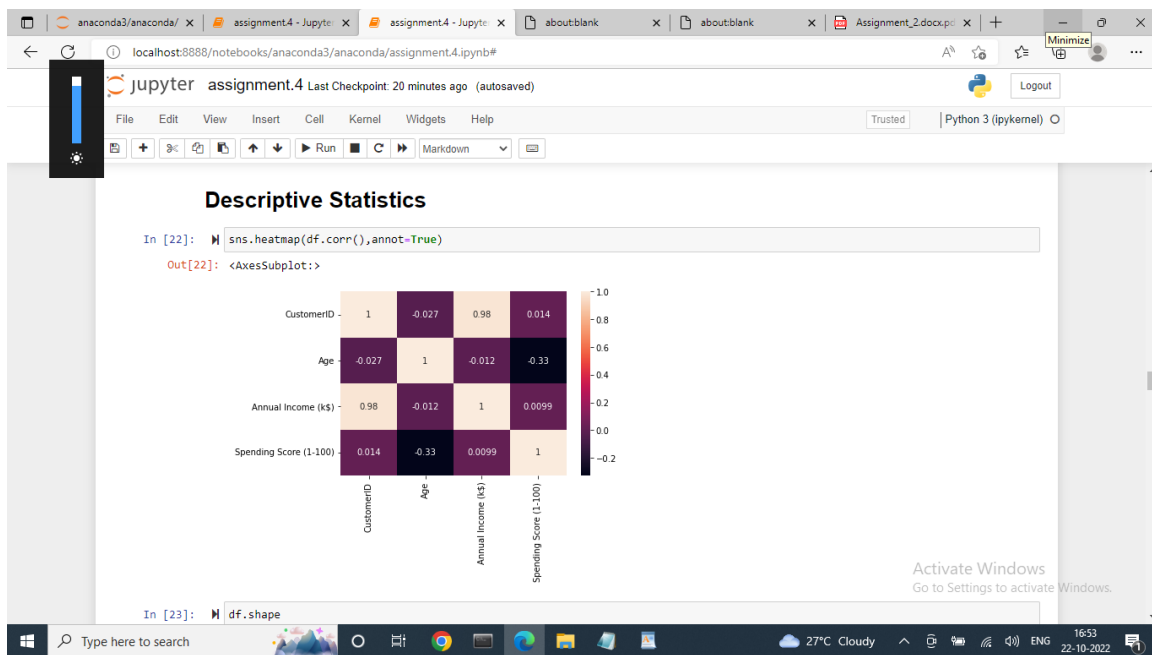
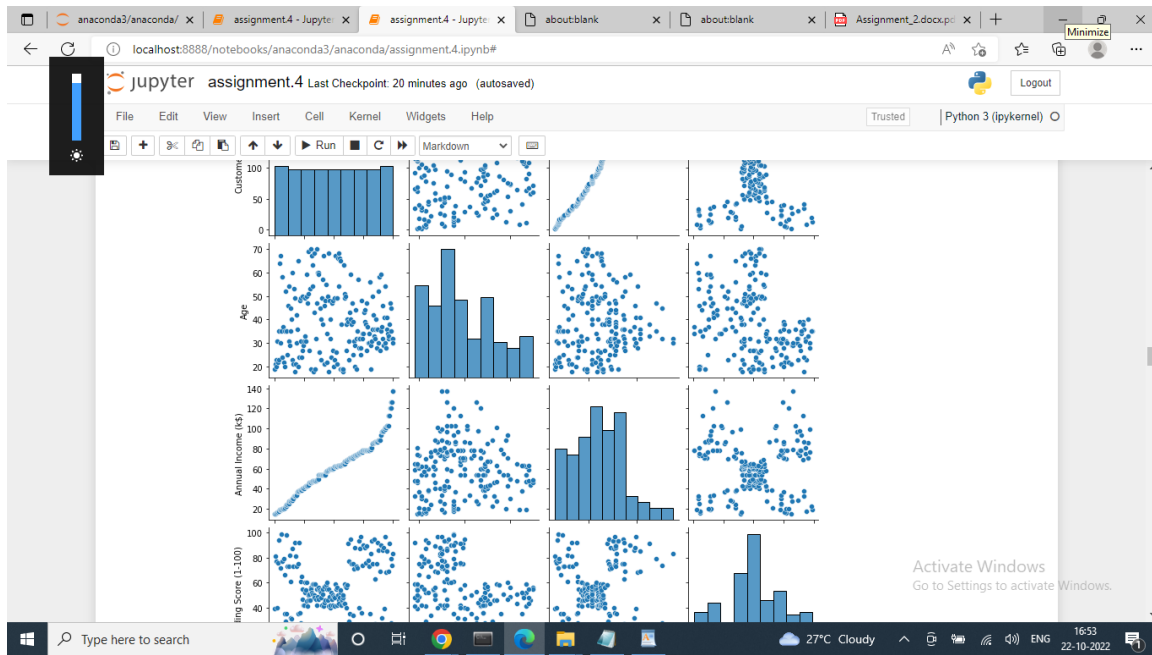
Assignment date	21 october 2022
Student Name	Navaneetha Krishnaveni A
Student Roll Number	721719104056
Maximum Marks	2 Marks











