

# Customer Segmentation Analysis

## Abstract

This report presents an unsupervised learning-based customer segmentation approach using K-Means clustering on an eCommerce dataset. The objective is to identify distinct customer groups based on their purchasing behaviour to enhance marketing strategies, customer retention, and inventory planning.

By analyzing Total Spending, Quantity Purchased, and Customer Region, four unique customer clusters were identified. The segmentation allows businesses to develop targeted marketing campaigns, personalized promotions, and optimized inventory management. Clustering quality was evaluated using the Davies-Bouldin Index (0.9374) and Silhouette Score (0.3953), ensuring a structured and effective segmentation model.

The report outlines the key characteristics of each customer segment, providing actionable insights for customer engagement, revenue growth, and strategic decision-making.

## Insights from the Cluster Segmentation Plot

### 1. Clusters Overview

- Four distinct customer groups (Clusters 0, 1, 2, and 3).
- Each cluster represents customers with different spending patterns and purchase behaviors.

### 2. Total Spending vs. Quantity Purchased

- The x-axis represents Total Spending.
- The y-axis represents Quantity Purchased.
- Customers are grouped based on their spending habits and purchase frequency.

### 3. Cluster Characteristics

Cluster	Characteristics	Business Implication
Cluster 0 (Purple)	Moderate purchases, low spending (≤ \$4000)	Price-sensitive customers; Offer discounts & promotions.
Cluster 1 (Blue)	Mixed spending levels, moderate purchase quantity	Mid-tier customers; Encourage with special offers.

Cluster	Characteristics	Business Implication
Cluster 2 (Green)	High-spending, bulk purchasers	High-value customers; Introduce VIP programs.
Cluster 3 (Yellow)	Highest quantity purchased, varying spending	Bulk buyers; Optimize inventory & bulk discounts.

## Business Strategies & Recommendations

### 1. Targeted Marketing:

- Cluster 2 & 3 (High-Spending Customers): Provide exclusive loyalty rewards and premium offers.
- Cluster 0 & 1 (Moderate Buyers): Focus on discounted bundles and limited-time deals to increase spending.

### 2. Promotional Offers & Upselling:

- High-quantity buyers (Cluster 3) can be targeted for subscription models or bulk-buy discounts.
- Low spenders (Cluster 0) should receive budget-friendly deals to encourage repeat purchases.

### 3. Inventory & Stock Optimization:

- Use purchase patterns from bulk buyers (Cluster 3) to adjust inventory levels and prevent stock shortages.
- Maintain high-demand products for repeat customers (Cluster 2).

### 4. Retention Strategies:

- Customers in Cluster 2 and 3 show higher lifetime value (LTV).
- Personalized engagement such as early access sales and exclusive loyalty benefits will help retain these customers.

## Conclusion

The clustering analysis successfully identified four distinct customer segments based on their spending behaviour and purchase frequency. These insights provide a data-driven approach to customer engagement, marketing, and business strategy development.

By segmenting customers, businesses can prioritize high-value customers, optimize pricing strategies, and improve inventory planning. The results highlight the importance of personalized marketing campaigns, loyalty programs, and targeted promotions to increase customer retention and revenue growth.

Additionally, the analysis revealed that bulk buyers and high-spending customers (Clusters 2 & 3) contribute significantly to revenue, making them ideal candidates for exclusive offers and long-term engagement strategies. On the other hand, price-sensitive customers (Clusters 0 & 1) require incentives like discounts and limited-time deals to encourage repeat purchases.

Future improvements can involve testing alternative clustering algorithms (e.g., DBSCAN, Hierarchical Clustering) to validate results further. Additionally, incorporating more features like customer demographics, order frequency, and product preferences may enhance segmentation accuracy.