Customer Segmentation: Clustering Results Report

Objective:

The goal of the analysis was to segment customers based on their purchasing behaviour using clustering techniques. By identifying distinct customer groups, we aim to enable targeted marketing strategies, personalized engagement, and effective resource allocation.

Key Findings:

1. Optimal Number of Clusters:
   - The optimal number of clusters determined through the Davies-Bouldin (DB) Index analysis is **2**.
   - The DB Index for **2 clusters** is **0.9329**, indicating the formation of compact and well-separated clusters.
2. Cluster Descriptions:
   The two clusters derived from the analysis represent distinct customer profiles:
   1. Cluster 0 (High-Value Customers):
      - Customers in this group exhibit significantly higher spending and quantity purchased.
      - Likely represent premium customers or frequent buyers who contribute the most to overall revenue.
      - Mean total spending is notably higher than Cluster 1.
      - Strategies: Loyalty rewards, exclusive offers, and personalized promotions.

   2. Cluster 1 (Budget-Conscious/Low-Activity Customers):
      - Customers in this group have relatively lower spending and purchase quantities.
      - Likely represent occasional or budget-conscious buyers.
      - Mean total spending and quantity are much lower compared to Cluster 0.
      - Strategies: Engagement campaigns, cross-selling opportunities, and upselling incentives.

Clustering Metrics:

1. Davies-Bouldin (DB) Index:

- The DB Index measures intra-cluster similarity and inter-cluster dissimilarity. A lower DB Index signifies better-defined clusters.
- **Lowest DB Index: 0.9329** (at 2 clusters).

2. Silhouette Score:

- Average silhouette score: **0.72** (for 2 clusters), indicating well-separated clusters and high cohesion within clusters.

3. Inertia (Sum of Squared Distances):

- Decreases consistently with the increase in the number of clusters but shows diminishing returns after 2 clusters.

4. Cluster Sizes:

- **Cluster 0**: Comprises 38% of the total customers.
- **Cluster 1**: Comprises 62% of the total customers.

Key Variables Analysed:

1. Total Spent:

- Clear distinction between clusters with higher total spending in Cluster 0.

2. Quantity Purchased:

- Cluster 0 customers purchase in bulk compared to Cluster 1.

3. Transaction Count:

- Higher transaction frequency observed in Cluster 0.

Visual Insights:

1. Davies-Bouldin Index vs. Number of Clusters:

- A line plot of DB Index against cluster counts (ranging from 2 to 10) shows the lowest value at **2 clusters**, reinforcing the choice of optimal clusters.

2. Scatter Plot: Total Spent vs. Quantity Purchased:

- Visualizes the separation between the two clusters.
- Cluster 0 customers are concentrated in the higher-spending region, while Cluster 1 occupies the lower-spending region.

3. Density Plots:

- Density distributions for **total spent** and **quantity purchased** highlight that Cluster 0 exhibits a right-skewed distribution, indicative of high-value customers.

4. Pairwise Plots:

- Relationship between key features (e.g., total spent, quantity, and transaction count) shows well-separated cluster behaviour, confirming the findings from scatter plots.

Insights and Recommendations:

1. **Cluster 0 (High-Value Customers)**:
    - Insights:
        - These customers generate the bulk of revenue.

        - High transaction frequency and purchase volumes suggest strong brand loyalty or frequent needs.
    - Recommendations:
        - Focus on retention through loyalty programs, early access to sales, and exclusive product offerings.
        - Use predictive analytics to anticipate their future needs and preferences.
2. **Cluster 1 (Budget-Conscious/Low-Activity Customers)**:
    - Insights:
        - Represent a larger proportion of the customer base but contribute less to revenue.
        - Potentially untapped or occasional buyers who can be converted into high-value customers.
    - Recommendations:
        - Deploy engagement campaigns offering discounts, combo deals, or referrals.
        - Analyse purchasing patterns to identify upselling or cross-selling opportunities.

Action Plan:

1. Develop tailored marketing strategies for both clusters:
    - **Cluster 0**: Premium focus with rewards for loyalty and personalized recommendations.
    - **Cluster 1**: Broader campaigns with emphasis on affordability and value.
2. Evaluate trends within clusters over time to identify migration patterns:
    - Monitor if Cluster 1 customers are transitioning to Cluster 0 or vice versa.
3. Integrate findings into CRM systems to automate personalized campaigns:
    - Use customer segmentation for dynamic pricing models, promotional email targeting, and behaviour-based ad retargeting.
4. Reassess clustering periodically as new customer data is collected:
    - This ensures that segmentation strategies remain aligned with evolving customer behaviour.