anaconda3/anaconda/ x assignment4 - Jupyter x assignment4 - Jupyter x about:blank x about:blank x Assignment\_2.docx.p x + Minimize

localhost:8888/notebooks/anaconda3/anaconda/assignment4.ipynb#

jupyter assignment.4 Last Checkpoint: 20 minutes ago (autosaved) Logout

File Edit View Insert Cell Kernel Widgets Help Trusted Python 3 (ipykernel)

In [23]: `df.shape`

Out[23]: (200, 5)

In [24]: `df.isnull().sum()`

Out[24]: CustomerID 0  
Gender 0  
Age 0  
Annual Income (k\$) 0  
Spending Score (1-100) 0  
dtype: int64

In [25]: `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

In [27]: `df.describe()`

Out[27]:

	CustomerID	Age	Annual Income (k\$)	Spending Score (1-100)
count	200	200	200	200
mean	100.5	36.0	61.5	50.0
std	100.0	16.0	18.0	10.0
min	0	18	18	1
max	199	50	130	100

Activate Windows  
Go to Settings to activate Windows.

Type here to search 27°C Cloudy 16:53 22-10-2022

anaconda3/anaconda/ x assignment4 - Jupyter x assignment4 - Jupyter x about:blank x about:blank x Assignment\_2.docx.p x + Minimize

localhost:8888/notebooks/anaconda3/anaconda/assignment4.ipynb#

jupyter assignment.4 Last Checkpoint: 20 minutes ago (autosaved) Logout

File Edit View Insert Cell Kernel Widgets Help Trusted Python 3 (ipykernel)

In [29]: `df.median()`

C:\Users\admin\AppData\Local\Temp\ipykernel\_7900\530051474.py:1: FutureWarning: Dropping of nuisance columns in DataFrame reductions (with 'numeric\_only=None') is deprecated; in a future version this will raise TypeError. Select only valid columns before calling the reduction.  
`df.median()`

Out[29]: CustomerID 100.5  
Age 36.0  
Annual Income (k\$) 61.5  
Spending Score (1-100) 50.0  
dtype: float64

In [30]: `df.mode()`

Out[30]:

	CustomerID	Gender	Age	Annual Income (k\$)	Spending Score (1-100)
0	1	Female	32.0	54.0	42.0
1	2	NaN	NaN	78.0	NaN
2	3	NaN	NaN	NaN	NaN
3	4	NaN	NaN	NaN	NaN
4	5	NaN	NaN	NaN	NaN
...	...	...	...	...	...
195	196	NaN	NaN	NaN	NaN
196	197	NaN	NaN	NaN	NaN
197	198	NaN	NaN	NaN	NaN
198	199	NaN	NaN	NaN	NaN

Activate Windows  
Go to Settings to activate Windows.

