

# Mall Customers Clustering Report: Q&A Analysis

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## Visualizations

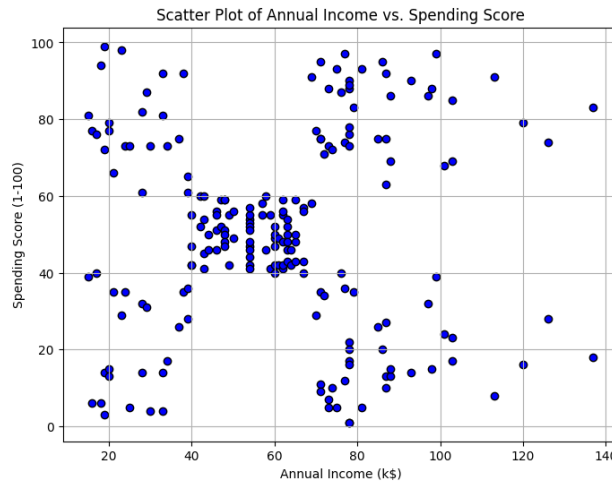


Figure 1: Annual Income vs. Spending Score Scatter Plot

## Q&A Section

### 1. Optimal Clusters

The optimal number of clusters is **5** for both K-Means and Hierarchical Clustering. This was justified using the Elbow Method (Figure 2), which shows a clear bend at  $k = 5$ , and the Dendrogram (Figure 4), where the largest vertical distance without crossing branches also corresponds to five clusters.

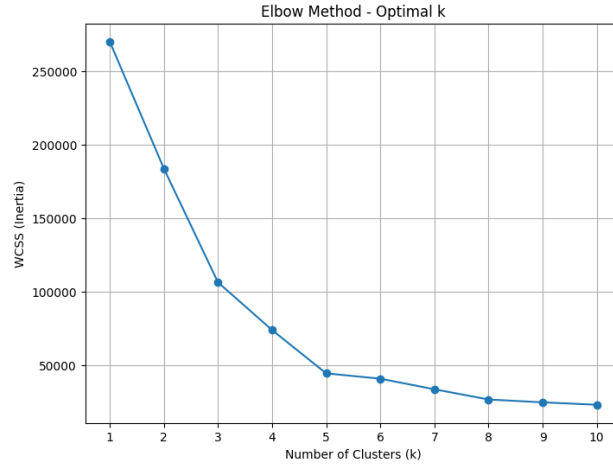


Figure 2: Elbow Method for K-Means (Optimal  $k = 5$ )

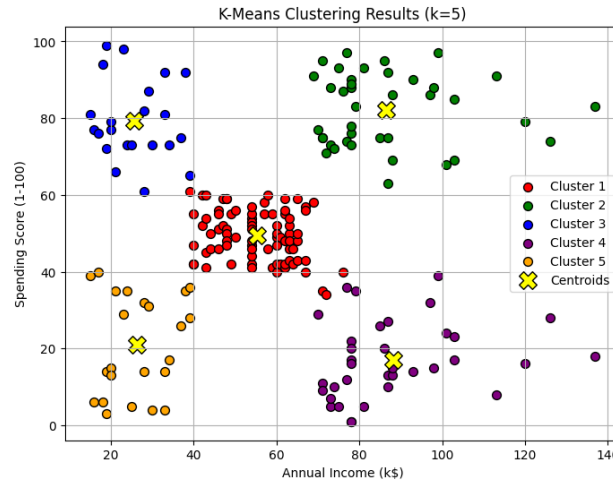


Figure 3: K-Means Clustering Results ( $k = 5$ )

## 2. Cluster Comparison

K-Means and Agglomerative Hierarchical Clustering produced visually similar, compact clusters (Figures 3 and 5). DBSCAN (Figure 6), in contrast, detected fewer core clusters and identified many data points as noise (black dots). Notably, DBSCAN does not force every sample into a cluster, differing from the other two methods.

