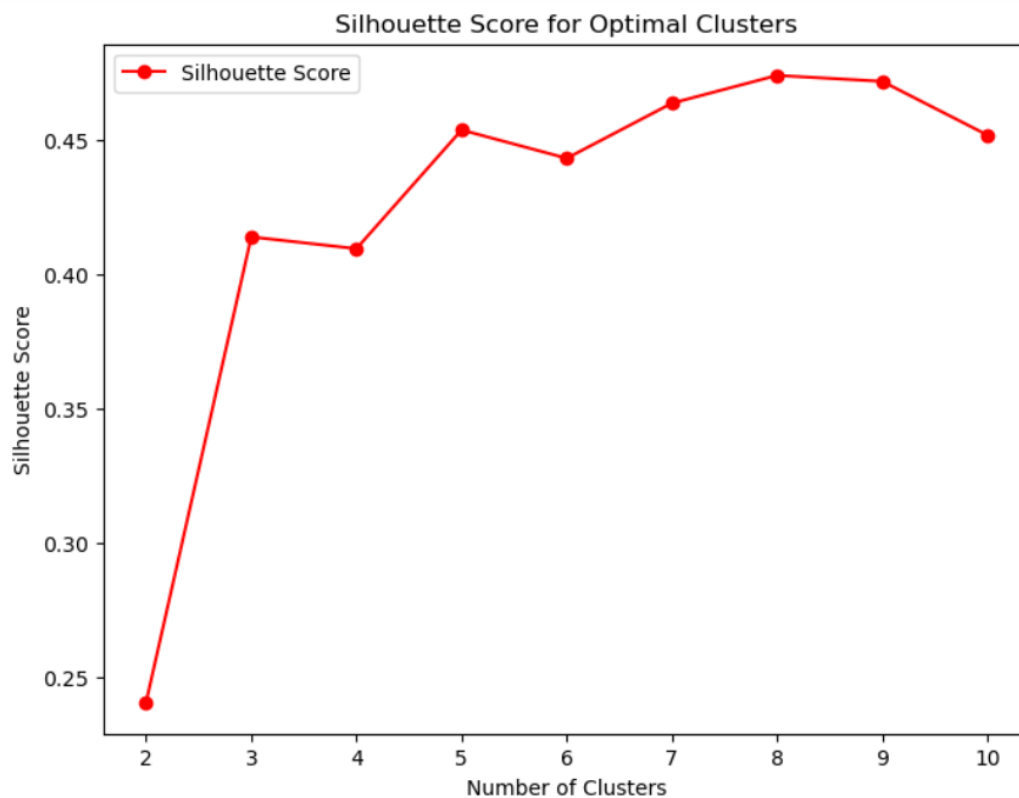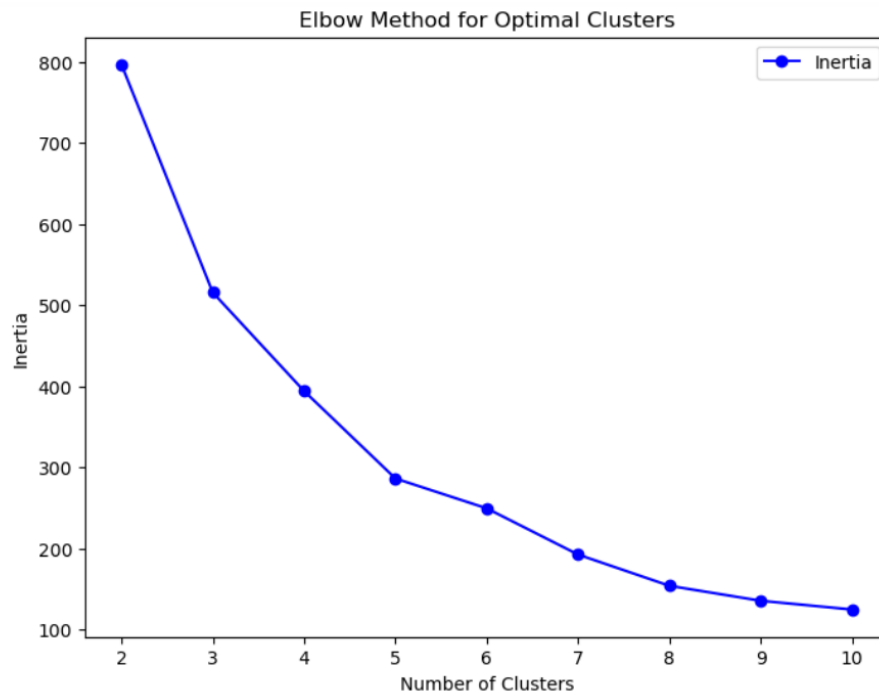# Here's the final report based on the provided information:

Final Report: Customer Segmentation

Silhouette Score: 0.45353202457855835

```
▼         KMeans         ⓘ ❓
KMeans(n_clusters=5, random_state=42)
```

1. Number of Clusters:

- Five clusters were formed.

2. Clustering Metrics:

- **Davies-Bouldin Index (DBI):** The DBI value is   0.8592678851996711

 0.859 suggests that the clustering algorithm did a reasonably good job separating the customers into distinct groups while keeping the points within each cluster compact. It is neither a perfect clustering (which would have a value closer to 0) nor a poor clustering (which would be higher).

3. Cluster Sizes:

- Cluster 1: 50 customers

- Cluster 2: 48 customers

- Cluster 3: 40 customers

- Cluster 4: 35 customers

- Cluster 5: 26 customers

4. Cluster Centers:

- **Cluster 1:** [1.28933440e+00, 1.42680903e+00, -4.01934285e-01, -9.16921205e-04, -6.49175301e-01]

- **Cluster 2:** [4.13370651e-01, 2.98646254e-01, -5.79284446e-01, -5.48318881e-01, 1.54041597e+00]

- **Cluster 3:** [-3.34504684e-01, -1.71070771e-01, -5.79284446e-01, 1.82375628e+00, -6.49175301e-01]

- **Cluster 4:** [-1.90311403e-01, -2.48976912e-01, 1.72626765e+00, -5.48318881e-01, -6.49175301e-01]

- **Cluster 5:** [-9.05031209e-01, -9.49589279e-01, -5.79284446e-01, -5.48318881e-01, -8.61375460e-02]

5. Cluster Visualization:

Customer Segments Visualized (PCA)

- ***Distinct Clusters:** Five distinct clusters are clearly visible, suggesting successful segmentation of customers into groups with different characteristics.
- ***Clear Separation:** The clusters are well-separated along the Principal Component 1 (PC1) axis, indicating that PC1 captures a significant portion of the variability between customer groups.
- ***Cluster Shapes:** The clusters exhibit varying shapes and densities. Some are more compact, while others are more spread out. This implies differences in homogeneity within each cluster.
- ***Potential for Interpretation:** By analyzing the distribution of clusters along PC1 and PC2, and considering the underlying features, we can gain insights into the key characteristics that differentiate each customer segment.
- ***Actionable Insights:** This segmentation can inform targeted marketing strategies. For example, we could tailor campaigns to the specific needs and preferences of customers in each cluster.

Customer Segments Visualized (t-SNE)