Type here to search 27°C Cloudy 16:54 22-10-2022

anaconda3/anaconda/ x assignment4 - Jupyter x assignment4 - Jupyter x about:blank x about:blank x Assignment\_2.docx:po x + - Minimize

localhost:8888/notebooks/anaconda3/anaconda/assignment4.ipynb#

jupyter assignment.4 Last Checkpoint: 21 minutes ago (autosaved) Logout

File Edit View Insert Cell Kernel Widgets Help Trusted Python 3 (ipykernel)

### Check For Missing Values


```
In [33]: df.isna().sum()
```

```
Out[33]: CustomerID      0
Gender                0
Age                  0
Annual Income (k$)     0
Spending Score (1-100) 0
dtype: int64
```

### Handling Outliers

```
In [34]: sns.boxplot(df['Annual Income (k$)'])
```

C:\Users\admin\anaconda3\lib\site-packages\seaborn\decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. 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[34]: <AxesSubplot:xlabel='Annual Income (k$)'

Activate Windows  
Go to Settings to activate Windows.



Type here to search 27°C Cloudy 16:54 22-10-2022

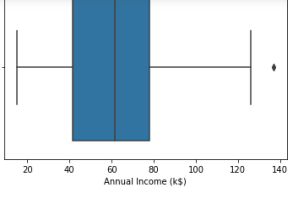

```

anaconda3/anaconda/ x assignment4 - Jupyter x assignment4 - Jupyter x about:blank x about:blank x Assignment\_2.docx:po x + - Minimize

localhost:8888/notebooks/anaconda3/anaconda/assignment4.ipynb#

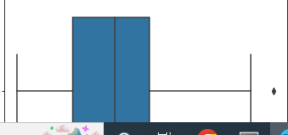
jupyter assignment.4 Last Checkpoint: 21 minutes ago (autosaved) Logout

File Edit View Insert Cell Kernel Widgets Help Trusted Python 3 (ipykernel)



```
In [35]: sns.boxplot(df['Annual Income (k$)'])
```

C:\Users\admin\anaconda3\lib\site-packages\seaborn\decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. 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[35]: <AxesSubplot:xlabel='Annual Income (k$)'

Activate Windows  
Go to Settings to activate Windows.



Type here to search 27°C Cloudy 16:54 22-10-2022


```

anaconda3/anaconda/ x assignment4 - Jupyter: x assignment4 - Jupyter: x about:blank x about:blank x Assignment\_2.docx:po x +

localhost:8888/notebooks/anaconda3/anaconda/assignment4.ipynb#

jupyter assignment.4 Last Checkpoint: 21 minutes ago (autosaved) Logout

File Edit View Insert Cell Kernel Widgets Help Trusted Python 3 (ipykernel)

### Encoding Categorical Values

```
In [37]: numeric_data = df.select_dtypes(include=[np.number])
categorical_data = df.select_dtypes(exclude=[np.number])
print("Number of numerical variables: ", numeric_data.shape[1])
print("Number of categorical variables: ", categorical_data.shape[1])

Number of numerical variables: 4
Number of categorical variables: 1

In [38]: print("Number of categorical variables: ", categorical_data.shape[1])
categorical_variables = list(categorical_data.columns)
categorical_variables

Number of categorical variables: 1

Out[38]: ['Gender']

In [39]: df['Gender'].value_counts()

Out[39]: Female    112
        Male       88
        Name: Gender, dtype: int64

In [40]: from sklearn.preprocessing import LabelEncoder
le = LabelEncoder()
label = le.fit_transform(df['Gender'])
df['Gender'] = label
```

Activate Windows  
Go to Settings to activate Windows.

anaconda3/anaconda/ x assignment4 - Jupyter: x assignment4 - Jupyter: x about:blank x about:blank x Assignment\_2.docx:po x +

localhost:8888/notebooks/anaconda3/anaconda/assignment4.ipynb#

jupyter assignment.4 Last Checkpoint: 21 minutes ago (autosaved) Logout

File Edit View Insert Cell Kernel Widgets Help Trusted Python 3 (ipykernel)

