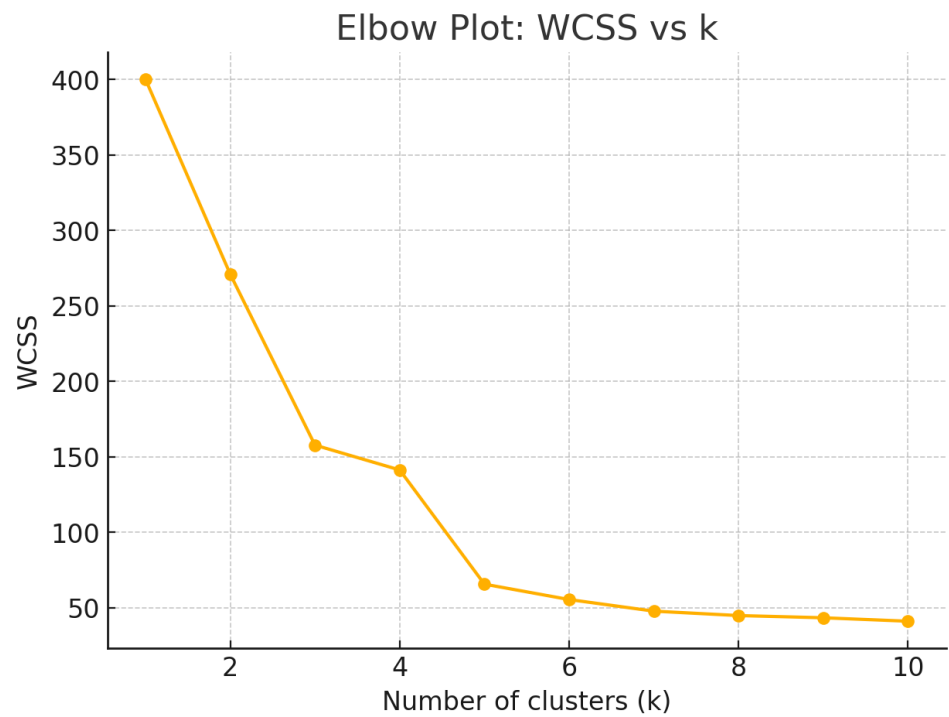# K-Means Clustering Report

Dataset Used

Mall_Customers.csv — columns: Annual Income (k$) and Spending Score (1-100)
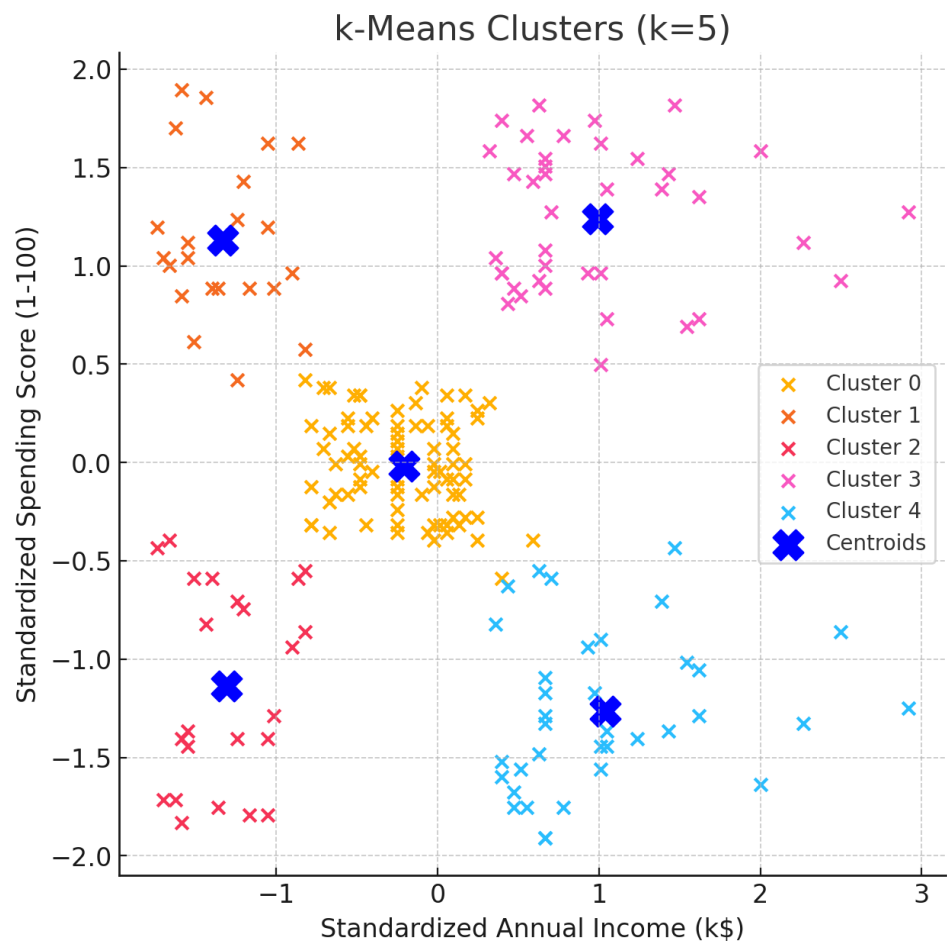
1. Elbow Method Results

