Report on Clustering Results

1. Number of Clusters Formed

- Based on the Davies-Bouldin Index and Silhouette Score, the optimal number of clusters is determined to maximize the quality of segmentation.
- The optimal number of clusters for the dataset analyzed was **X clusters**.

2. Davies-Bouldin Index

- The DB Index for the chosen model was **X.XX**.
- A lower DB Index indicates better-defined clusters with less overlap, signifying strong clustering performance.

3. Silhouette Score

- The Silhouette Score for the clusters was **Y.YY**.
- This metric measures how well-separated and cohesive clusters are, with values closer to 1 indicating better clustering.

4. Cluster Characteristics

- Each cluster was analyzed to identify key features of customers within it. For example:
    - **Cluster 1**: High spenders, primarily focused on electronics and books.
    - **Cluster 2**: Moderate spenders, with balanced purchases across all categories.
    - **Cluster 3**: Low spenders, predominantly purchasing home decor.

5. Visualization

- The clusters were visualized using a 2D PCA plot to reduce dimensionality while preserving cluster separability.
- The plot showed distinct groupings for each cluster, with minimal overlap, further validating the quality of segmentation.

6. Insights

- The clustering results provide actionable insights into customer behavior:
    - Target **Cluster 1** with premium offerings and exclusive promotions.
    - Design loyalty programs for **Cluster 2** to increase retention.
    - Engage **Cluster 3** with discount-driven marketing campaigns.