### Scaling The Data

```
In [42]: X = df.drop("Age",axis=1)
        Y = df["Age"]

In [43]: from sklearn.preprocessing import StandardScaler
object = StandardScaler()
scale = object.fit_transform(X)
print(scale)
```

```
[ 1.41163985 -0.88648526  1.398894  1.38981187]
[ 1.42895978  1.12815215  1.42906343 -1.36651894]
[ 1.44628805 -0.88648526  1.42906343  1.46745499]
[ 1.46368123 -0.88648526  1.46723286 -0.43488148]
[ 1.48092195  1.12815215  1.46723286  1.81684904]
[ 1.49824268 -0.88648526  1.54357172 -1.01712489]
[ 1.5155634  1.12815215  1.54357172  0.69102378]
[ 1.53288413 -0.88648526  1.61991057 -1.28867582]
[ 1.55020485 -0.88648526  1.61991057  1.35899031]
[ 1.56752558 -0.88648526  1.61991057 -1.05594645]
[ 1.5848463 -0.88648526  1.61991057  0.72984534]
[ 1.60216702  1.12815215  2.00160487 -1.63826986]
[ 1.61948775 -0.88648526  2.00160487  1.58391968]
[ 1.63680847 -0.88648526  2.26879087 -1.32769738]
[ 1.6541292 -0.88648526  2.26879087  1.11806095]
[ 1.67144992 -0.88648526  2.49788745 -0.86183865]
[ 1.68877065  1.12815215  2.49788745  0.92395314]
[ 1.70609137  1.12815215  2.91767117 -1.25805425]
[ 1.7234121  1.12815215  2.91767117  1.27334719]
```

Activate Windows  
Go to Settings to activate Windows.



anaconda3/anaconda/ x assignment4 - Jupyter x assignment4 - Jupyter x about:blank x about:blank x Assignment\_2.docx.p x + Minimize

localhost:8888/notebooks/anaconda3/anaconda/assignment4.ipynb#

jupyter assignment.4 Last Checkpoint: 21 minutes ago (autosaved) Logout

File Edit View Insert Cell Kernel Widgets Help Trusted Python 3 (ipykernel)

```
object = StandardScaler()
scale = object.fit_transform(X)
print(scale)
```

```
[ 1.41163905 -0.88640526 1.390894 1.38981187]
[ 1.42895978 1.12815215 1.42906343 -1.36651894]
[ 1.44628005 -0.88640526 1.42906343 1.46745499]
[ 1.46360123 -0.88640526 1.46723286 -0.43480148]
[ 1.48092195 1.12815215 1.46723286 1.81604904]
[ 1.49824268 -0.88640526 1.54357172 -1.01712489]
[ 1.5155634 1.12815215 1.54357172 0.69102378]
[ 1.53288413 -0.88640526 1.61991057 -1.28887582]
[ 1.55020485 -0.88640526 1.61991057 1.35099031]
[ 1.56752558 -0.88640526 1.61991057 -1.05594645]
[ 1.5848463 -0.88640526 1.61991057 0.72984534]
[ 1.60216702 1.12815215 2.00160487 -1.63826986]
[ 1.61948775 -0.88640526 2.00160487 1.58391968]
[ 1.63680847 -0.88640526 2.26879087 -1.32769738]
[ 1.6541292 -0.88640526 2.26879087 1.11806095]
[ 1.67144992 -0.88640526 2.49780745 -0.86183865]
[ 1.68877065 1.12815215 2.49780745 0.92395314]
[ 1.70609137 1.12815215 2.91767117 -1.25005425]
[ 1.7234121 1.12815215 2.91767117 1.27334719]]
```

```
In [44]: X_scaled = pd.DataFrame(scale, columns = X.columns)
X_scaled
```

```
Out[44]:
```

	CustomerID	Gender	Annual Income (k\$)	Spending Score (1-100)
0	-1.723412	1.128152	-1.738999	-0.434801
1	-1.706091	1.128152	-1.738999	1.195704

Activate Windows  
Go to Settings to activate Windows.

Type here to search 27°C Cloudy 16:54 22-10-2022

anaconda3/anaconda/ x assignment4 - Jupyter x assignment4 - Jupyter x about:blank x about:blank x Assignment\_2.docx.p x + Minimize

localhost:8888/notebooks/anaconda3/anaconda/assignment4.ipynb#

jupyter assignment.4 Last Checkpoint: 21 minutes ago (autosaved) Logout

File Edit View Insert Cell Kernel Widgets Help Trusted Python 3 (ipykernel)

```
In [44]: X_scaled = pd.DataFrame(scale, columns = X.columns)
X_scaled
```

```
Out[44]:
```

