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Task - 5

```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import warnings
warnings.filterwarnings('ignore')
```

Double-click (or enter) to edit

Load the dataset.

```
data = pd.read_csv("Mall_Customers.csv")
data
```

	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

Data preprocessing.

```
data.shape
```

```
(200, 5)
```

```
data.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

```
data.isnull().any()
```

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

```
data.isnull().sum()
```

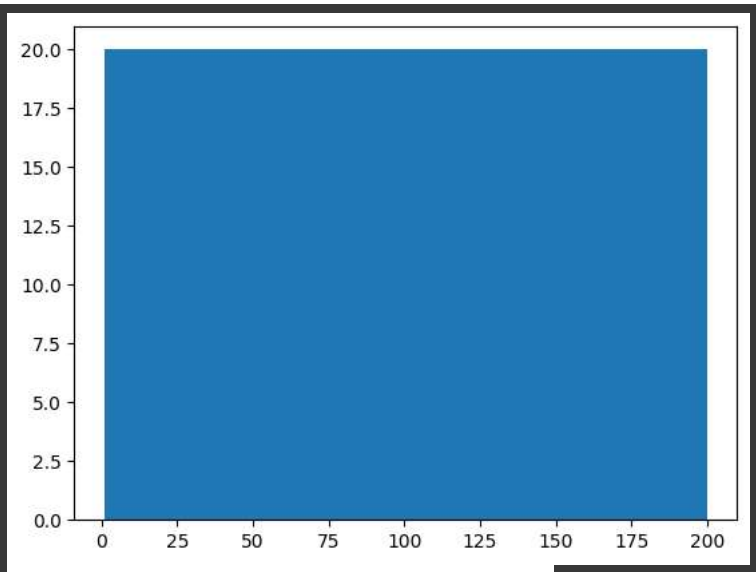
```
CustomerID              0
Gender                  0
Age                     0
Annual Income (k$)      0
Spending Score (1-100)  0
dtype: int64
```

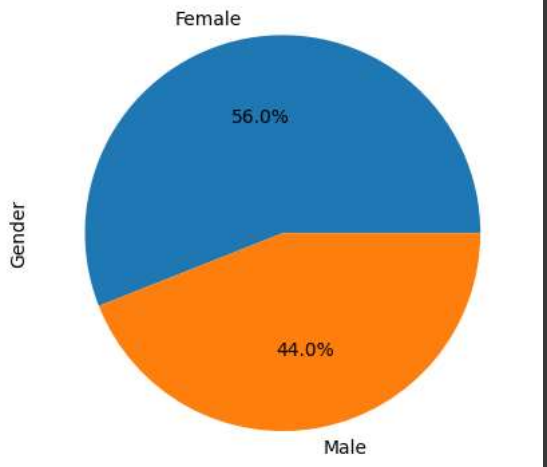
```
data.info()
```

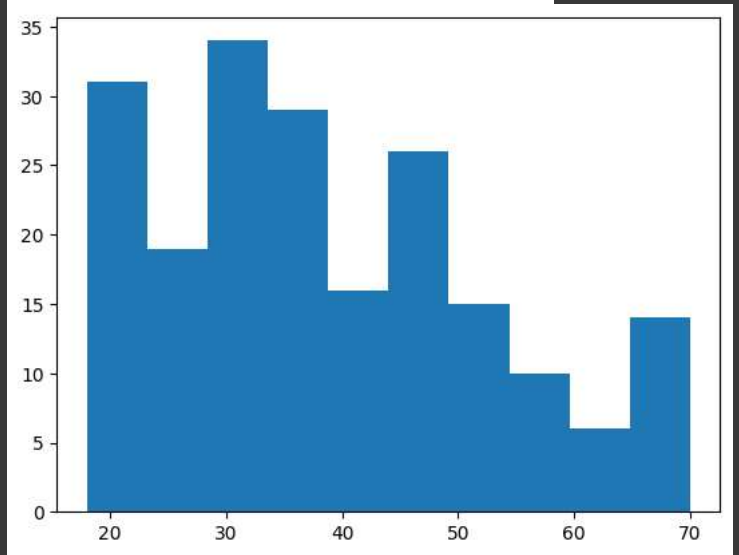
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 200 entries, 0 to 199
Data columns (total 5 columns):
 #   Column                  Non-Null Count  Dtype
---  ------                  --------------  -----
 0   CustomerID              200 non-null    int64
 1   Gender                  200 non-null    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
```

