Experiment No. 5
Apply appropriate Unsupervised Learning Technique on the Wholesale Customers Dataset
Date of Performance:
Date of Submission:

Aim: Apply appropriate Unsupervised Learning Technique on the Wholesale Customers Dataset.

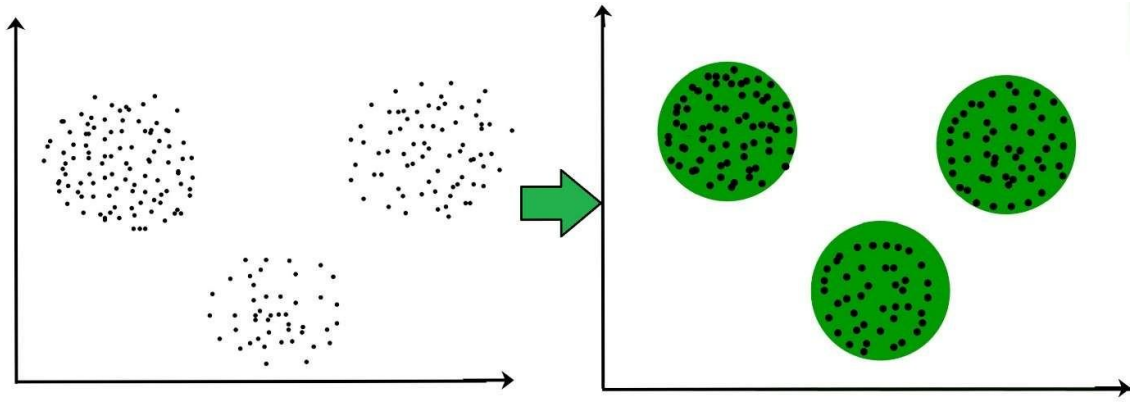
Objective: Able to perform various feature engineering tasks, apply Clustering Algorithm on the given dataset.

Theory:

It is basically a type of unsupervised learning method. An unsupervised learning method is a method in which we draw references from datasets consisting of input data without labeled responses. Generally, it is used as a process to find meaningful structure, explanatory underlying processes, generative features, and groupings inherent in a set of examples.

Clustering is the task of dividing the population or data points into a number of groups such that data points in the same groups are more similar to other data points in the same group and dissimilar to the data points in other groups. It is basically a collection of objects on the basis of similarity and dissimilarity between them.

For example: The data points in the graph below clustered together can be classified into one single group. We can distinguish the clusters, and we can identify that there are 3 clusters in the below picture.



Dataset:

This data set refers to clients of a wholesale distributor. It includes the annual spending in monetary units (m.u.) on diverse product categories. The wholesale distributor operating in different regions of Portugal has information on annual spending of several items in their stores across different regions and channels. The dataset consist of 440 large retailers annual spending on 6 different varieties of product in 3 different regions (lisbon , oporto, other) and across different sales channel (Hotel, channel) Detailed overview of dataset

Records in the dataset = 440 ROWS

Columns in the dataset = 8 COLUMNS

FRESH: annual spending (m.u.) on fresh products (Continuous)

MILK:- annual spending (m.u.) on milk products (Continuous)

GROCERY:- annual spending (m.u.) on grocery products (Continuous)

FROZEN:- annual spending (m.u.) on frozen products (Continuous)

DETERGENTS_PAPER :- annual spending (m.u.) on detergents and paper products (Continuous)

DELICATESSEN:- annual spending (m.u.)on and delicatessen products (Continuous);

CHANNEL: - sales channel Hotel and Retailer

REGION:- three regions (Lisbon, Oporto, Other)

Conclusion:

1. After applying K-Means clustering to the data in the provided code, you can use the clustered data to segment customers or data points into meaningful groups. These clusters can serve various purposes, including understanding customer behavior, targeting marketing efforts, or personalizing recommendations.By analyzing the characteristics of each cluster and visualizing how features vary across clusters, you can gain insights and make data-driven decisions.

2. Segment your customers into groups (e.g., Cluster 1, Cluster 2, Cluster 3) using clustering analysis. Then, implement a specific delivery scheme and measure how each customer segment responds in terms of satisfaction, order frequency, and other relevant metrics. Tailor the delivery scheme based on the unique responses of each segment to optimize its effectiveness.

```
# Import necessary libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from sklearn.preprocessing import StandardScaler
from sklearn.cluster import KMeans
from sklearn.decomposition import PCA
```

```
# Load the Wholesale Customers Dataset
data = pd.read_csv('/content/Wholesale customers data.csv')
```

```
print(data.head())
```

```
   Channel  Region  Fresh  Milk  Grocery  Frozen  Detergents_Paper  Delicassen
0        2       3  12669  9656     7561     214              2674        1338
1        2       3   7057  9810     9568    1762              3293        1776
2        2       3   6353  8808     7684    2405              3516        7844
3        1       3  13265  1196     4221    6404               507        1788
4        2       3  22615  5410     7198    3915              1777        5185
```

```
# Extract the features (excluding the 'Channel' and 'Region' columns)
features = data.drop(['Channel', 'Region'], axis=1)
```

```
# Perform feature scaling using StandardScaler
scaler = StandardScaler()
scaled_features = scaler.fit_transform(features)
```

```
pca = PCA(n_components=2)
principal_components = pca.fit_transform(scaled_features)
principal_df = pd.DataFrame(data=principal_components, columns=['PC1', 'PC2'])
```

```
# Determine the optimal number of clusters using the Elbow Method
wcss = []
for i in range(1, 11):
    kmeans = KMeans(n_clusters=i, init='k-means++', random_state=42)
    kmeans.fit(principal_df)
    wcss.append(kmeans.inertia_)
```

