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# Experiment-5

**Aim:** To train a machine learning model using K-means clustering algorithm to find the optimal value of number of clusters for the annual income and spending score of Mall Customers found in the dataset.

**Code:**

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

df = pd.read_csv('Mall_Customers.csv')
# df = df.iloc[1400:1500]
data_for_clustering = df[["AnnualIncome","SpendingScore"]]
data_for_clustering

x = data_for_clustering.values
x

plt.scatter(data_for_clustering.AnnualIncome.to_list() ,
data_for_clustering.SpendingScore.to_list())
plt.title("Mall customers Spending Score")
plt.xlabel("Annual Income")
plt.ylabel("Spending Score")
plt.show()

def get_wcss(X):
    wcss_list= []
    for i in range(1, 11):
        kmeans = KMeans(n_clusters=i, init='k-means++', random_state= 42)
        kmeans.fit(X)
        wcss_list.append(kmeans.inertia_)

    return wcss_list

wcss = get_wcss(x)
print(wcss)
plt.plot(range(1, 11), wcss)
plt.title('The Elbow Method Graph')
plt.xlabel('Number of clusters(k)')
plt.ylabel('wcss_list')
plt.show()
```

```
def clustering_kmeans(X,k):
    kmeans = KMeans(n_clusters=k, init='k-means++', random_state= 42)
    y= kmeans.fit_predict(X)
    return kmeans,y

# Using the Elbow method the optimal value of cluster(k) is 5 for the given
dataset
k_means, y = clustering_kmeans(x, 5)

plt.scatter(x[y == 0, 0], x[y == 0, 1], s = 100, c = 'blue', label = 'Cluster
1') #for first cluster
plt.scatter(x[y == 1, 0], x[y == 1, 1], s = 100, c = 'green', label = 'Cluster
2') #for second cluster
plt.scatter(x[y== 2, 0], x[y == 2, 1], s = 100, c = 'red', label = 'Cluster
3') #for third cluster
plt.scatter(x[y == 3, 0], x[y == 3, 1], s = 100, c = 'cyan', label = 'Cluster
4') #for fourth cluster
plt.scatter(x[y == 4, 0], x[y == 4, 1], s = 100, c = 'magenta', label =
'Cluster 5') #for fifth cluster
plt.scatter(k_means.cluster_centers_[:, 0], k_means.cluster_centers_[:, 1], s
= 300, c = 'yellow', label = 'Centroid')
plt.title('Customers Cluster')
plt.xlabel('Annual Income')
plt.ylabel('Spending Score')
plt.legend()
plt.show()
```

**Observation:**

**Task 1:**

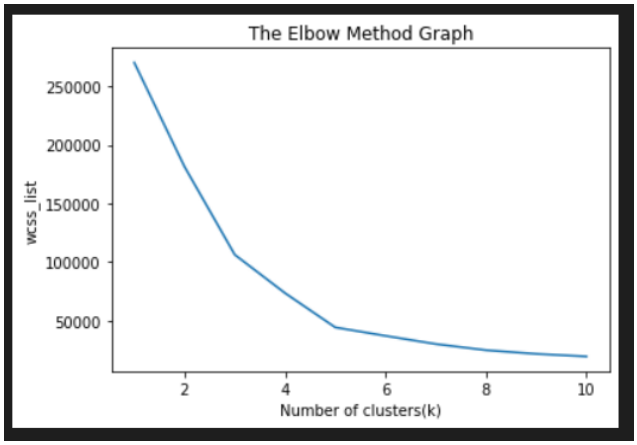
Below is the WCSS score for cluster values from 1-10:

```
[1, 269981.28000000014]
[2, 181363.59595959607]
[3, 106348.37306211119]
[4, 73679.78903948837]
[5, 44448.45544793369]
[6, 37233.81451071002]
[7, 30259.657207285458]
[8, 25011.839349156595]
[9, 21850.16528258562]
[10, 19672.07284901432]
```

The data points and cluster centroids for cluster k=5:

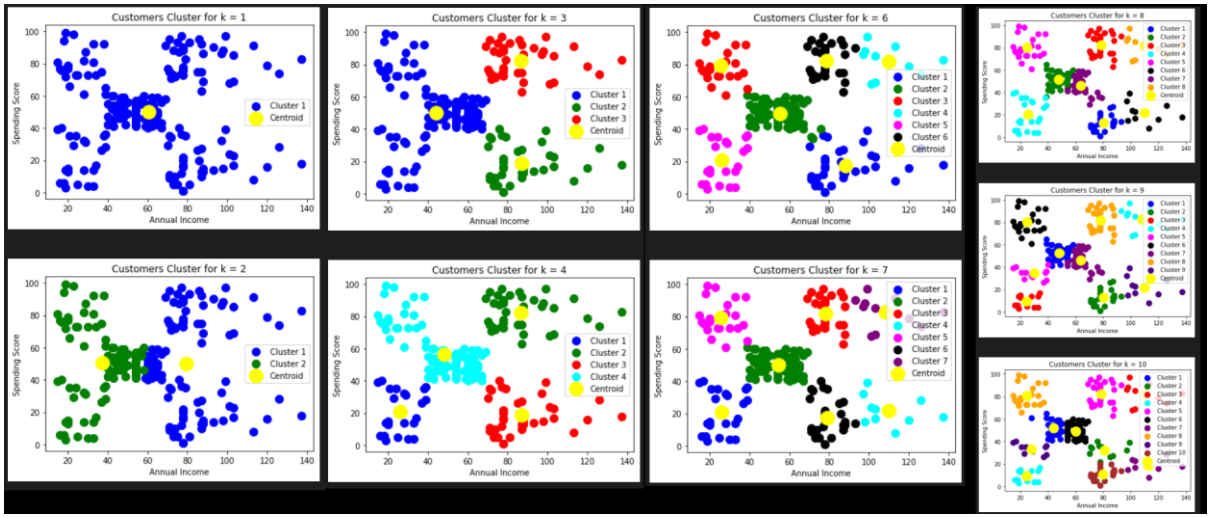

**Task 2:**

From the below Elbow Method graph which is wcss values plotted against each cluster value k we observe that the optimal value of k is 5 and the plot for k=5 is below.





Plots for each value of k:



**Conclusion:**

In this experiment, the aim is to implement the K-Means clustering algorithm and to run the algorithm on a random dataset which in this case is a dataset containing the annual income and spending score of mall customers. Then using k-means algorithm, for ‘k’ values ranging from 1-10, I calculated the within cluster sum of squares(WCSS) values and plotted the Elbow Method graph which helps to find out the optimal number of clusters which comes out to be 5 using the graph.

Then using this ‘k’ value, the graph with 5 clusters for annual income and spending score is plotted and all the centroids along with their data points are plotted. Using matplotlib, I also have plotted graphs for other ‘k’ values also and placed these images them in them document and can also be viewed in the jupyter notebook file present in the GitHub link below.

GitHub: https://github.com/pranav567/AI-ML-Lab/tree/master/experiment-5
DataSet: https://www.kaggle.com/shwetabh123/mall-customers