The Elbow Method helps identify the optimal number of clusters based on WCSS.
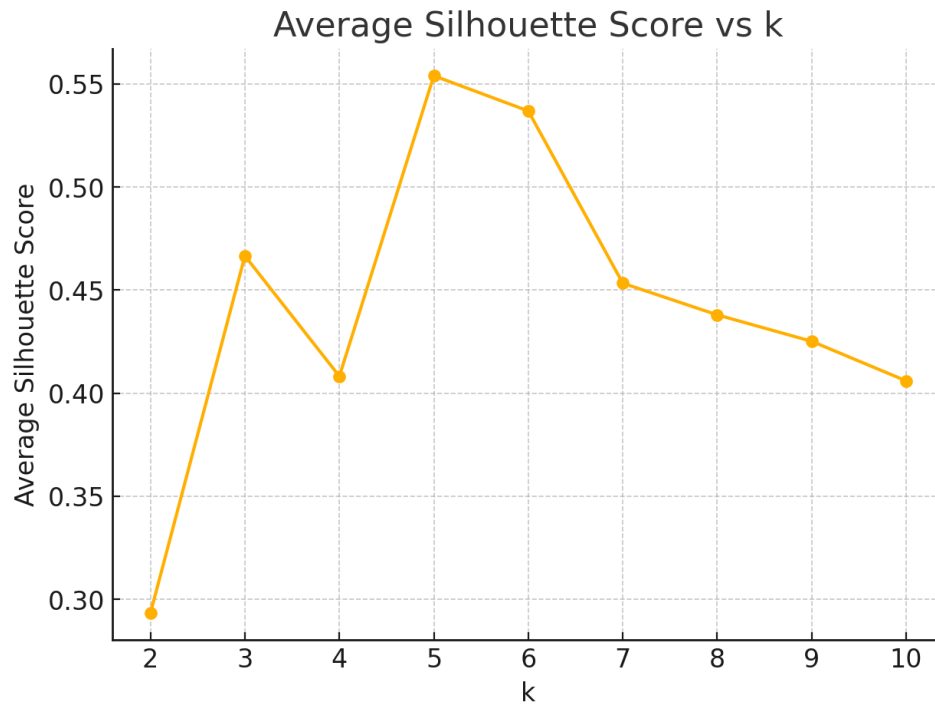

Elbow Plot: WCSS vs k

k	WCSS
1.0	400.00
2.0	270.89
3.0	157.70
4.0	141.24
5.0	65.58
6.0	55.38
7.0	47.69
8.0	44.77
9.0	43.30
10.0	41.02

2. Cluster Visualization (k=5)

k-Means Clusters (k=5)

3. Silhouette Analysis

Average Silhouette Score vs k

k	Silhouette Score
2.0	0.2933
3.0	0.4666
4.0	0.4082
5.0	0.5539
6.0	0.5369
7.0	0.4533
8.0	0.4380
9.0	0.4251
10.0	0.4059

4. Observations

• The Elbow plot suggests k=5 as the optimal number of clusters.
• The Silhouette scores also peak around k=5, supporting this choice.
• The final cluster visualization shows well-separated groups of customers based on income and spending score.
• Centroids indicate segments like high income–high spending, low income–low spending, etc.