Customer Segmentation Report

- Objective:
  - To segment customers into distinct groups using clustering techniques, enabling better targeting and personalization.

- Methodology:

- Data Preparation:
  - Aggregated customer transaction data, including:
  - TotalSpent, TotalQuantity, TotalTransactions, AvgTransactionValue, and AvgQuantityPerTransaction.
  - Merged with customer profile data and scaled numerical features using `StandardScaler`.

- Clustering Approach:
  - Used ‘KMeans’ clustering algorithm.
  - Evaluated clusters (2 to 10) using the Elbow Method and Davies-Bouldin Index (DB).

- Optimal Clusters:
  - Number of Clusters: 9
  - Minimum DB Index: 1.0229 (indicates well-separated clusters).

- Cluster Visualization:
  - Applied PCA to reduce dimensionality for 2D visualization.
  - Visualized clusters with a scatterplot showing distinct group separations.

- Results:
- Clustering Metrics:
  - Davies-Bouldin Index: 1.0229
  - Silhouette Score: 0.2834

- Cluster Profiles:
  - Clusters represent variations in customer behavior, including spending levels, transaction frequency, and product preferences.

Cluster	Characteristics
1	High spenders with frequent transactions
2	Moderate spenders with occasional purchases
3	Low spenders with minimal activity

- Visual Insights:
  - Scatterplot: Clusters visualized in PCA-reduced space.
  - Elbow and DB Index Plots: Determined optimal cluster count.
  - Heatmap: Revenue distribution by product category.

- Recommendations:
  - Focus retention strategies on high-spending clusters.
  - Personalize campaigns for moderate spenders to increase engagement.
  - Re-engage low-spending clusters with targeted promotions.
  - Use category revenue insights to optimize inventory and marketing efforts.