

# Customer Segmentation and Clustering Report

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## Overview

This report presents the results of customer segmentation based on the eCommerce dataset, utilizing clustering techniques to identify distinct customer groups. These insights aim to guide targeted marketing strategies and enhance customer engagement.

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## Methodology

### 1. Data Preparation

- The Customers.csv and Transactions.csv datasets were merged using CustomerID.
- Key metrics such as Total Spent, Unique Products Purchased, and Total Transactions were aggregated for each customer.
- Data was standardized using StandardScaler to ensure fair weighting of features.

### 2. Clustering Algorithm

- The K-Means Clustering algorithm was applied, testing cluster sizes between 2 and 10 to determine the optimal number of clusters.
- The Davies-Bouldin (DB) Index was used as the primary evaluation metric.

### 3. Evaluation Metrics

- **Davies-Bouldin Index (DB Index):** Lower values indicate better-defined clusters.
  - **Within-Cluster Sum of Squares (WCSS):** Assessed compactness within clusters.
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## **Results**

### **1. Number of Clusters**

The optimal number of clusters was determined to be 4 based on the elbow method and DB Index evaluation.

### **2. Davies-Bouldin Index**

The DB Index for the selected model with 4 clusters is 0.62, indicating well-separated and compact clusters.

### **3. Cluster Characteristics**

- **Cluster 1:** High-value customers with significant spending and diverse product purchases.
  - **Cluster 2:** Customers with moderate spending and frequent transactions.
  - **Cluster 3:** Budget-conscious customers with low spending and fewer transactions.
  - **Cluster 4:** New or inactive customers with minimal activity.
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## **Visualizations**

- 1. Cluster Distribution:** A scatter plot using PCA reduced dimensions illustrates the separation between clusters.
  - 2. Customer Metrics by Cluster:** Bar charts display average metrics (e.g., spending, transactions) per cluster.
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## **Recommendations**

### **1. Personalized Campaigns:**

- **Target Cluster 1 with premium offerings and loyalty rewards.**
- **Engage Cluster 2 with upselling and cross-selling opportunities.**

### **2. Retention Strategies:**

- **Focus on reactivating Cluster 4 with discounts and promotional offers.**

### **3. Resource Allocation:**

- **Prioritize inventory and support for products favored by Cluster 1 and Cluster 2.**
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## **Conclusion**

**The clustering analysis successfully identified 4 distinct customer groups, providing actionable insights for strategic planning. By leveraging these insights, the eCommerce platform can enhance customer satisfaction, increase retention, and drive revenue growth.**