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

```
# Load datasets
transactions_df = pd.read_csv('Transactions.csv')
products_df = pd.read_csv('Products.csv')
customers_df = pd.read_csv('Customers.csv')

```

```
#merging datasets for analysis
merged_df = transactions_df.merge(products_df, on="ProductID").merge(customers_df, on="Custo
```

```
print(merged_df)
```

```
    TransactionID CustomerID ProductID      TransactionDate  Quantity  \
0          T00001      C0199      P067  2024-08-25 12:38:23         1
1          T00112      C0146      P067  2024-05-27 22:23:54         1
2          T00166      C0127      P067  2024-04-25 07:38:55         1
3          T00272      C0087      P067  2024-03-26 22:55:37         2
4          T00363      C0070      P067  2024-03-21 15:10:10         3
..            ...        ...       ...                  ...       ...
995        T00496      C0118      P037  2024-10-24 08:30:27         1
996        T00759      C0059      P037  2024-06-04 02:15:24         3
997        T00922      C0018      P037  2024-04-05 13:05:32         4
998        T00959      C0115      P037  2024-09-29 10:16:02         2
999        T00992      C0024      P037  2024-04-21 10:52:24         1

     TotalValue  Price_x                    ProductName     Category  \
0        300.68   300.68  ComfortLiving Bluetooth Speaker  Electronics
1        300.68   300.68  ComfortLiving Bluetooth Speaker  Electronics
2        300.68   300.68  ComfortLiving Bluetooth Speaker  Electronics
3        601.36   300.68  ComfortLiving Bluetooth Speaker  Electronics
4        902.04   300.68  ComfortLiving Bluetooth Speaker  Electronics
..          ...      ...                              ...          ...
995      459.86   459.86             SoundWave Smartwatch  Electronics
996     1379.58   459.86             SoundWave Smartwatch  Electronics
997     1839.44   459.86             SoundWave Smartwatch  Electronics
998      919.72   459.86             SoundWave Smartwatch  Electronics
999      459.86   459.86             SoundWave Smartwatch  Electronics

     Price_y          CustomerName         Region  SignupDate
0     300.68        Andrea Jenkins         Europe  2022-12-03
1     300.68       Brittany Harvey           Asia  2024-09-04
2     300.68       Kathryn Stevens         Europe  2024-04-04
3     300.68       Travis Campbell  South America  2024-04-11
4     300.68         Timothy Perez         Europe  2022-03-15
..       ...                   ...            ...         ...
995   459.86            Jacob Holt  South America  2022-01-22
996   459.86  Mrs. Kimberly Wright  North America  2024-04-07
997   459.86          Tyler Haynes  North America  2024-09-21
998   459.86       Joshua Hamilton           Asia  2024-11-11
999   459.86        Michele Cooley  North America  2024-02-05

[1000 rows x 13 columns]
```

```
merged_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1000 entries, 0 to 999
Data columns (total 13 columns):
 #   Column           Non-Null Count  Dtype
---  ------           --------------  -----
 0   TransactionID    1000 non-null   object
 1   CustomerID       1000 non-null   object
 2   ProductID        1000 non-null   object
 3   TransactionDate  1000 non-null   object
 4   Quantity         1000 non-null   int64
 5   TotalValue       1000 non-null   float64
 6   Price_x          1000 non-null   float64
 7   ProductName      1000 non-null   object
 8   Category         1000 non-null   object
 9   Price_y          1000 non-null   float64
 10  CustomerName     1000 non-null   object
```

```
 11  Region          1000 non-null   object
 12  SignupDate      1000 non-null   object
dtypes: float64(3), int64(1), object(9)
memory usage: 101.7+ KB
```

```
merged_df.isnull().sum()
```

