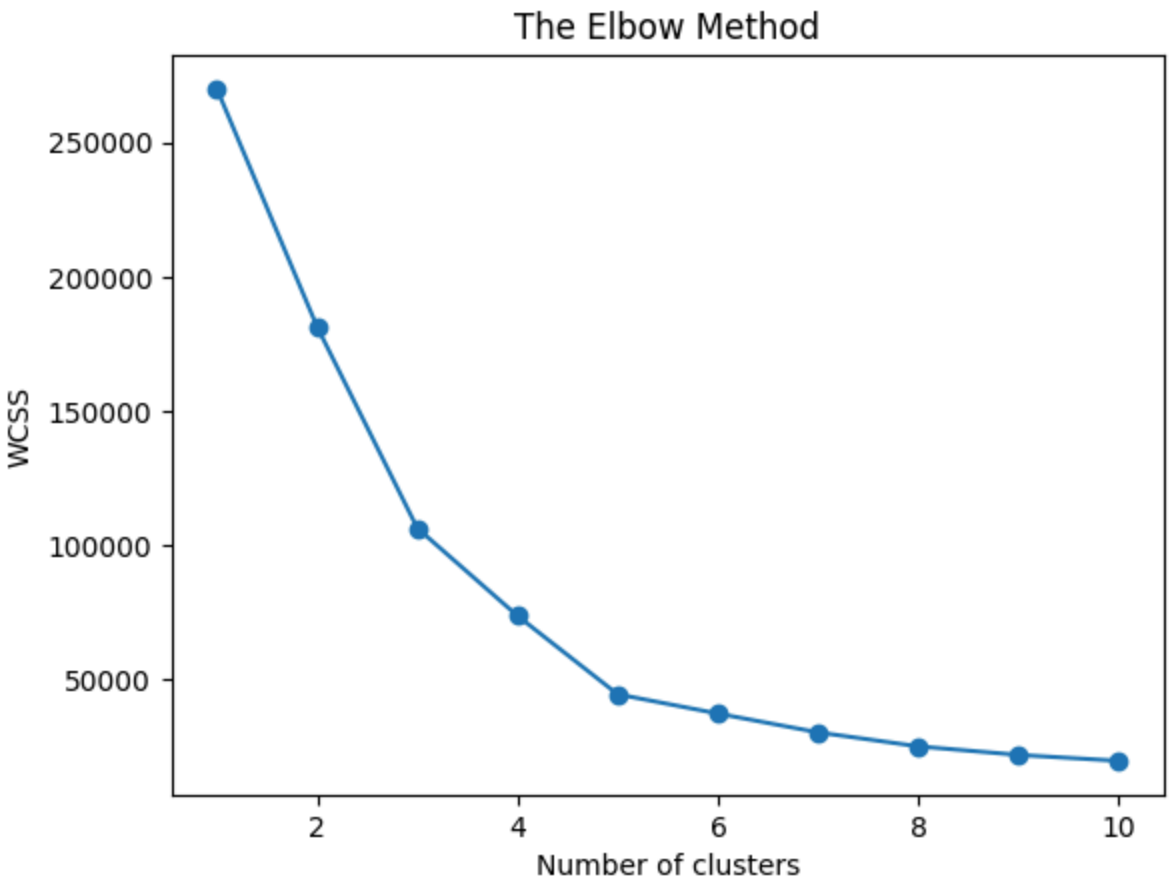
In [8]:
```
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
from sklearn.cluster import KMeans
import warnings
warnings.filterwarnings("ignore", message="KMeans is known to have a memory le
```

In [2]:
```
# Load dataset (make sure the path is correct in your environment)
dataset = pd.read_csv('Mall_Customers.csv')
print(dataset.head())
```