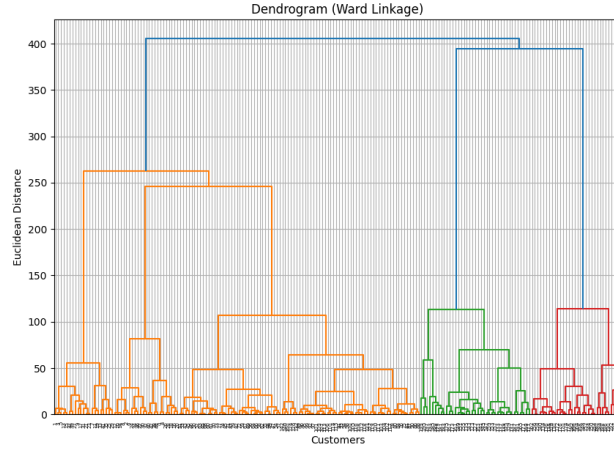


Figure 4: Dendrogram for Hierarchical Clustering

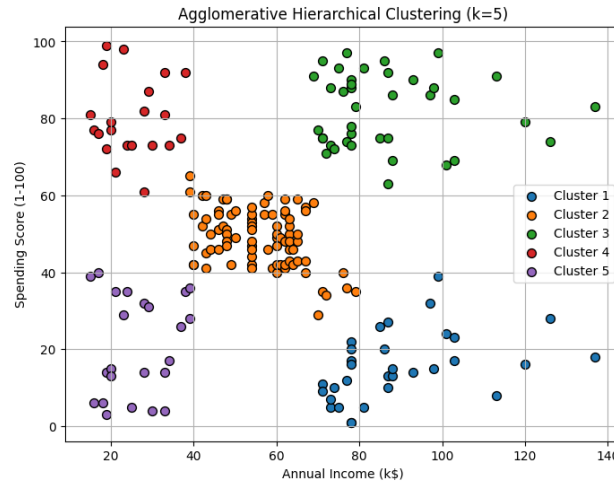


Figure 5: Agglomerative Hierarchical Clustering ( $k = 5$ )

### 3. DBSCAN Performance

DBSCAN identified several noise points (label -1), reflecting customers whose patterns do not fit into dense clusters. While the method successfully detects core groupings and outliers, K-Means and Hierarchical algorithms assign all customers to a segment, even those with atypical traits.

### 4. Algorithm Suitability

For this dataset, which features compact, well-separated clusters, **K-Means** and **Hierarchical Clustering** are most suitable and provide the clearest

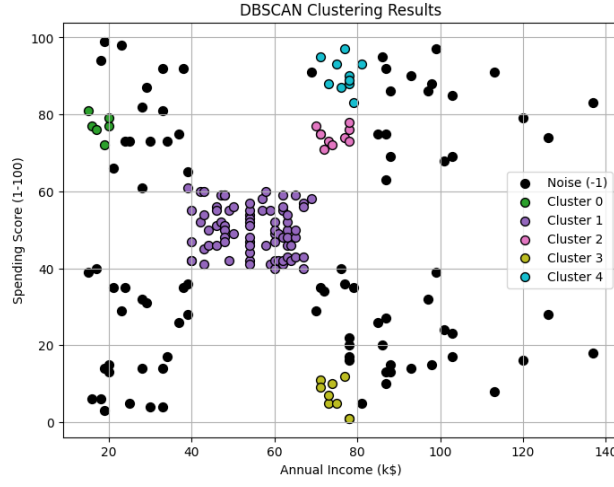


Figure 6: DBSCAN Clustering Results

segmentation. DBSCAN is more effective for datasets containing irregular clusters or substantial noise, which is less relevant in this scenario.

## 5. Real-World Application

Identified customer segments can drive targeted mall marketing strategies. For example, customers with high income but low spending scores (a specific cluster) could be targeted with premium product promotions, exclusive events, or personalized membership programs to boost their engagement and spending.