Assignment 5

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21BIT0023

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

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

	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 × 5 columns

```
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
```

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

```
df.head()
```

	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

```
df.isnull().any()
```

```
Gender                  False
Age                     False
Annual Income (k$)      False
```

```
Spending Score (1-100)    False
dtype: bool
```

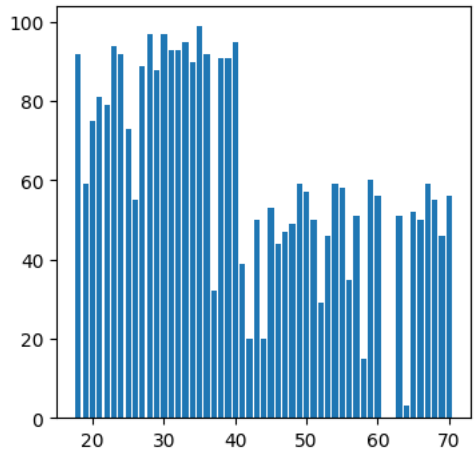
```
df.describe()
```

	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

```
import matplotlib.pyplot as plt
import seaborn as sns
```

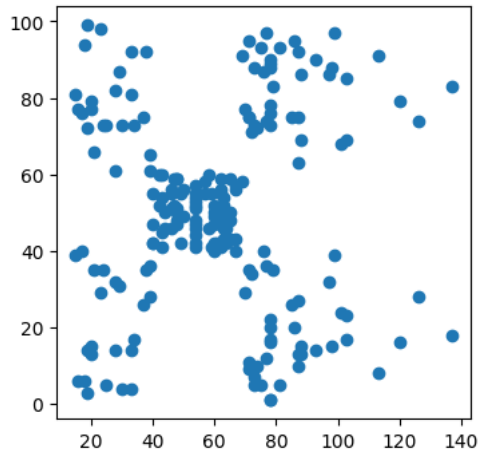
```
plt.figure(figsize=(4,4))
plt.bar(df['Age'], df['Spending Score (1-100)'])
```

```
<BarContainer object of 200 artists>
```



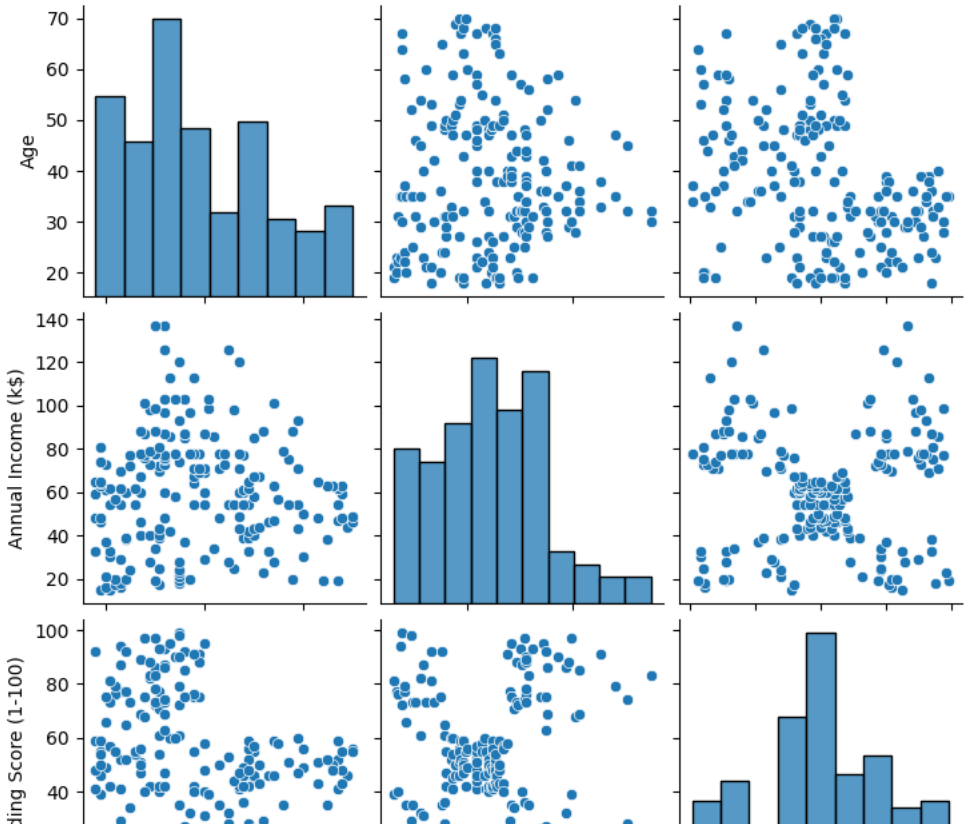

```
plt.figure(figsize=(4,4))
plt.scatter(df['Annual Income (k$)'], df['Spending Score (1-100)'])
```

```
<matplotlib.collections.PathCollection at 0x7a4b62fc8370>
```




```
sns.pairplot(df)
```