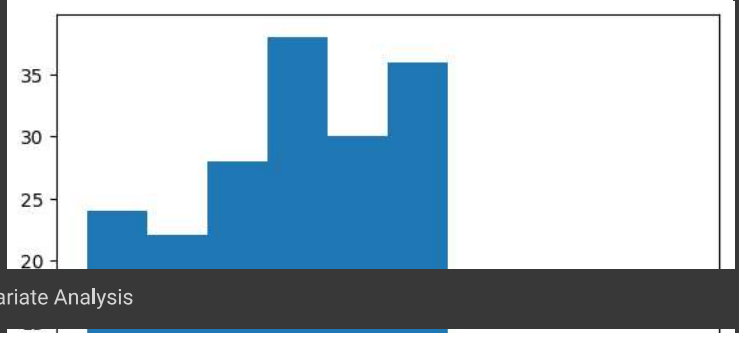
Uni Variate Analysis

```
for i in data.columns:
    if(i!='Gender'):
        plt.hist(data[i])
        plt.show()
    else:
        data[i].value_counts().plot.pie(autopct='%1.1f%%')
        plt.show()
```





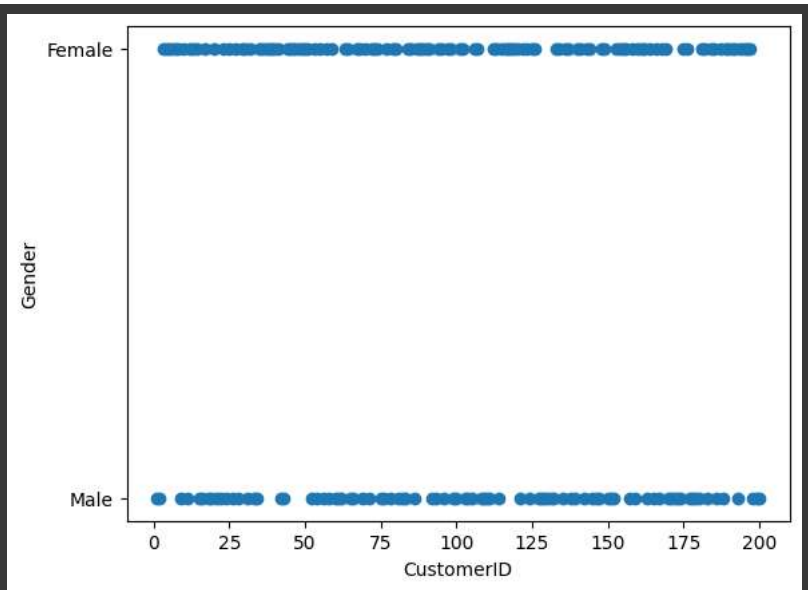


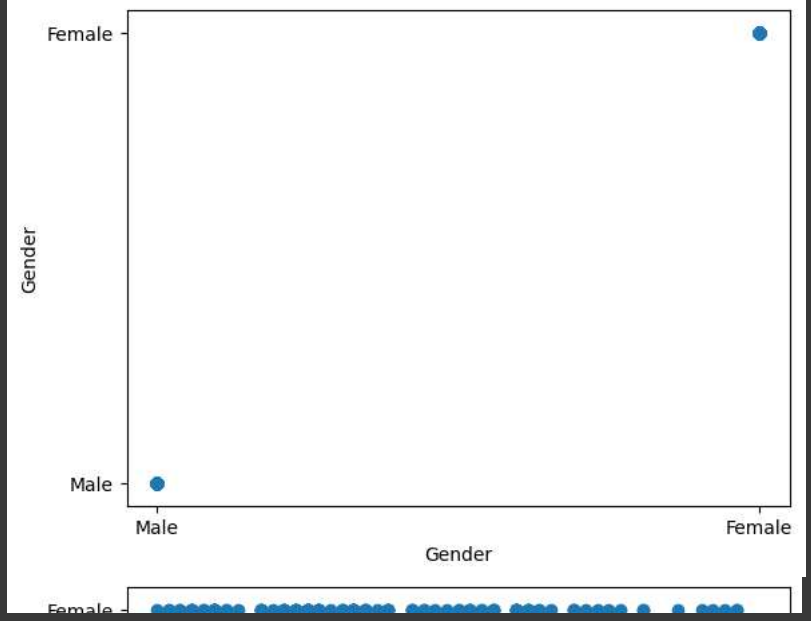


Bi Variate Analysis

Scatter Plot

```
for i in data.columns:
  plt.scatter(data[i],data['Gender'])
  plt.xlabel(i)
  plt.ylabel("Gender")
  plt.show()
```