	CustomerID	Gender	Annual Income (k\$)	Spending Score (1-100)
0	-1.723412	1.128152	-1.738999	-0.434801
1	-1.706091	1.128152	-1.738999	1.195704
2	-1.688771	-0.886405	-1.700830	-1.715913
3	-1.671450	-0.886405	-1.700830	1.040418
4	-1.654129	-0.886405	-1.662660	-0.395980
...	...	...	...	...
195	1.654129	-0.886405	2.268791	1.118061
196	1.671450	-0.886405	2.497807	-0.861839
197	1.688771	1.128152	2.497807	0.923953
198	1.706091	1.128152	2.917671	-1.250054
199	1.723412	1.128152	2.917671	1.273347

200 rows x 4 columns

```
In [45]: #train test split
from sklearn.model_selection import train_test_split
# split the dataset
X_train, X_test, Y_train, Y_test = train_test_split(X_scaled, Y, test_size=0.20, random_state=0)
```

```
In [48]: X_train.shape
```

Activate Windows  
Go to Settings to activate Windows.

Type here to search 27°C Cloudy 16:54 22-10-2022

anaconda3/anaconda/ x assignment4 - Jupyter: x assignment4 - Jupyter: x about:blank x about:blank x Assignment\_2.docx:po x + - Minimize

localhost:8888/notebooks/anaconda3/anaconda/assignment4.ipynb#

jupyter assignment.4 Last Checkpoint: 21 minutes ago (autosaved) Logout

File Edit View Insert Cell Kernel Widgets Help Trusted Python 3 (ipykernel)

```
X_train, X_test, Y_train, Y_test = train_test_split(X_scaled, Y, test_size=0.20, random_state=0)
```

In [48]: `X_train.shape`  
Out[48]: (160, 4)

In [49]: `X_test.shape`  
Out[49]: (40, 4)

In [50]: `Y_train.shape`  
Out[50]: (160,)

In [51]: `Y_test.shape`  
Out[51]: (40,)

#clustering algorithm

In [52]: `x = df.iloc[:, [3, 4]].values`

In [53]: `#finding optimal number of clusters using the elbow method`  
`from sklearn.cluster import KMeans`  
`wcss_list= [] #initializing the list for the values of WCSS`  
`#Using for Loop for iterations from 1 to 10.`  
`for i in range(1, 11):`  
 `kmeans = KMeans(n_clusters=i, init='k-means++', random_state= 42)`  
 `kmeans.fit(x)`  
 `wcss_list.append(kmeans.inertia_)`  
`plt.plot(range(1, 11), wcss_list)`  
`plt.title('The Elbow Method Graph')`  
`plt.xlabel('Number of clusters(k)')`  
`plt.ylabel('wcss_list')`  
`plt.show()`

Activate Windows  
Go to Settings to activate Windows.

Type here to search 27°C Cloudy 16:54 22-10-2022

anaconda3/anaconda/ x assignment4 - Jupyter: x assignment4 - Jupyter: x about:blank x about:blank x Assignment\_2.docx:po x + - Minimize

localhost:8888/notebooks/anaconda3/anaconda/assignment4.ipynb#

jupyter assignment.4 Last Checkpoint: 21 minutes ago (autosaved) Logout

File Edit View Insert Cell Kernel Widgets Help Trusted Python 3 (ipykernel)

```
from sklearn.cluster import KMeans
wcss_list= [] #initializing the list for the values of WCSS

#Using for Loop for iterations from 1 to 10.
for i in range(1, 11):
    kmeans = KMeans(n_clusters=i, init='k-means++', random_state= 42)
    kmeans.fit(x)
    wcss_list.append(kmeans.inertia_)
plt.plot(range(1, 11), wcss_list)
plt.title('The Elbow Method Graph')
plt.xlabel('Number of clusters(k)')
plt.ylabel('wcss_list')
plt.show()
```

C:\Users\admin\anaconda3\lib\site-packages\sklearn\cluster\\_kmeans.py:1036: UserWarning: KMeans is known to have a memory leak on 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()

The Elbow Method Graph

Activate Windows  
Go to Settings to activate Windows.

Type here to search 27°C Cloudy 16:54 22-10-2022

