

Clustering Analysis Report

1. Introduction

Clustering analysis was performed to identify distinct customer segments based on their transactional behaviour. The Davies-Bouldin Index (DBI) was used to determine the optimal number of clusters, and the clustering results were visualized using Principal Component Analysis (PCA).

2. Optimal Number of Clusters

- Number of Clusters Formed:** 10
- Davies-Bouldin Index Value:** 1.3
The DBI minimized at 10 clusters, indicating a good balance between cluster compactness and separation.

3. Visualization of Clusters

- The PCA visualization of the 10 clusters (Figure 2) shows the distribution of customers in reduced dimensions.
 - Clusters are generally well-separated, though some overlap indicates potential similarities in customer behaviour.

4. Cluster-wise Analysis

The following table summarizes the key metrics for each cluster:

Cluster	Total Spent	Average Transaction	Transaction Count	Unique Products
0	3528.85	733.27	4.89	4.84
1	4391.78	780.55	5.75	5.60
2	3477.54	725.39	4.89	4.88
3	2014.08	717.98	2.86	2.77
4	2507.07	585.28	4.31	4.31
5	1079.83	375.97	7.48	7.16
6	5263.28	702.30	7.48	7.16
7	3975.42	735.14	5.54	5.36
8	3532.41	663.70	5.50	5.44
9	3399.36	715.88	4.80	4.64

5. Key Observations

- **Premium Customers:** Cluster 1 has the highest average transaction value (780.55), suggesting premium customers.
 - **Frequent Shoppers:** Clusters 5 and 6 exhibit the highest transaction counts (7.48), with Cluster 6 spending the most overall (5263.28).
 - **Cost-Conscious Shoppers:** Cluster 4 has the lowest average transaction value (585.28), indicating cost-sensitive customers.
 - **Infrequent Buyers:** Cluster 3 shows the lowest transaction count (2.86), suggesting occasional shoppers.
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6. Conclusion

This clustering analysis provides valuable insights into customer segmentation:

- High-value customers can be targeted with loyalty programs.
- Frequent shoppers can benefit from subscription plans or bulk offers.
- Cost-conscious customers can be engaged through discounts or deals.
- Infrequent buyers can be incentivized with reminders or promotions.

These segments allow for targeted marketing strategies to improve customer satisfaction and drive revenue growth.