	0
TransactionID	0
CustomerID	0
ProductID	0
TransactionDate	0
Quantity	0
TotalValue	0
Price_x	0
ProductName	0
Category	0
Price_y	0
CustomerName	0
Region	0
SignupDate	0

dtype: int64

```
merged_df.describe().T
```

	count	mean	std	min	25%	50%	75%	max
Quantity	1000.0	2.53700	1.117981	1.00	2.000	3.00	4.00	4.00
TotalValue	1000.0	689.99556	493.144478	16.08	295.295	588.88	1011.66	1991.04
Price_x	1000.0	272.55407	140.736390	16.08	147.950	299.93	404.40	497.76
Price_y	1000.0	272.55407	140.736390	16.08	147.950	299.93	404.40	497.76

```
from sklearn.preprocessing import StandardScaler
from sklearn.metrics.pairwise import cosine_similarity
```

```
# Prepare customer profile dataset
customer_profile = merged_df.groupby("CustomerID").agg({
    "Region": "first",
    "TotalValue": "sum",
    "Quantity": "sum",
    "Category": lambda x: x.mode()[0]
}).reset_index()
```

```
 #Encode categorical features
customer_profile = pd.get_dummies(customer_profile, columns=["Region", "Category"], drop_fir
```

```
# Standardize numerical columns
scaler = StandardScaler()
customer_profile[["TotalValue", "Quantity"]] = scaler.fit_transform(customer_profile[["Total

```

```
customer_profile.to_csv('final_data.csv', index=False)
customer_profile.head()
```

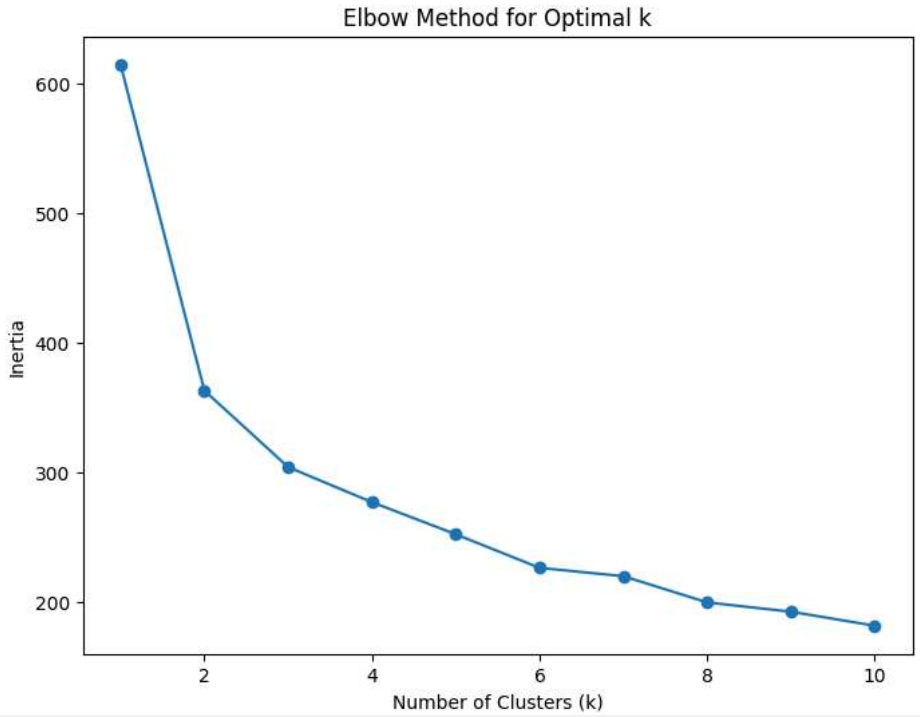
	CustomerID	TotalValue	Quantity	Region_Europe	Region_North America	Region_South America	Category_Clothing	Category_Electronics	Category_Ho Dec
0	C0001	-0.061701	-0.122033	False	False	True	False	True	Fa
1	C0002	-0.877744	-0.448000	False	False	False	True	False	Fa
2	C0003	-0.405857	0.203934	False	False	True	False	False	Tr
3	C0004	1.032547	1.670787	False	False	True	False	False	Fa

