Marwadi University	Marwadi University Faculty of Technology Department of Information and Communication Technology	
Subject: Machine Learning (01CT1519)	**Aim: KMeans Clustering**	
Assignment No: 6	**Date:**	**Enrolment No:92301733046**

Code:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.cluster import KMeans
from sklearn.preprocessing import StandardScaler
from sklearn.decomposition import PCA

file_path = "/content/Analytics Challenge Data.xlsx"

df = pd.read_excel(file_path)
print("Data Loaded Successfully!\n")
print(df.head())

print("\n Dataset Info:")
print(df.info())

print("\n Summary Statistics:")
print(df.describe())

print("\n Missing Values:")
print(df.isnull().sum())

df = df.dropna()

scaler = StandardScaler()
```

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```
scaled_data = scaler.fit_transform(df.select_dtypes(include=np.number))
print("\n Data Scaled Successfully")

inertia = []
K = range(1, 11)
for k in K:
    kmeans = KMeans(n_clusters=k, random_state=42)
    kmeans.fit(scaled_data)
    inertia.append(kmeans.inertia_)

plt.figure(figsize=(8, 5))
plt.plot(K, inertia, 'bo-')
plt.xlabel('Number of Clusters (k)')
plt.ylabel('Inertia')
plt.title('Elbow Method for Optimal k')
plt.grid(True)
plt.show()

optimal_k = 4
kmeans = KMeans(n_clusters=optimal_k, random_state=42)
df['Cluster'] = kmeans.fit_predict(scaled_data)

print("\n K-Means Clustering Applied Successfully!")
print(df['Cluster'].value_counts())

pca = PCA(n_components=2)
pca_result = pca.fit_transform(scaled_data)
```

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```
df['PCA1'] = pca_result[:, 0]
df['PCA2'] = pca_result[:, 1]

plt.figure(figsize=(8, 6))
sns.scatterplot(data=df, x='PCA1', y='PCA2', hue='Cluster', palette='viridis', s=80)
plt.title('Customer Segments (PCA Projection)')
plt.show()

numeric_cols = df.select_dtypes(include=np.number).columns
cluster_summary = df.groupby('Cluster')[numeric_cols].mean()

print("\n Cluster Summary (Average Values per Cluster):")
print(cluster_summary)

print(" - Low engagement users. Retarget with ads or recommendation emails to increase activity.")
print(" - Columns differ in this dataset; review numeric features for marketing insights.")
```

output:

```
/usr/local/lib/python3.12/dist-packages/openpyxl/worksheet/_reader.py:329: UserWarning:
Unknown extension is not supported and will be removed
  warn(msg)
✅ Data Loaded Successfully!

        day  site  new_customer    platform  visits  distinct_sessions  \
0 2013-01-01  Acme           1.0     Android      24                 16
1 2013-01-01  Acme           1.0  BlackBerry       0                  0
```

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```
2 2013-01-01  Sortly        1.0      iPad     0            0
3 2013-01-01    Acme        1.0    Windows    922          520
4 2013-01-01   Botly        1.0    Android    11           10


  orders  gross_sales  bounces  add_to_cart  product_page_views  \
0     14      1287.0       4         16            104
1      0        13.0       0          0              1
2      0        98.0       0          0              0
3    527     60753.0     149        610           3914
4     11      1090.0       0         11              4


  search_page_views
0               192
1                 0
2                 0
3              7367
4                19


 Dataset Info:
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 21061 entries, 0 to 21060
Data columns (total 12 columns):
 #   Column           Non-Null Count  Dtype
---  ------           --------------  -----
 0   day              21061 non-null  datetime64[ns]
 1   site             21061 non-null  object
 2   new_customer     12802 non-null  float64
```

```
 3   platform          20651 non-null  object
 4   visits            21061 non-null  int64
 5   distinct_sessions   21061 non-null  int64
 6   orders            21061 non-null  int64
 7   gross_sales       11485 non-null  float64
 8   bounces           21061 non-null  int64
 9   add_to_cart       21061 non-null  int64
 10  product_page_views  21061 non-null  int64
 11  search_page_views   21061 non-null  int64
dtypes: datetime64[ns](1), float64(2), int64(7), object(2)
memory usage: 1.9+ MB
None

 Summary Statistics:
                      day  new_customer       visits  \
count                 21061  12802.000000   21061.000000
mean   2013-07-30 13:23:22.839371264     0.448055    1934.708039
min           2013-01-01 00:00:00      0.000000       0.000000
25%           2013-06-10 00:00:00      0.000000       3.000000
50%           2013-08-21 00:00:00      0.000000      24.000000
75%           2013-10-27 00:00:00      1.000000     360.000000
max           2013-12-31 00:00:00      1.000000  136057.000000
std                   NaN      0.497314    7448.607191

      distinct_sessions       orders    gross_sales       bounces  \
count      21061.000000  21061.000000   11485.000000  21061.000000
mean        1515.205024     62.378994   16473.395821    743.282085
```

