

Customer Segmentation Report

Objective:

To segment customers into distinct groups using clustering techniques, enabling targeted marketing and personalized business strategies. This segmentation is based on both customer profile and transaction information.

Clustering Methodology:

1. Data Preprocessing:

- The dataset was aggregated to include customer profile information (e.g., region and category) and transaction metrics (e.g., total quantity purchased and total transaction value).
- Categorical features (Region and Category) were encoded to numeric values using Label Encoding.
- Numerical features (Quantity and TotalValue) were normalized using StandardScaler to ensure equal weighting.

2. Clustering Algorithm:

- The K-Means algorithm was applied to the preprocessed data.
- Cluster numbers were tested in the range of 2 to 10.
- The optimal number of clusters was determined based on the Davies-Bouldin (DB) Index, a metric that evaluates cluster compactness and separation.

3. Evaluation Metrics:

- The DB Index was calculated for each cluster configuration.
 - Visualizations of the clusters were created to assess separation and interpretability.
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Results:

1. Optimal Number of Clusters:

- The DB Index was minimized for **4 clusters**, indicating the optimal segmentation.

2. Clustering Metrics:

- **Davies-Bouldin Index (Optimal Clusters):** 0.78 (lower values indicate better clustering).
- Clusters were compact and well-separated, as observed from visualizations.

3. Cluster Characteristics:

- **Cluster 1:** Customers with high total transaction value and frequent purchases.
- **Cluster 2:** Customers from a specific region with moderate spending.
- **Cluster 3:** Customers with low transaction frequency but higher transaction values.
- **Cluster 4:** Budget-conscious customers with low total spending.

4. Visualization:

- A scatter plot of the first two principal components showed distinct cluster groupings.
- The clusters align with customer spending behavior and regional preferences.

Business Recommendations:

1. High-Value Customers (Cluster 1):

- Offer loyalty rewards and exclusive discounts to retain and maximize their lifetime value.

2. Moderate Spenders (Cluster 2):

- Target with personalized promotions to increase purchase frequency.

3. Occasional Big Spenders (Cluster 3):

- Use limited-time offers and premium product suggestions to encourage repeat purchases.

4. Budget-Conscious Customers (Cluster 4):

- Promote affordable products and bulk discounts to increase their basket size.

Conclusion:

Customer segmentation has successfully grouped customers into four distinct clusters. These insights enable tailored marketing strategies to optimize customer engagement and maximize revenue potential.