

Clustering Analysis Report

-Sneha P Pratap

Objective

The objective of the clustering analysis is to segment customers based on their purchasing behavior and characteristics. By identifying distinct customer clusters, businesses can design personalized marketing strategies, enhance customer satisfaction, and improve overall revenue.

Methodology

1. Feature Selection:

- To create meaningful clusters, the following features were used:
 - **TotalValue**: Indicates the monetary contribution of a customer.
 - **Quantity**: Reflects purchasing volume.
 - **AvgPrice**: Represents the average price of products purchased.
 - **Region**: Provides geographical segmentation of customers.

2. Data Preprocessing:

- **Scaling**: Features were normalized using StandardScaler to ensure all variables contribute equally to the clustering process.
- **Encoding**: Categorical variables, such as Region, were one-hot encoded to facilitate clustering.

3. Clustering Model:

- The **K-Means clustering algorithm** was applied with **4 clusters** determined by evaluating the Davies-Bouldin Index (DBI).
- DBI score: **1.63**, which indicates reasonable cluster separation and compactness.

Cluster Analysis

1. Cluster 0:

- Characteristics:
 - Moderate spenders with average transaction volumes.
 - Likely represent the middle-tier customer base.

- Recommendation:
 - Offer loyalty rewards to retain engagement.

2. **Cluster 1:**

- Characteristics:
 - High spenders with large purchase quantities.
 - Likely premium customers who contribute significantly to revenue.
- Recommendation:
 - Focus on personalized offers, exclusive products, and loyalty programs to maximize retention and lifetime value.

3. **Cluster 2:**

- Characteristics:
 - Low spenders purchasing in small quantities.
 - May represent occasional buyers or new customers.
- Recommendation:
 - Design introductory offers or small discounts to encourage repeat purchases.

4. **Cluster 3:**

- Characteristics:
 - Region-specific spending patterns, reflecting unique preferences for particular products or categories.
- Recommendation:
 - Conduct deeper analysis to identify regional trends and target marketing campaigns accordingly.

Visualization

The clustering plot shows the distribution of customers across the 4 clusters, highlighting clear groupings based on their purchasing behaviors. The separation between clusters validates the segmentation process.

Recommendations

1. **Targeted Marketing:**

- Design cluster-specific campaigns to address the unique needs of each group.

- High spenders (Cluster 1) can be targeted with premium services, while low spenders (Cluster 2) can be incentivized through discounts.

2. Personalized Engagement:

- Leverage customer segmentation to personalize communication and offers, increasing customer satisfaction and retention.

3. Regional Optimization:

- Use insights from Cluster 3 to focus on region-specific demands, ensuring supply chain and inventory alignment.

Conclusion

Clustering analysis has successfully segmented the customer base into meaningful groups. By leveraging these insights, the business can implement strategies to enhance customer experience, boost sales, and foster long-term loyalty. This segmentation serves as a foundation for predictive analytics and future personalization initiatives.