CLUSTERING ANALYSIS REPORT

1. The Number of Clusters Formed:

Based on the Davies-Bouldin Index (DB Index) evaluation, the optimal number of clusters formed is **5**.

2. DB Index Value

The DB Index value for **5** clusters **is 0.8525**, which is the lowest among the evaluated cluster counts, indicating better clustering quality.

3. Other Relevant Clustering Metrics

DB Index for Other Cluster Counts:

- 2 Clusters: 1.0072
- 3 Clusters: 0.9578
- 4 Clusters: 1.0604
- 6 Clusters: 0.8694
- 7 Clusters: 0.8553
- 8 Clusters: 0.9125
- 9 Clusters: 0.8848
- 10 Clusters: 0.8630

Clustering Visualization:

1. Visualization: DB Index vs Number of Clusters

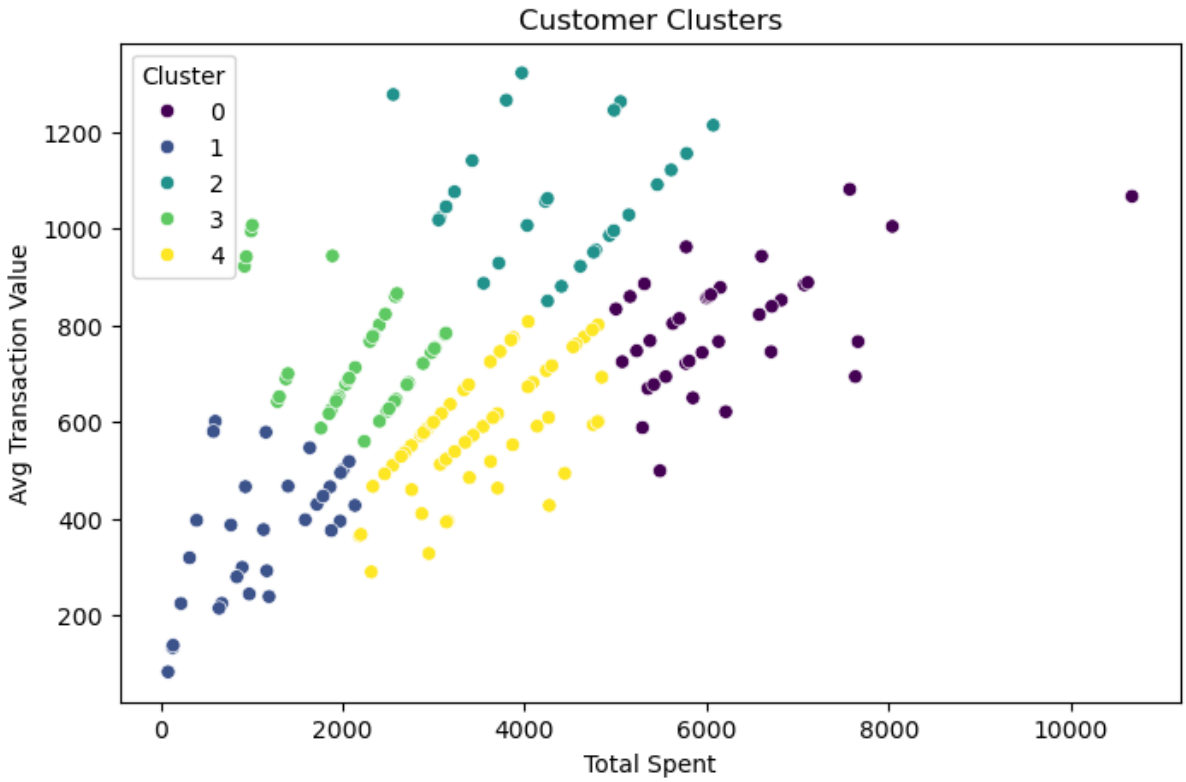
Optimal Cluster Size (Lowest DB Index):

The DB Index is lowest at **5** clusters **(~0.85),** and therefore, the best clustering solution in terms of compactness and separation is obtained by 5 clusters.

Trends in DB Index Values:

- The DB Index depends on the increase in the number of clusters.
- There is a sharp increase at **4** clusters **(~1.06),** which indicates poor clustering quality.
- After 5 clusters, the DB Index stabilizes but is still a little higher than the minimum at **5** clusters.

2. Visualization: Customer Clusters



Distinguish Customer Segments:

The customers are clustered into five categories. Each cluster indicates a specific type of spending behavior.

Cluster Distribution:

- **Cluster 0 (Dark Purple Color):**
  Customers are spending highly with a low average transaction value
- **Cluster 1 (Blue Color):**
  Customers spend very low and also have lower average transaction values.

- **Cluster 2 (Green Color):**
  Moderate range of spending, but their average transaction value is a bit higher.
- **Cluster 3 (Yellow Color):**
  Their spending range is moderate but their average transaction value is less.
- **Cluster 4 (Teal):**
  Customers with high average transaction values and mid-to-high total spending.

Customer Behavior Patterns:

- The more the total spent, the more spread out the average transaction value, indicating different purchasing behaviors.

- Some clusters, such as Cluster 4, have customers who spend more per transaction, while others, such as Cluster 3, have more frequent but lower-value transactions.