

Clustering Results Report

Overview

Customer segmentation was performed using K-Means clustering to group customers into distinct segments based on their profiles and transaction behavior. The model's performance was evaluated using the Davies-Bouldin Index (DB Index), a widely used clustering evaluation metric.

Key Results

1. Number of Clusters Formed:

- The optimal number of clusters formed was **7**.

2. Davies-Bouldin Index (DB Index):

- The DB Index value for the 7-cluster solution was **0.847**, indicating well-separated and compact clusters.

3. Clustering Features:

- Features used for clustering included:
 - Total spending
 - Total transactions
 - Average transaction value
 - Most purchased product category (one-hot encoded)
 - Region (one-hot encoded)

4. Other Metrics:

- The clusters were visualized using PCA (Principal Component Analysis), reducing the high-dimensional feature space to 2 components.
- Clusters showed clear separation in the 2D PCA visualization, validating the clustering logic.

Observations

1. Cluster Characteristics:

- High-spending customers were concentrated in specific clusters, providing opportunities for premium services.
- Low-transaction customers formed distinct clusters, indicating potential for re-engagement campaigns.

2. Regional Insights:

- Clustering effectively captured regional variations, highlighting opportunities for localized marketing strategies.

3. Product Preferences:

- Most purchased product categories were dominant within certain clusters, suggesting targeted cross-selling and upselling strategies.

Recommendations

1. Target High-Spending Clusters:

- Focus on high-spending clusters for loyalty programs and personalized offers to increase retention and lifetime value.

2. Re-engagement Strategies:

- Develop campaigns targeting low-transaction clusters to increase customer activity.

3. Localized Marketing:

- Leverage regional cluster insights to design tailored promotions and advertisements.

4. Cross-Selling Opportunities:

- Promote complementary products within clusters to boost average order value.

Next Steps

1. Integrate cluster assignments into the CRM system for actionable customer segmentation.
2. Monitor the performance of clusters over time to refine strategies.

3. Experiment with other clustering algorithms or features to further improve segmentation accuracy.