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import pandas as pd
import matplotlib.pyplot as plt
from sklearn.cluster import KMeans

# 1. Load the data
df = pd.read_csv('/content/Mall_Customers.csv')

# 2. Select the features for clustering
X = df[['Annual Income (k$)', 'Spending Score (1-100)']]

# 3. Use the elbow method to find the optimal number of clusters (k)
wcss = []
for i in range(1, 11):
    kmeans = KMeans(n_clusters=i, init='k-means++', max_iter=300, n_init=10, random_state=0)
    kmeans.fit(X)
    wcss.append(kmeans.inertia_)

# Plot the elbow curve to visualize WCSS vs. number of clusters
plt.figure(figsize=(6, 6))
plt.plot(range(1, 11), wcss, marker='o', linestyle='--')
plt.title('The Elbow Method')
plt.xlabel('Number of Clusters (k)')
plt.ylabel('WCSS')
plt.show()

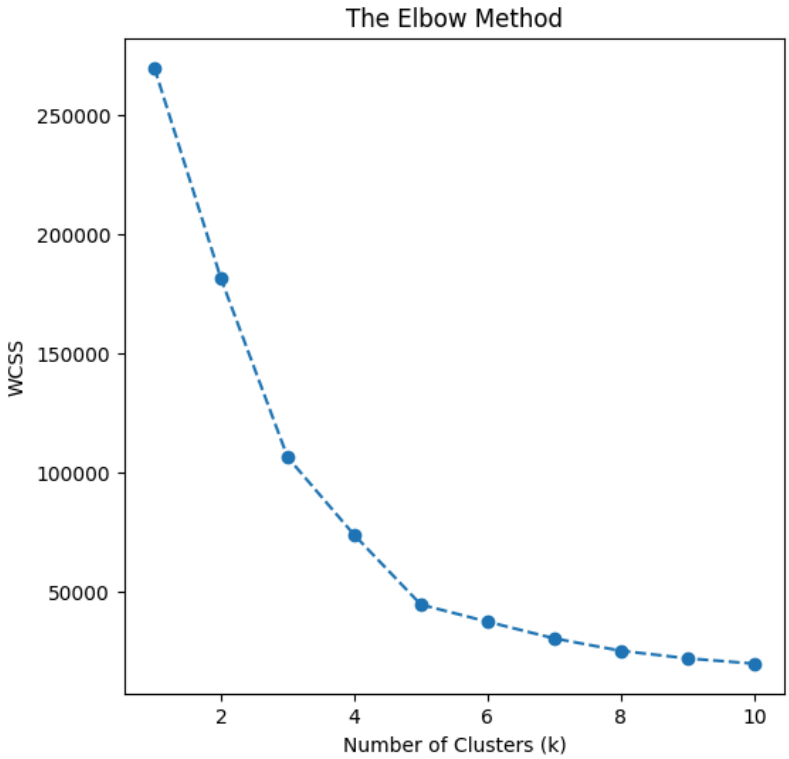
# 4. Apply K-means with the optimal number of clusters (k=5)
# Based on the elbow plot, the optimal number of clusters is typically 5.
kmeans = KMeans(n_clusters=5, init='k-means++', max_iter=300, n_init=10, random_state=0)
y_kmeans = kmeans.fit_predict(X)

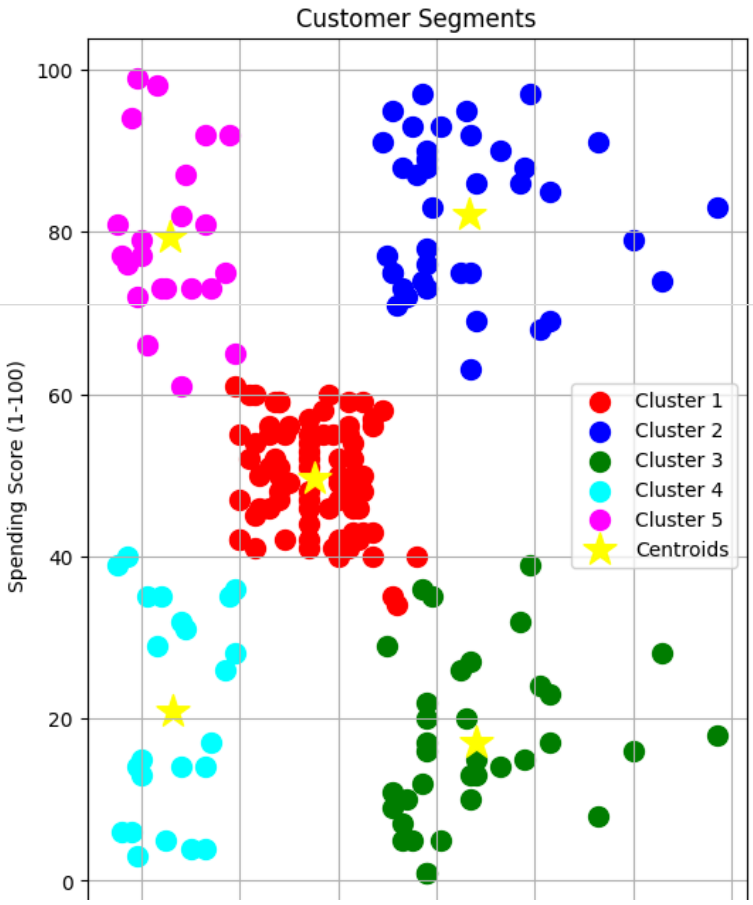
# Add the cluster labels to the original DataFrame
df['Cluster'] = y_kmeans

# 5. Visualize the clusters and their centroids
plt.figure(figsize=(6, 8))
plt.scatter(X.iloc[y_kmeans == 0, 0], X.iloc[y_kmeans == 0, 1], s=100, c='red', label='Cluster 1')
plt.scatter(X.iloc[y_kmeans == 1, 0], X.iloc[y_kmeans == 1, 1], s=100, c='blue', label='Cluster 2')
plt.scatter(X.iloc[y_kmeans == 2, 0], X.iloc[y_kmeans == 2, 1], s=100, c='green', label='Cluster 3')
plt.scatter(X.iloc[y_kmeans == 3, 0], X.iloc[y_kmeans == 3, 1], s=100, c='cyan', label='Cluster 4')
plt.scatter(X.iloc[y_kmeans == 4, 0], X.iloc[y_kmeans == 4, 1], s=100, c='magenta', label='Cluster 5')

# Plot the centroids
plt.scatter(kmeans.cluster_centers_[:, 0], kmeans.cluster_centers_[:, 1], s=300, c='yellow', marker='*', label='Centroi

plt.title('Customer Segments')
plt.xlabel('Annual Income (k$)')
plt.ylabel('Spending Score (1-100)')
plt.legend()
plt.grid(True)
plt.show()
```


The Elbow Method
WCSS
250000
200000
150000
100000
50000
2
4
6
8
10
Number of Clusters (k)


Customer Segments
Spending Score (1-100)
100
80
60
40
20
0
Cluster 1
Cluster 2
Cluster 3
Cluster 4
Cluster 5
Centroids