Pasos siguientes: Generar código con customer_profile | Ver gráficos recomendados | New interactive sheet

```
from sklearn.cluster import KMeans
from sklearn.metrics import davies_bouldin_score
```

```
# Prepare dataset for clustering
clustering_data = customer_profile.drop(columns=["CustomerID", "Similarity"], errors='ignore
```

```
# Elbow method
inertia = []
for k in range(1, 11):
    kmeans = KMeans(n_clusters=k, random_state=42)
    kmeans.fit(clustering_data)
    inertia.append(kmeans.inertia_)

# Plotting the elbow method
plt.figure(figsize=(8, 6))
plt.plot(range(1, 11), inertia, marker='o')
plt.title('Elbow Method for Optimal k')
plt.xlabel('Number of Clusters (k)')
plt.ylabel('Inertia')
plt.show()
```



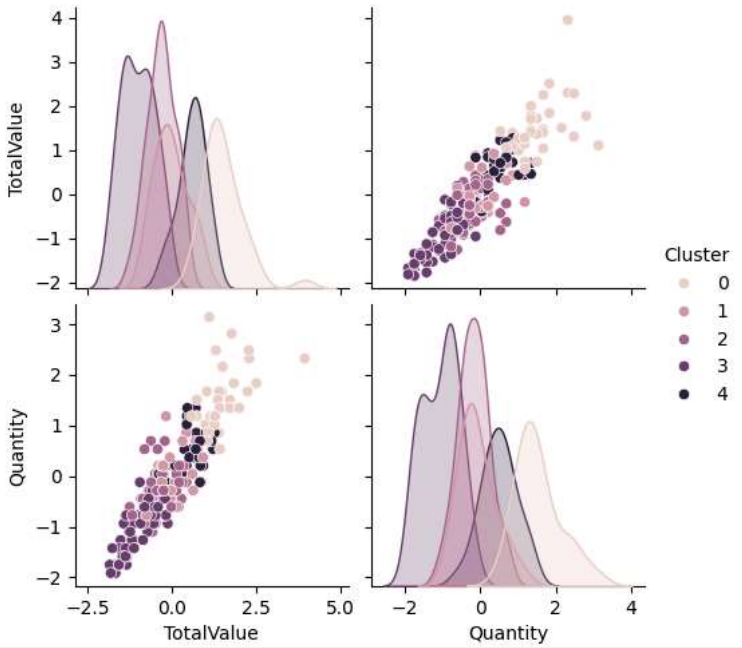

```
# Prepare dataset for clustering
clustering_data = customer_profile.drop(columns=["CustomerID", "Similarity"], errors='ignore

kmeans = KMeans(n_clusters=5, random_state=42)
customer_profile["Cluster"] = kmeans.fit_predict(clustering_data)
# Calculate Davies-Bouldin Index
```

```
db_index = davies_bouldin_score(clustering_data, customer_profile["Cluster"])
print("Davies-Bouldin Index:", db_index)
```