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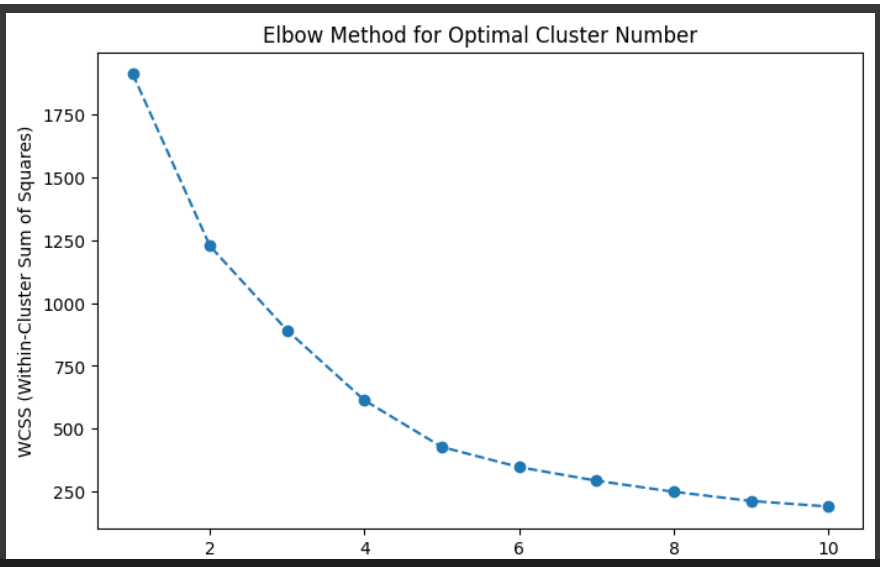

```
# Plot the Elbow Method graph to choose the optimal number of clusters
plt.figure(figsize=(8, 5))
plt.plot(range(1, 11), wcss, marker='o', linestyle='--')
plt.title('Elbow Method for Optimal Cluster Number')
plt.xlabel('Number of Clusters')
plt.ylabel('WCSS (Within-Cluster Sum of Squares)')
plt.show()
```




```
num_clusters = 3
```

```
# Apply K-Means clustering with the chosen number of clusters
kmeans = KMeans(n_clusters=num_clusters, init='k-means++', random_state=42)
cluster_labels = kmeans.fit_predict(principal_df)
```