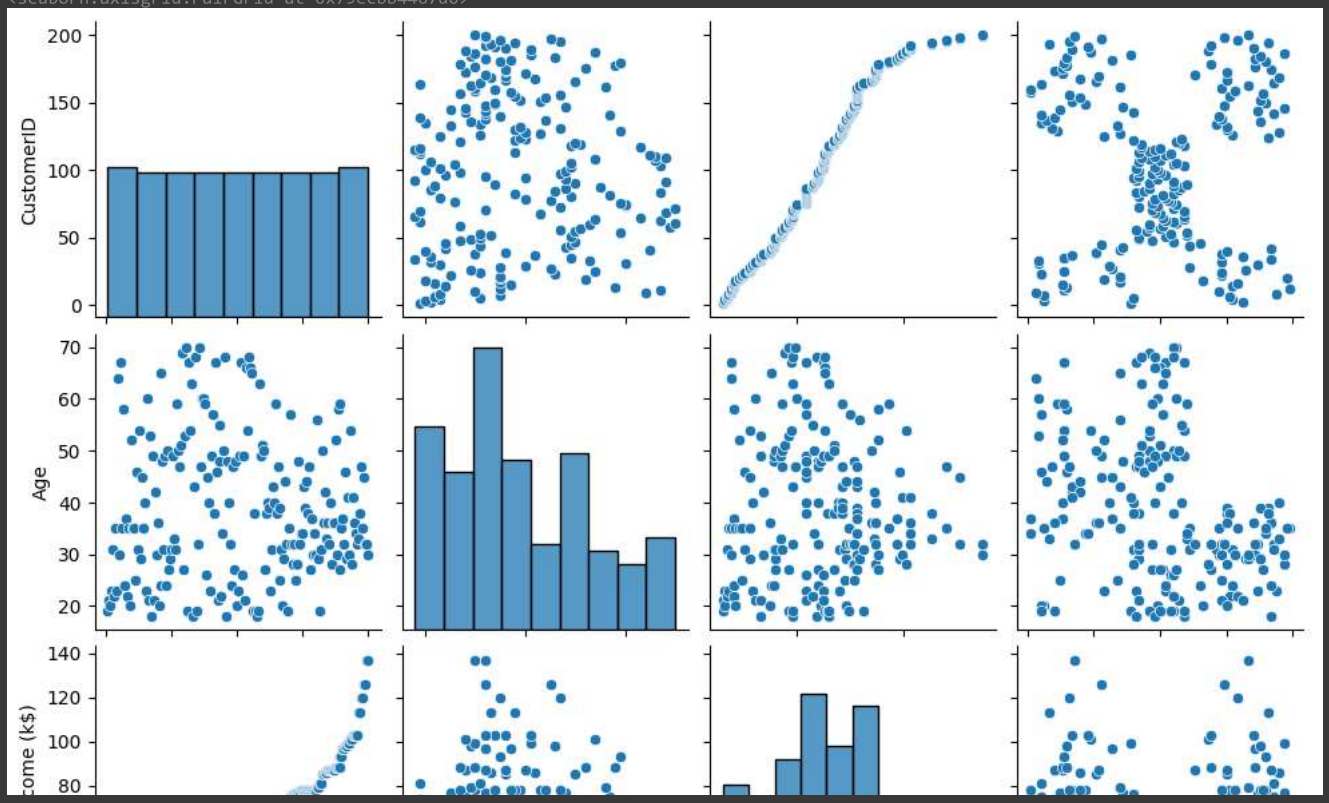


Multivariate Variate Analysis

Pairplot

```
sns.pairplot(data)
```

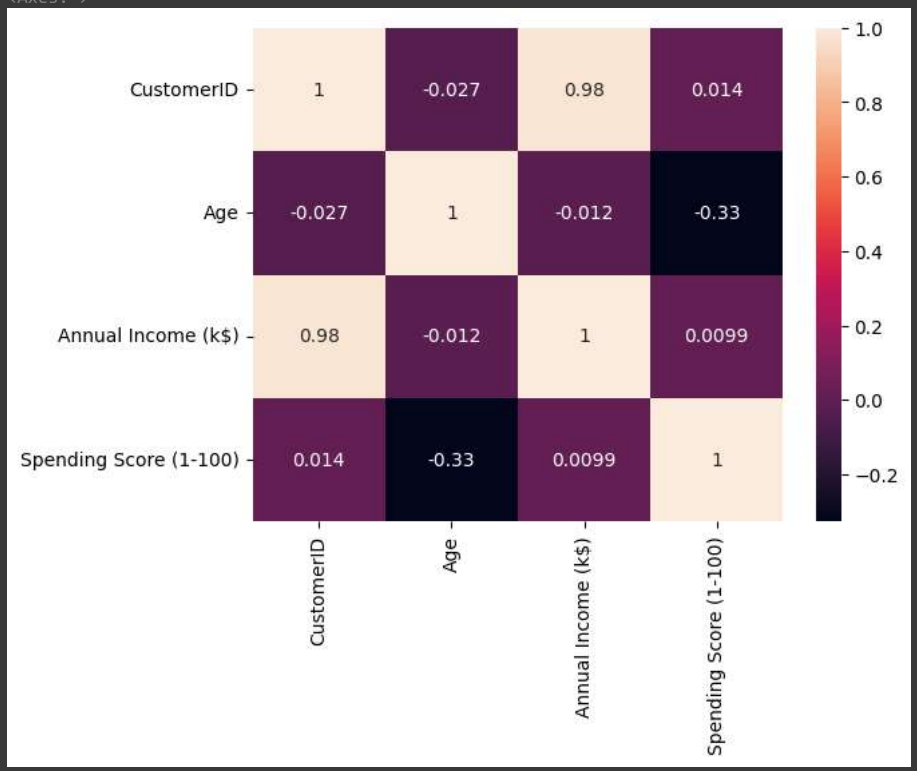
```
<seaborn.axisgrid.PairGrid at 0x79ecbb4467d0>
```



Heatmap

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

```
<Axes: >
```



Machine Learning approach with clustering algorithm

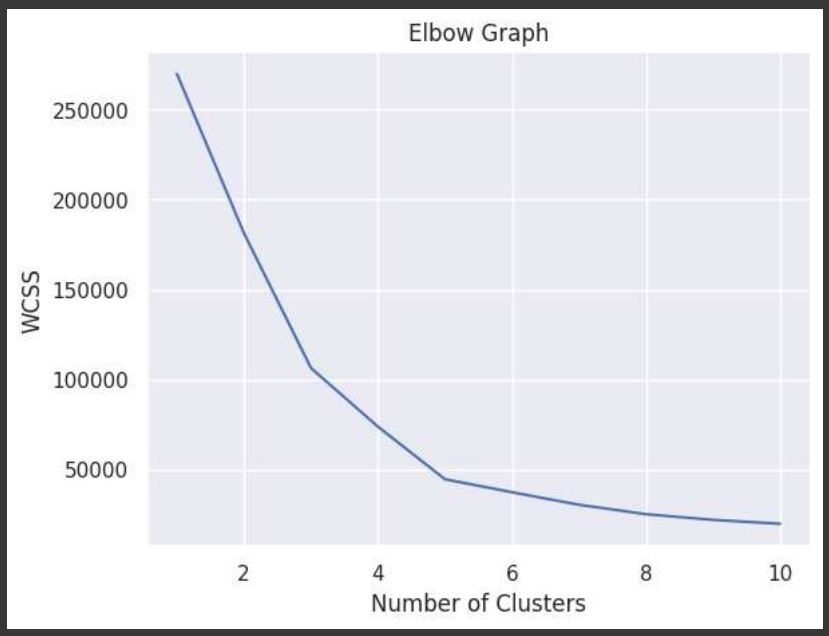
```
from sklearn.cluster import KMeans
```

```
data.Gender = data.Gender.map({'Male':1,"Female":0})
```

```
wcss = []

for i in range(1,11):
    kmeans = KMeans(n_clusters=i,init='k-means++',random_state=42)
    kmeans.fit(data.drop(columns = ['CustomerID',"Age","Gender"]))
    wcss.append(kmeans.inertia_)
```

```
sns.set()
plt.plot(range(1,11),wcss)
plt.title('Elbow Graph')
plt.xlabel('Number of Clusters')
plt.ylabel('WCSS')
plt.show()
```



