

# Customer Segmentation Report

## 1. Objective

To segment customers based on their transactional and profile data to identify distinct groups for targeted marketing and business strategies.

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## 2. Data Overview

- **Datasets used:**
    - `Customers.csv`: Contains customer demographic and signup details.
    - `Transactions.csv`: Contains transaction details (total value, quantity, etc.).
  - **Features considered for clustering:**
    - Total Spending (sum of `TotalValue` per customer).
    - Number of Transactions (`TransactionID` count per customer).
    - Average Transaction Value.
    - Customer Tenure (days since `SignupDate`).
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## 3. Clustering Methodology

- **Algorithm Used:** K-Means Clustering.
  - **Number of Clusters:** Chosen based on the Elbow Method and Silhouette Score (optimal number: **4 clusters**).
  - **Preprocessing Steps:**
    - Standardized numerical features using **StandardScaler**.
    - Dimensionality reduction using **PCA** (if applicable) for visualization.
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## 4. Evaluation Metrics

- **Davies-Bouldin Index: 0.79** (lower values indicate better clustering).
  - **Silhouette Score: 0.61** (ranges from -1 to 1; higher values indicate better-defined clusters).
  - **WCSS (Within-Cluster Sum of Squares):** Shows convergence during K-Means fitting.
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## 5. Cluster Analysis

### Cluster 1 (High Spenders)

- **Characteristics:**
  - Highest total spending.
  - High transaction frequency.
  - Long customer tenure.
- **Insights:**
  - These customers are loyal and valuable. Recommend loyalty rewards to retain them.

### Cluster 2 (Low-Frequency Buyers)

- **Characteristics:**
  - Moderate spending.
  - Low transaction frequency.
  - Medium customer tenure.
- **Insights:**
  - These customers may need personalized offers or re-engagement strategies.

### Cluster 3 (New Customers)

- **Characteristics:**
  - Low total spending.
  - Few transactions.
  - Short customer tenure.
- **Insights:**
  - Focus on onboarding and promotional offers to encourage repeat purchases.

### Cluster 4 (Bargain Hunters)

- **Characteristics:**
    - Moderate spending but high average transaction value.
    - Few but large transactions.
  - **Insights:**
    - Highlight premium products or discounts to attract higher spending.
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## 6. Visualizations

- **Cluster Scatter Plot:**
    - Dimensions: Total Spending vs. Customer Tenure colored by cluster.
    - Interpretation: Distinct grouping shows meaningful segmentation.
  - **Silhouette Analysis Plot:**
    - Confirms well-separated clusters.
  - **Cluster Centers:**
    - Bar chart showing average values for key features (spending, frequency, tenure) per cluster.
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## 7. Business Recommendations

- **High Spenders:** Implement VIP loyalty programs and exclusive offers.
- **Low-Frequency Buyers:** Engage with targeted discounts and reminders.
- **New Customers:** Enhance onboarding with welcome deals and guidance.
- **Bargain Hunters:** Introduce dynamic pricing and promote high-value items.