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

```
# Add cluster labels to the dataset
data['Cluster'] = cluster_labels
```

```
# Display the first few rows of the dataset with cluster labels
print(data.head())
```

```
   Channel  Region  Fresh  Milk  Grocery  Frozen  Detergents_Paper  \
0        2       3  12669  9656     7561     214              2674
1        2       3   7057  9810     9568    1762              3293
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3        1       3  13265  1196     4221    6404               507
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   Delicassen  Cluster
0        1338        0
1        1776        0
2        7844        0
3        1788        0
4        5185        0
```
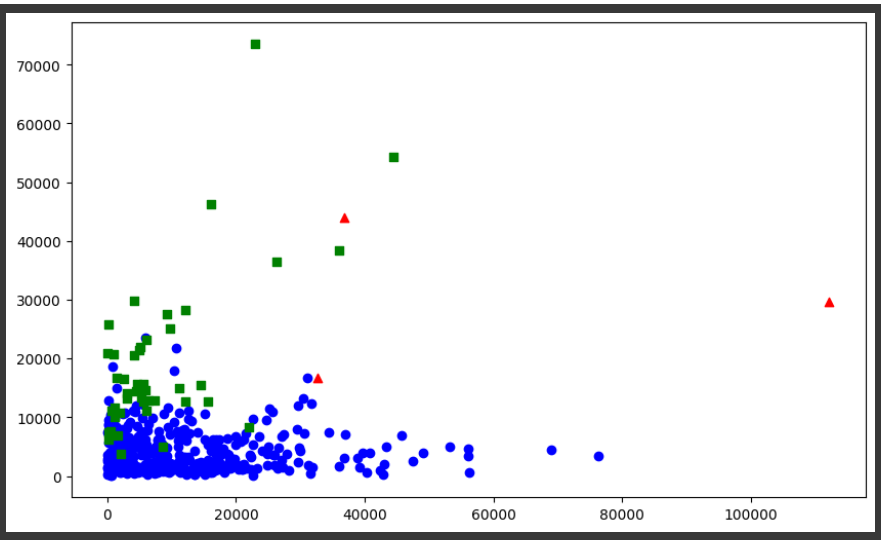
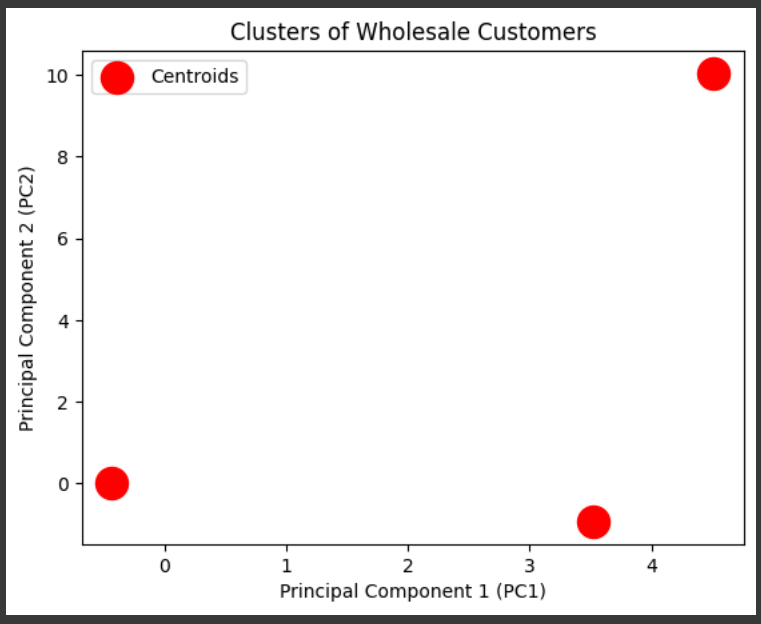

```
print(data.columns)
```

```
Index(['Channel', 'Region', 'Fresh', 'Milk', 'Grocery', 'Frozen',
       'Detergents_Paper', 'Delicassen', 'Cluster'],
      dtype='object')
```

```
colors = ['b', 'g', 'r', 'c', 'm', 'y', 'k']
markers = ['o', 's', '^', 'v', 'D', 'p', 'H']

plt.figure(figsize=(10, 6))
for cluster in range(num_clusters):
    cluster_data = data[data['Cluster'] == cluster]
    plt.scatter(
        cluster_data['Fresh'],
        cluster_data['Milk'],
        label=f'Cluster {cluster + 1}',
        c=colors[cluster % len(colors)],
        marker=markers[cluster % len(markers)]
    )
```




```
plt.scatter(kmeans.cluster_centers_[:, 0], kmeans.cluster_centers_[:, 1], s=300, c='red', label='Centroids
plt.title('Clusters of Wholesale Customers')
plt.xlabel('Principal Component 1 (PC1)')
plt.ylabel('Principal Component 2 (PC2)')
plt.legend()
plt.show()
```

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        marker=markers[cluster % len(markers)]
    )
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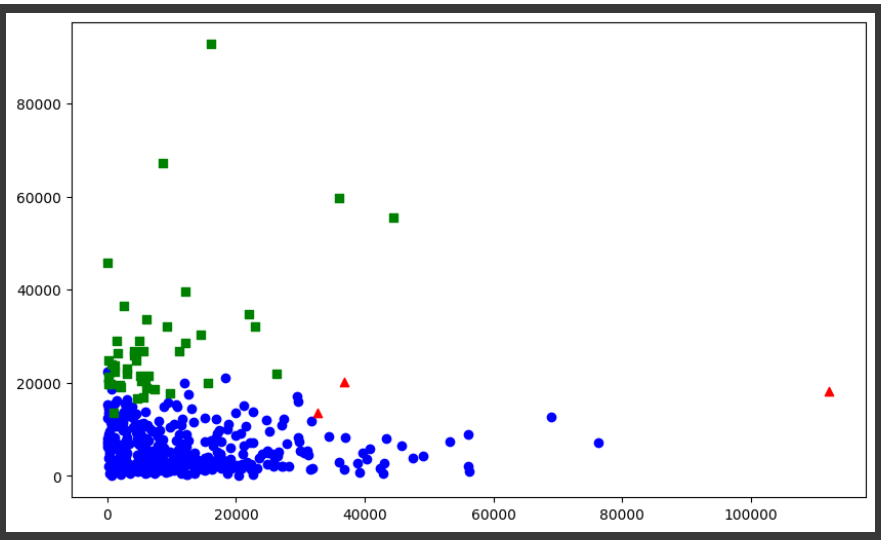


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