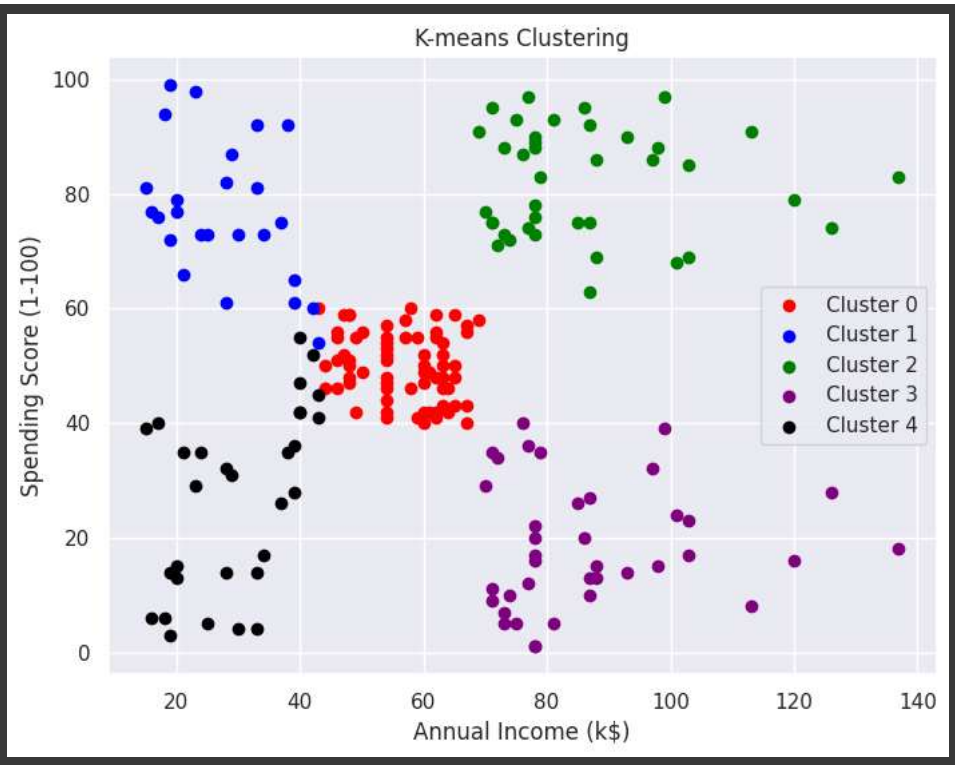

```
model = KMeans(n_clusters = 5)
data['cluster'] = model.fit_predict(data)
```

```
plt.figure(figsize=(8, 6))

colors = ['red', 'blue', 'green', 'purple','black']

for cluster_label, color in zip(range(5), colors):
    cluster_data = data[data['cluster'] == cluster_label]
    plt.scatter(cluster_data['Annual Income (k$)'], cluster_data['Spending Score (1-100)'], c=color, label=f'Cluster {cluster_label}')

plt.title('K-means Clustering')
plt.xlabel('Annual Income (k$)')
plt.ylabel('Spending Score (1-100)')
plt.legend()
plt.show()
```


K-means Clustering
Spending Score (1-100)
Annual Income (k$)
Cluster 0
Cluster 1
Cluster 2
Cluster 3
Cluster 4
0
20
40
60
80
100
20
40
60
80
100
120
140