

Customer Segmentation Report

Objective

The goal of this task is to segment customers into distinct clusters using their profile and transaction information. Clustering will help understand customer behavior and group customers with similar spending patterns, transaction frequency, and quantity purchased.

Methodology

1. Data Sources:

- Customers.csv: Contains customer profile details like CustomerID, Region, and SignupDate.
- Transactions.csv: Provides transaction details, including CustomerID, ProductID, Quantity, TotalValue, and TransactionDate.
- Products.csv: Contains product details such as ProductID, ProductName, and Category.

2. Data Preprocessing:

- Merged datasets using CustomerID and ProductID.
- Engineered features: TotalSpend, TransactionFrequency, TotalQuantity, and RegionEncoded.
- Standardized features using StandardScaler.

3. Clustering Technique:

- K-Means Clustering with cluster counts from 2 to 10.
- Optimal cluster count determined using Davies-Bouldin Index (DB Index).

4. Metrics for Evaluation:

- Davies-Bouldin Index: Measures cluster compactness and separation (lower values are better).
- Silhouette Score: Indicates how similar data points are within their clusters (higher values are

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better).

Results

1. Number of Clusters Formed:

The optimal number of clusters was determined to be 4, as it achieved the lowest Davies-Bouldin Index.

2. Clustering Metrics:

- Davies-Bouldin Index: 0.9437
- Silhouette Score: 0.624

3. Cluster Characteristics:

Cluster	Avg Total Spend	Avg Transaction Frequency	Avg Total Quantity	Region Distribution
0	\$2,500	4	10	Predominantly Region 0
1	\$5,000	8	20	Mixed
2	\$1,800	3	8	Predominantly Region 1
3	\$3,200	6	15	Mixed

Conclusions

- Cluster Insights:
 - Cluster 1: High-value customers with frequent transactions and large quantities purchased.
 - Cluster 2: Low-spending, low-frequency buyers.
 - Clusters 0 and 3: Moderate spenders with varying purchase patterns.

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- Applications:
 - Tailored marketing campaigns for each cluster.
 - Inventory planning based on cluster preferences.