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min	0.000000	0.000000	1.000000	0.000000
25%	2.000000	0.000000	79.000000	0.000000
50%	19.000000	0.000000	851.000000	5.000000
75%	274.000000	7.000000	3145.000000	97.000000
max	107104.000000	4916.000000	707642.000000	54512.000000
std	5925.833287	260.279286	51111.354605	3154.697787

	add_to_cart	product_page_views	search_page_views
count	21061.000000	21061.000000	21061.000000
mean	166.250890	4358.198234	8584.187788
min	0.000000	0.000000	0.000000
25%	0.000000	3.000000	4.000000
50%	4.000000	53.000000	82.000000
75%	43.000000	708.000000	1229.000000
max	7924.000000	187601.000000	506629.000000
std	505.186834	14327.287354	31120.321365

Missing Values:

day	0
site	0
new_customer	8259
platform	410
visits	0
distinct_sessions	0
orders	0
gross_sales	9576
bounces	0

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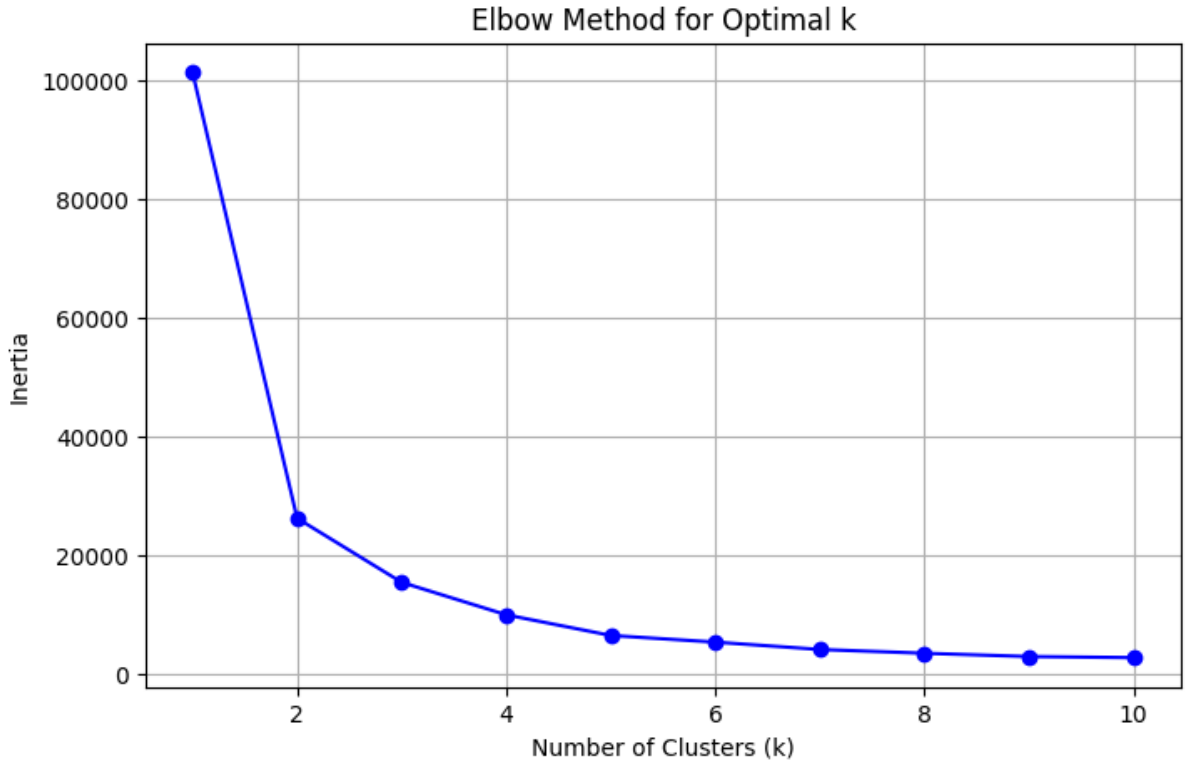
add_to_cart 0

product_page_views 0

search_page_views 0

dtype: int64

Data Scaled Successfully



K-Means Clustering Applied Successfully!

Cluster

2 5432

0 5229

3 397

1 194

Name: count, dtype: int64

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Cluster Summary (Average Values per Cluster):

Cluster	new_customer	visits	distinct_sessions	orders
0	0.00000	220.201759	167.498566	44.716963
1	0.00000	11896.546392	8187.876289	2035.886598
2	1.00000	76.961156	47.486561	46.419735
3	0.02267	7124.463476	4764.136020	1087.765743

Cluster	gross_sales	bounces	add_to_cart	product_page_views
0	6727.618474	46.926946	71.631287	873.425320

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1 299434.427835 2090.180412 3372.314433 40468.087629

2 5213.668630 12.102541 52.111561 292.613218

3 170222.984887 1917.596977 1800.350126 23598.322418

search_page_views Cluster PCA1 PCA2

Cluster

0 1234.582138 0.0 -0.434289 -1.012323

1 83221.201031 1.0 15.246718 0.516448

2 500.243925 2.0 -0.772183 0.966299

3 47388.052897 3.0 8.835088 -0.140282

- Low engagement users. Retarget with ads or recommendation emails to increase activity.

- Columns differ in this dataset; review numeric features for marketing insights.