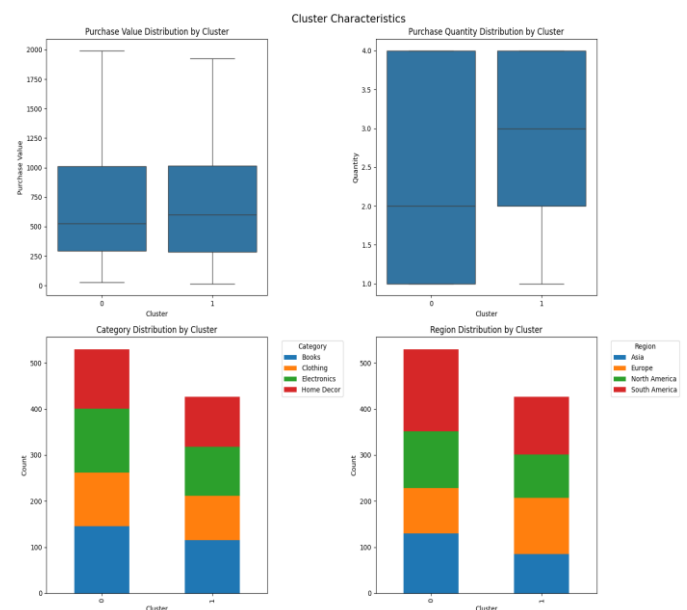
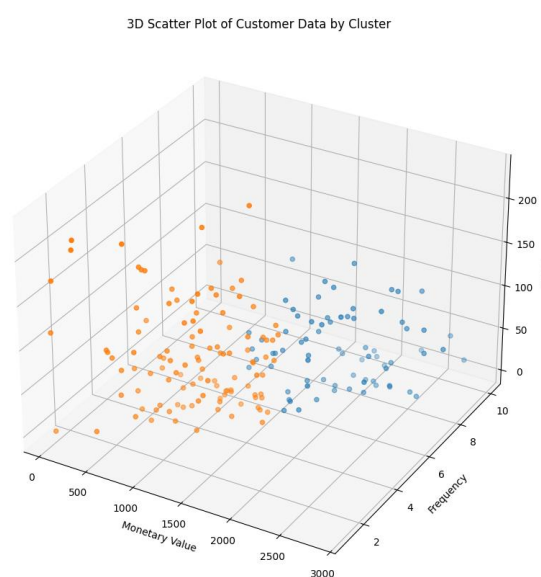
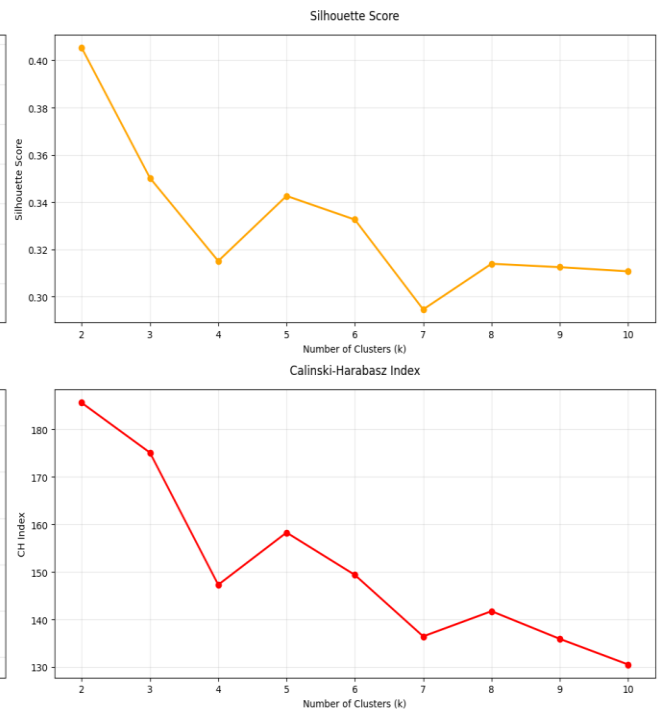
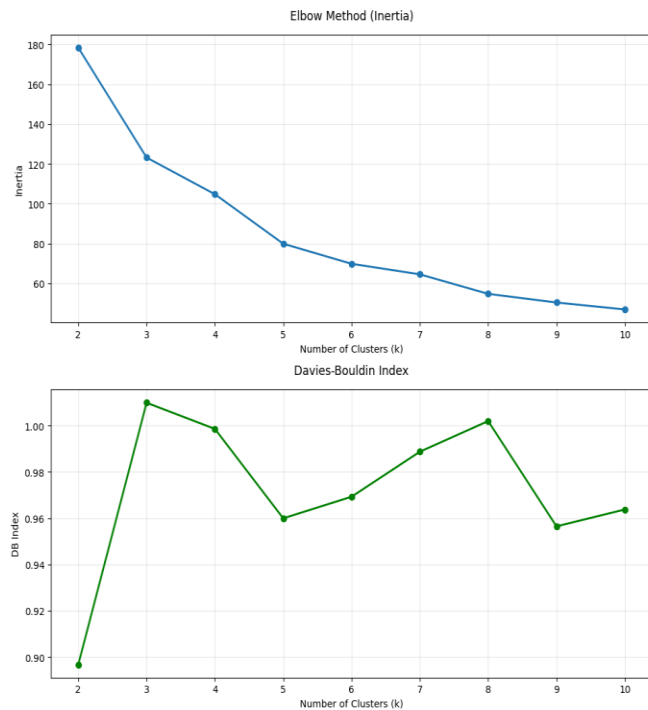


Optimal number of clusters according to different metrics:

- Elbow: 5
- Silhouette: 2
- Db_index: 2
- Calinski: 2

- Final Clustering Metrics:
- Silhouette: 0.405
- Db_index: 0.897
- Calinski: 185.609



Cluster Profiles:

Category Distribution by Cluster (%):

Category	Books	Clothing	Electronics	Home Decor
cluster_labels				
0	27.36	22.08	26.23	24.34
1	26.93	22.48	25.06	25.53

Region Distribution by Cluster (%):

Region	Asia	Europe	North America	South America
cluster_labels				
0	24.53	18.49	23.40	33.58
1	19.91	28.57	22.01	29.51

Detailed Cluster Profiles:

- Cluster 0 Profile:

 - Size: 75 customers (39.9% of total)
 - Average Purchase Value: \$690.06
 - Average Price Point: \$276.84
 - Average Quantity per Transaction: 2.50
 - Primary Category: Books
 - Primary Region: South America
- Top 3 Categories:
 - Category
 - Books 145
 - Electronics 139
 - Home Decor 129
- Top 3 Products:
 - ActiveWear Smartwatch 24
 - SoundWave Headphones 21
 - ActiveWear Rug 17
- Customer Behavior Profile:
 - High value customers
 - Low volume purchases
 - Price sensitivity: Low

- Cluster 1 Profile:

- Size: 113 customers (60.1% of total)
- Average Purchase Value: \$687.07
- Average Price Point: \$266.88
- Average Quantity per Transaction: 2.56
- Primary Category: Books
- Primary Region: South America

- **Top 3 Categories:**

- Category
- Books 115
- Home Decor 109
- Electronics 107

- **Top 3 Products:**

- ProductName
- SoundWave Headphones 16
- BookWorld Biography 15
- SoundWave Mystery Book 14

- **Customer Behavior Profile:**

- Low value customers
- High volume purchases
- Price sensitivity: High