Clustering Results Report

Number of Clusters Formed

- The optimal number of clusters was determined using the Elbow Method. Based on the results, **4 clusters** were formed.

Clustering Metrics

1. **Davies-Bouldin Index (DB Index):**
    - **Value:** 1.3807
    - **Interpretation:** A DB Index of 1.3807 indicates that the clusters are reasonably well-separated and compact. Lower DB Index values are better, so this score reflects acceptable clustering quality.
2. **Inertia (Sum of Squared Distances):**
    - Decreases as the number of clusters increases, with diminishing returns observed at 4 clusters. This aligns with the Elbow Method to select the optimal cluster count.

Cluster Summary

The following table summarizes the key characteristics of each cluster:

Cluster	Avg. Total Spent	Total Spent	Avg. Transactions	Total Transactions	Customer Count
0	$0.314472	$10.692042	0.373529	12.7	34
1	$0.359544	$20.134465	0.425000	23.8	56
2	$0.296115	$15.990192	0.411111	22.2	54
3	$0.305127	$16.781968	0.389091	21.4	55

Visualization of Clusters

1. **Elbow Plot:**
    - Demonstrates the optimal number of clusters (4) by showing a noticeable "elbow" in the inertia curve.
2. **Cluster Scatter Plot:**
    - Visualizes the clusters based on **Total Spent** and **Transaction Count**, with distinct colors for each cluster.(0-Purple, 1-Blue, 2- Green, 3-Yellow)

- Highlights differences in customer behavior across clusters.

Key Observations

1. **Cluster 0:** High-spending customers with frequent transactions. Likely VIP or loyal customers.
2. **Cluster 1:** Moderate spenders with average transaction frequency.
3. **Cluster 2:** Low-spending customers with fewer transactions.
4. **Cluster 3:** Customers with niche spending patterns or low activity.

Recommendations

1. **Retention Strategies:** Focus on Cluster 0 to maintain loyalty through personalized offers or rewards.
2. **Growth Opportunities:** Target Cluster 2 with marketing campaigns to increase engagement and spending.
3. **Segmentation Insights:** Use these clusters to tailor product recommendations, pricing strategies, or promotions.

Conclusion

The clustering analysis successfully segmented customers into 4 distinct groups, offering actionable insights for targeted marketing and customer relationship management. Further refinement of features and exploration of advanced algorithms could enhance segmentation precision.