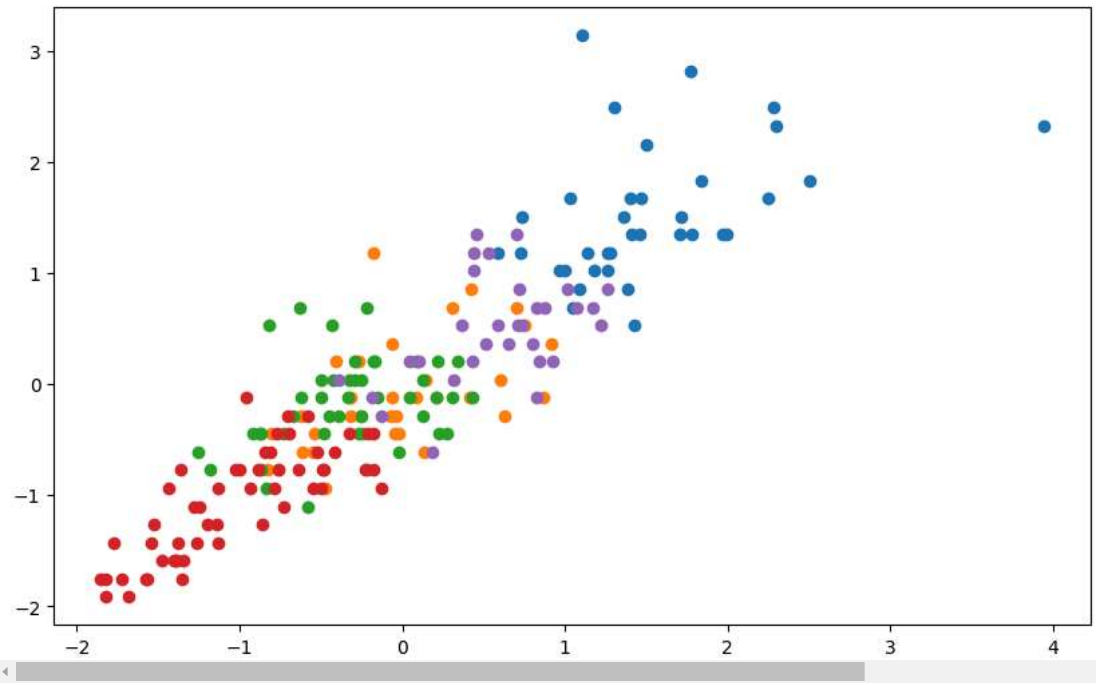
```
Davies-Bouldin Index: 1.4764601048668444
```

```
# Pairplot for visualizing relationships between variables and clusters
plt.figure(figsize=(16,12))
sns.pairplot(customer_profile, hue="Cluster", vars=["TotalValue", "Quantity"])
plt.show()
```

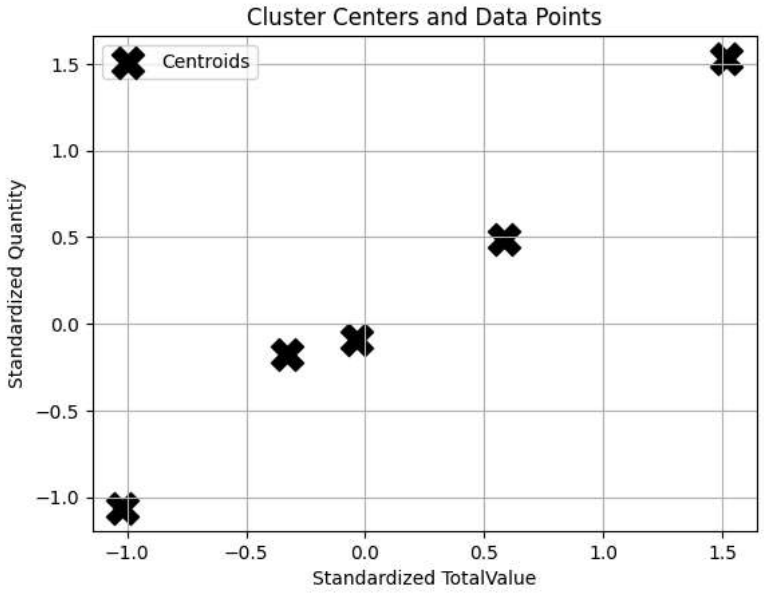
```
<Figure size 1600x1200 with 0 Axes>
```




```
#Visualize centroids in 2D space (if relevant)
plt.figure(figsize=(10, 6))
for cluster_id in range(kmeans.n_clusters):
    plt.scatter(
        clustering_data[customer_profile["Cluster"] == cluster_id]["TotalValue"],
        clustering_data[customer_profile["Cluster"] == cluster_id]["Quantity"],
        label=f"Cluster {cluster_id}"
    )
```



```
1
2  # Overlay centroids
3  centroids = kmeans.cluster_centers_
4  plt.scatter(centroids[:, 0], centroids[:, 1], s=300, c="black", marker="X",
   label="Centroids")
5  plt.title("Cluster Centers and Data Points")
6  plt.xlabel("Standardized TotalValue")
7  plt.ylabel("Standardized Quantity")
8  plt.legend()
9  plt.grid()
10 plt.show()
```



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