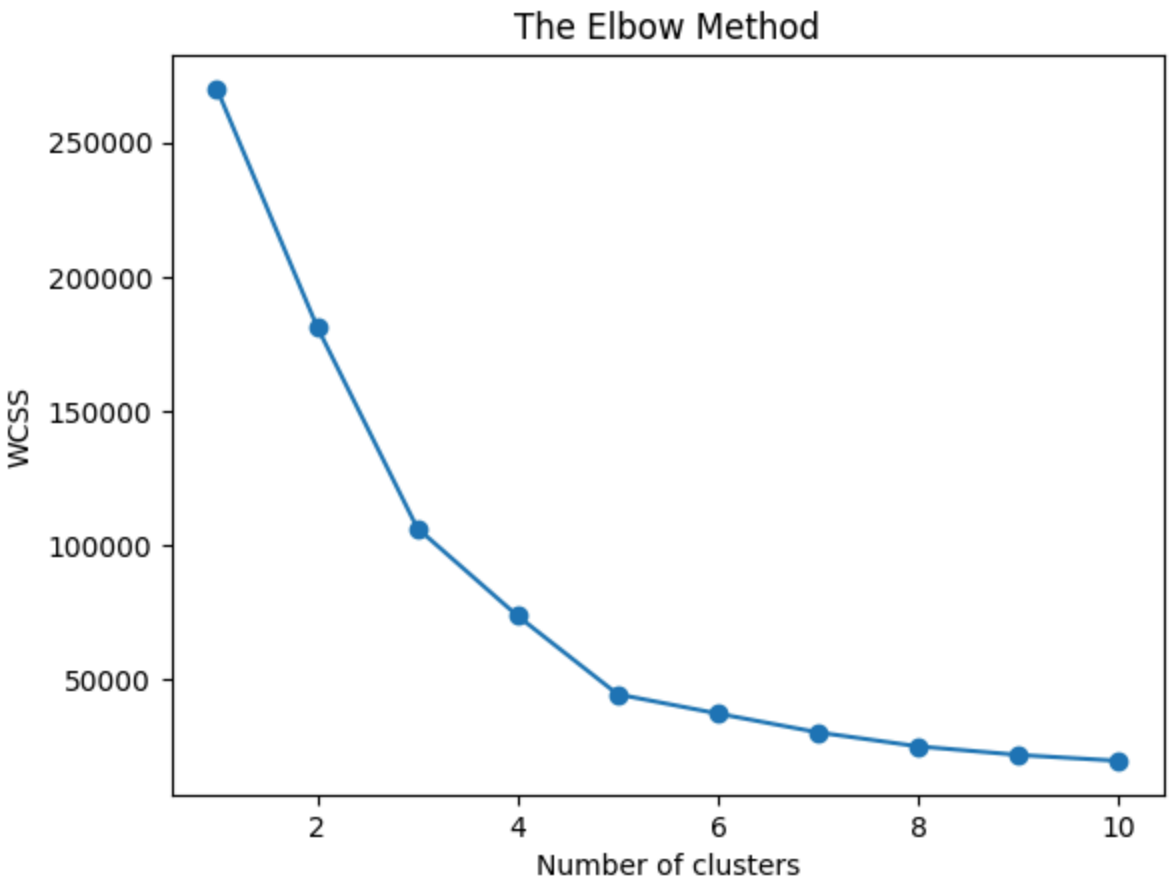
```
   CustomerID   Genre  Age  Annual Income (k$)  Spending Score (1-100)
0           1    Male   19                  15                      39
1           2    Male   21                  15                      81
2           3  Female   20                  16                       6
3           4  Female   23                  16                      77
4           5  Female   31                  17                      40
```

In [20]:
```
# Display first few rows # Select features for clustering (Annual Income and S
X = dataset.iloc[:, [3, 4]].values
```

In [22]:
```
# Elbow Method to find the optimal number of clusters
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_)
plt.plot(range(1, 11), wcss, marker='o')
plt.title('The Elbow Method')
plt.xlabel('Number of clusters')
plt.ylabel('WCSS')
plt.show() # Fit KMeans with 5 clusters
```


The Elbow Method
WCSS
250000
200000
150000
100000
50000
2
4
6
8
10
Number of clusters

