Pavithra S 21BIT0389 Assignment 5

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

```
df.head()
```

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()
```

```
Annual Income (k$)        False
Spending Score (1-100)    False
dtype: bool
```

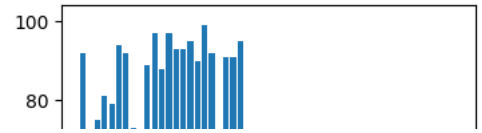
```
df.describe()
```

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

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

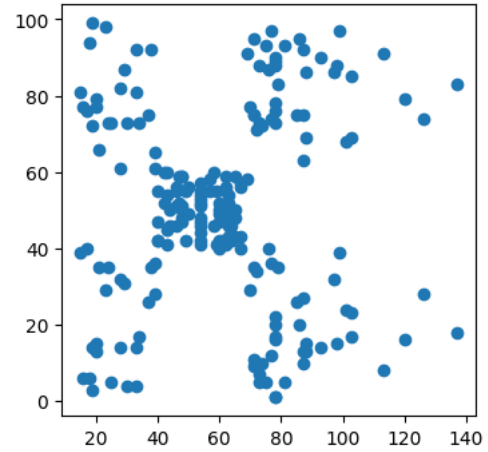
```
plt.figure(figsize=(4,4))
plt.bar(df['Age'],df['Spending Score (1-100)'])
```

```
<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 0x7c52e32c8310>
```

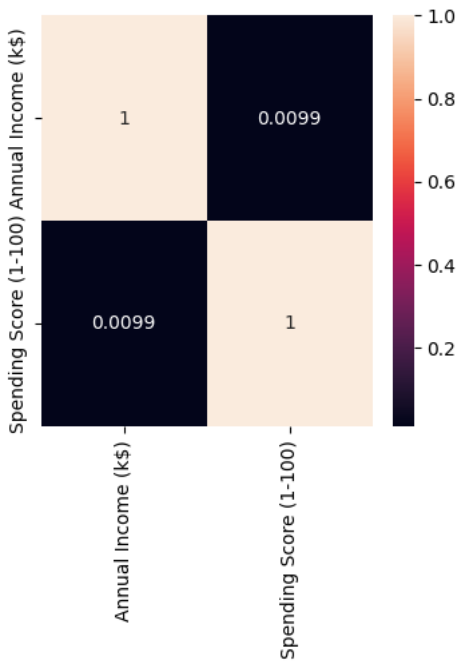



```
sns.pairplot(df)
```

```
<seaborn.axisgrid.PairGrid at 0x7c52de9d4130>
```

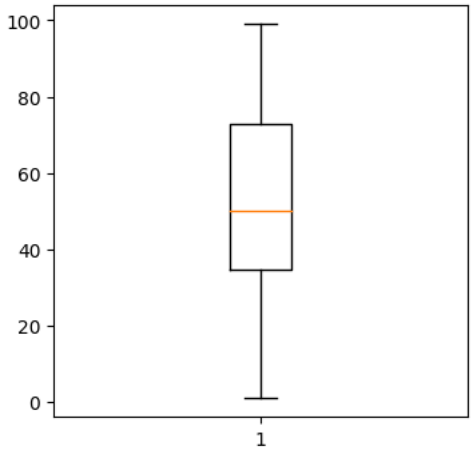

```
plt.figure(figsize=(4,4))
sns.heatmap(df.corr(),annot=True)
```

```
<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()
```



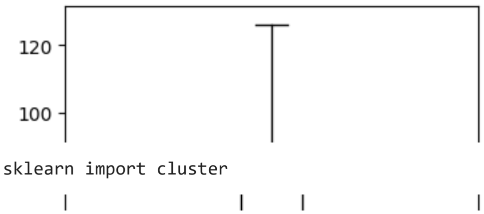

```
q1=df['Annual Income (k$)'].quantile(0.25)
q3=df['Annual Income (k$)'].quantile(0.75)
IQR=q3-q1
upper_limit=q3+(1.5*IQR)
lower_limit=q1-(1.5*IQR)
```

```
df.median()
```

```
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 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 from 10 to 'auto' in 1.4. Set the value of `n_init` e
  warnings.warn(
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:870: FutureWarning: The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_init` e
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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 from 10 to 'auto' in 1.4. Set the value of `n_init` e
  warnings.warn(
```
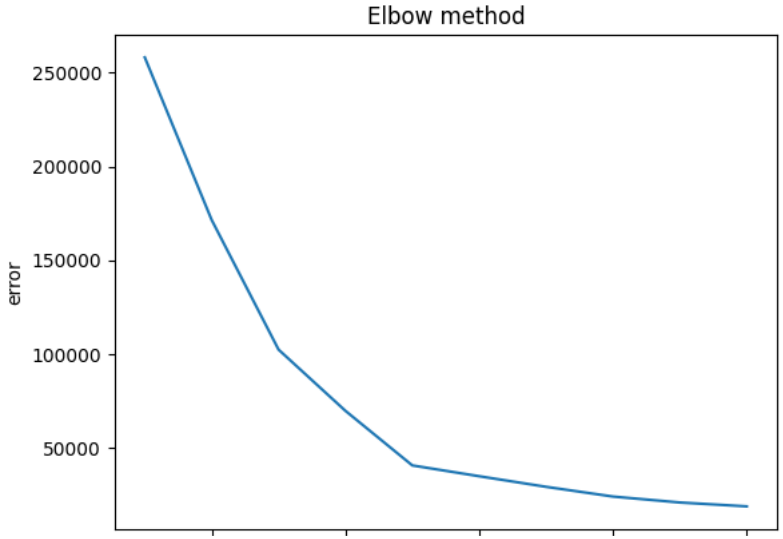

```
error
```

```
[258182.89500000005,
 171461.67386954778,
 102283.01391906125,
 69614.42989643844,
 40494.033637799395,
 34728.61250605758,
 29079.527525982565,
 23885.154432307656,
 20710.67806616173,
 18654.24865249818]
```

```
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=5,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` wi
  warnings.warn(
```

```
KMeans(n_clusters=5, random_state=0)
```

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

```
array([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, 3, 1,
       3, 4, 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, 1, 2, 0, 2, 0, 2,
       0, 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)
```

```
km_model.predict([[17,70]])
```

```
/usr/local/lib/python3.10/dist-packages/sklearn/base.py:439: UserWarning: X does not have valid feature names, but KMeans was fitted with feature names
  warnings.warn(
array([4], dtype=int32)
```

```
km_model.predict([[130,6]])
```

```
/usr/local/lib/python3.10/dist-packages/sklearn/base.py:439: UserWarning: X does not have valid feature names, but KMeans was fitted with feature names
  warnings.warn(
array([0], dtype=int32)
```

```
km_model.predict([[75,75]])
```

```
/usr/local/lib/python3.10/dist-packages/sklearn/base.py:439: UserWarning: X does not have valid feature names, but KMeans was fitted with feature names
  warnings.warn(
array([2], dtype=int32)
```