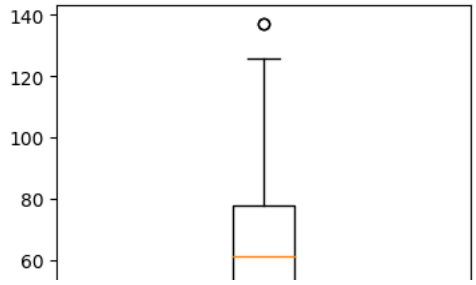
```
<seaborn.axisgrid.PairGrid at 0x7a4b62df7e20>
```



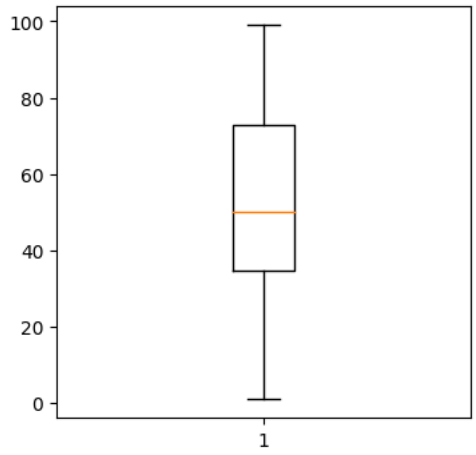

```
plt.figure(figsize=(4,4))
sns.heatmap(df.corr(),annot=True)
```

```
<ipython-input-13-6aab38f112ea>:2: FutureWarning: The default value of numeric_only in DataFrame.corr is deprecated. In a future ver
  sns.heatmap(df.corr(),annot=True)
<Axes: >
```

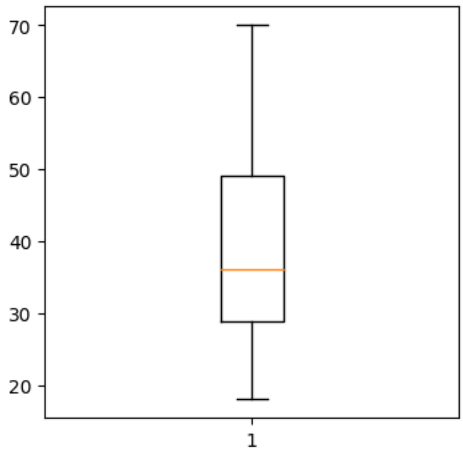

```
plt.figure(figsize=(4,4))
plt.boxplot(df['Annual Income (k$)'])
plt.show()
```




```
plt.figure(figsize=(4,4))
plt.boxplot(df['Spending Score (1-100)'])
plt.show()
```




```
plt.figure(figsize=(4,4))
plt.boxplot(df['Age'])
plt.show()
```




```
q1=df['Annual Income (k$)'].quantile(0.25)
q3=df['Annual Income (k$)'].quantile(0.75)
IQR=q3-q1
upper_limit=q3+(1.5*IQR)
lower_limit=q1-(1.5*IQR)
```

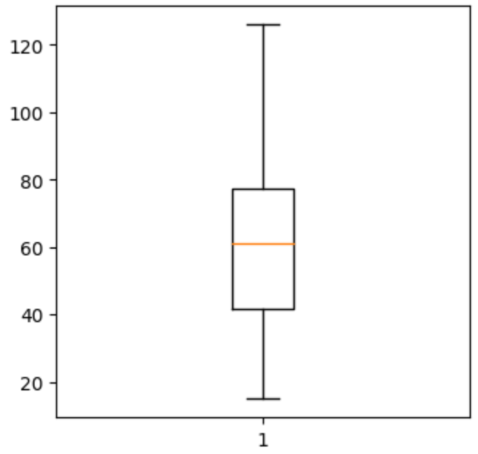
```
df.median()
```

```
<ipython-input-18-6d467abf240d>:1: FutureWarning: The default value of numeric_only in DataFrame.median is deprecated. In a future v
  df.median()
Age                     36.0
Annual Income (k$)      61.5
Spending Score (1-100)  50.0
dtype: float64
```

```
df['Annual Income (k$)']=np.where(df['Annual Income (k$)']>upper_limit,61.5,df['Annual Income (k$)'])
```

```
plt.figure(figsize=(4,4))
plt.boxplot(df['Annual Income (k$)'])
```

```
plt.show()
```




```
from sklearn.preprocessing import LabelEncoder
le = LabelEncoder()
df['Gender'] = le.fit_transform(df['Gender'])
df.head()
```

	Gender	Age	Annual Income (k$)	Spending Score (1-100)
0	1	19	15.0	39
1	1	21	15.0	81
2	0	20	16.0	6
3	0	23	16.0	77
4	0	31	17.0	40

```
from sklearn.preprocessing import MinMaxScaler
scale=MinMaxScaler()
df=pd.DataFrame(scale.fit_transform(df),columns=df.columns)
df.head()
```

	Gender	Age	Annual Income (k$)	Spending Score (1-100)
0	1.0	0.019231	0.000000	0.387755
1	1.0	0.057692	0.000000	0.816327
2	0.0	0.038462	0.009009	0.051020
3	0.0	0.096154	0.009009	0.775510
4	0.0	0.250000	0.018018	0.397959

```
from sklearn import cluster
```

```
error=[]
for i in range(1,11):
  kmeans = cluster.KMeans(n_clusters=i,init = 'k-means++',random_state=0)
  kmeans.fit(df)
  error.append(kmeans.inertia_)
```

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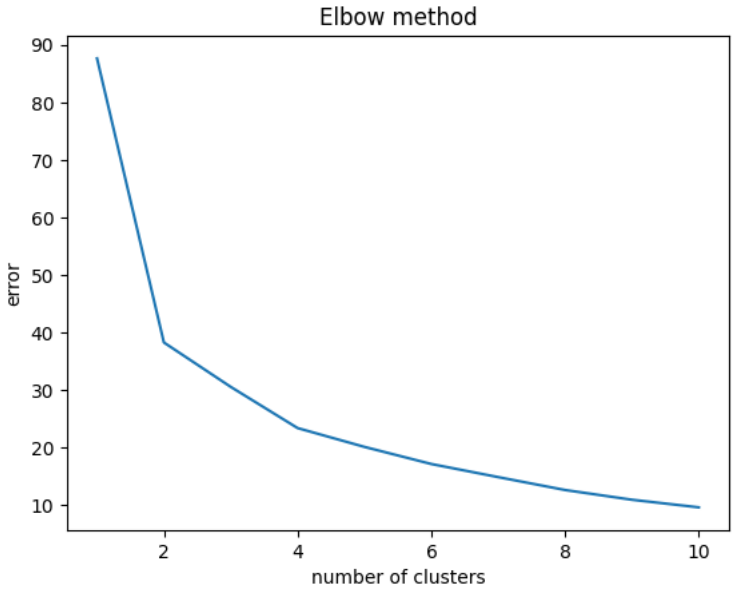

```
error
```

```
[87.64248645238291,
 38.256261727718496,
 30.53615452035327,
 23.37397528270042,
 20.102172077784857,
 17.128172918518988,
 14.850573520364879,
 12.608723763869847,
 10.917668890407121,
 9.591940516007261]
```

```
plt.plot(range(1,11),error)
plt.title('Elbow method')
plt.xlabel('number of clusters')
plt.ylabel('error')
plt.show()
```




```
km_model = cluster.KMeans(n_clusters=4,init = 'k-means++',random_state=0)
```

```
km_model.fit(df)
```

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

```
KMeans(n_clusters=4, random_state=0)
```

```
pred = km_model.predict(df)
pred
```

```
array([3, 3, 2, 1, 1, 1, 2, 1, 0, 1, 0, 1, 2, 1, 0, 3, 2, 3, 0, 1, 0, 3,
       2, 3, 2, 3, 2, 3, 2, 1, 0, 1, 0, 3, 2, 1, 2, 1, 2, 1, 2, 3, 0, 1,
       2, 1, 2, 1, 1, 1, 2, 3, 1, 0, 2, 0, 2, 0, 1, 0, 0, 3, 2, 2, 0, 3,
       2, 2, 3, 1, 0, 2, 2, 2, 0, 3, 2, 0, 1, 2, 0, 3, 0, 2, 1, 0, 2, 1,
       1, 2, 2, 3, 0, 2, 1, 3, 2, 1, 0, 3, 1, 2, 0, 3, 0, 1, 2, 0, 0, 0,
       0, 1, 2, 3, 1, 1, 2, 2, 2, 2, 3, 2, 1, 3, 1, 1, 0, 3, 0, 3, 0, 3,
       1, 1, 0, 1, 2, 3, 0, 1, 2, 3, 1, 1, 0, 3, 0, 1, 2, 3, 0, 3, 2, 1,
       2, 1, 0, 1, 0, 1, 2, 1, 0, 1, 0, 1, 0, 1, 2, 3, 0, 3, 0, 3, 2, 1,
       0, 3, 0, 3, 2, 1, 0, 1, 2, 3, 2, 3, 2, 1, 2, 1, 0, 1, 2, 1, 2, 3,
       0, 3], dtype=int32)
```

```
km_model.predict([[1,0.2,0.07,0.8]])
```

```
/usr/local/lib/python3.10/dist-packages/sklearn/base.py:439: UserWarning: X does not have valid feature names, but KMeans was fitte
  warnings.warn(
array([3], dtype=int32)
```

```
km_model.predict([[0,0.2,0.07,0.8]])
```

```
/usr/local/lib/python3.10/dist-packages/sklearn/base.py:439: UserWarning: X does not have valid feature names, but KMeans was fitte
  warnings.warn(
array([1], dtype=int32)
```