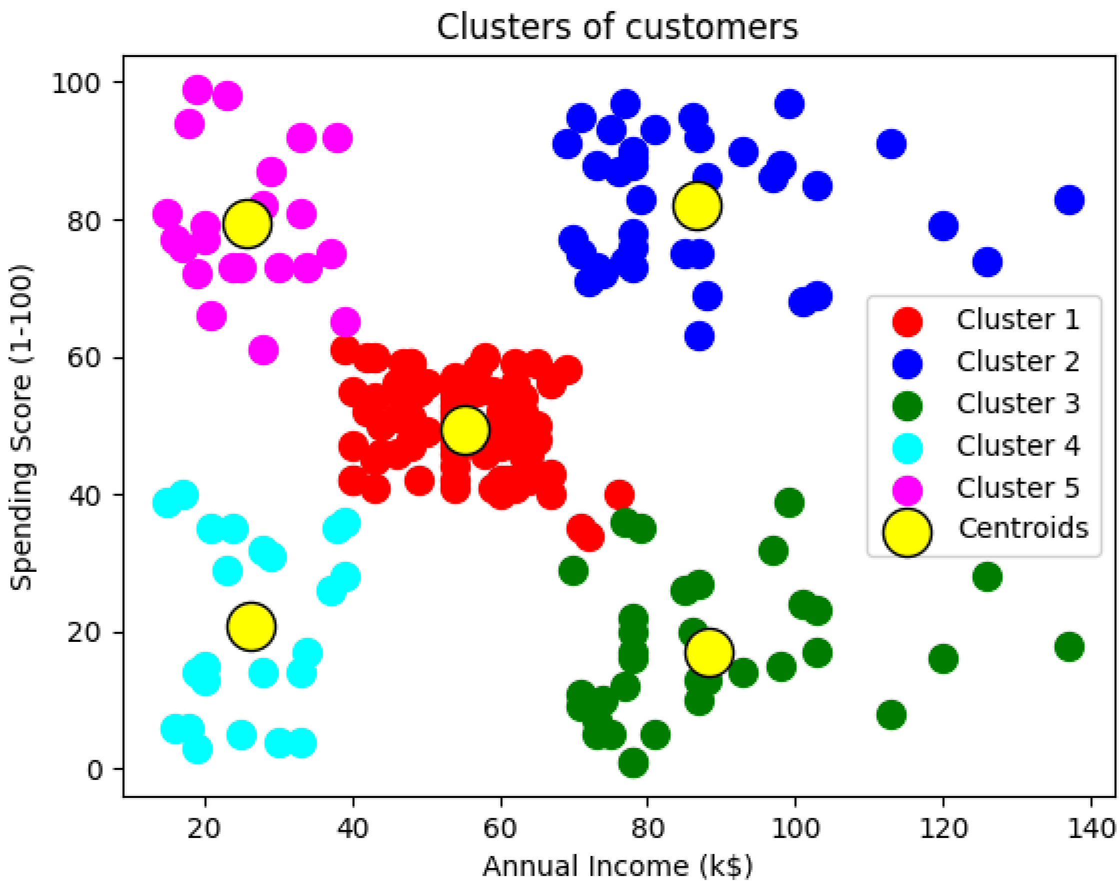
In [12]:



In [24]:

```
kmeans = KMeans( n_clusters=5,
                 init='k-means++',
                 max_iter=300,
                 n_init=10,
                 random_state=0
                )
y_kmeans = kmeans.fit_predict(X)
print("Cluster labels:", y_kmeans)
print("Type of labels:", type(y_kmeans)) # Visualizing the clusters
plt.scatter(X[y_kmeans == 0, 0], X[y_kmeans == 0, 1], s=100, c='red', label='C
plt.scatter(X[y_kmeans == 1, 0], X[y_kmeans == 1, 1], s=100, c='blue', label='
plt.scatter(X[y_kmeans == 2, 0], X[y_kmeans == 2, 1], s=100, c='green', label=
plt.scatter(X[y_kmeans == 3, 0], X[y_kmeans == 3, 1], s=100, c='cyan', label='
plt.scatter(X[y_kmeans == 4, 0], X[y_kmeans == 4, 1], s=100, c='magenta', labe
# Plot centroids
plt.scatter(kmeans.cluster_centers_[:, 0], kmeans.cluster_centers_[:, 1], s=30
plt.title('Clusters of customers')
plt.xlabel('Annual Income (k$)')
plt.ylabel('Spending Score (1-100)')
plt.legend()
plt.show()
```

```
Cluster labels: [3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3
4 3 4 3 4 3
 4 3 4 3 4 3 0 3 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 0 0 0 0 0 0 0 0 0 0 0 0 1 2 1 0 1 2 1 2 1 0 1 2 1 2 1 2 1 2 1 0 1 2 1 2 1
 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2
 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1]
Type of labels: <class 'numpy.ndarray'>
```



In [ ]: