SNS COLLEGE OF ENGINEERING

(Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Artificial Intelligence & Machine Learning

Unit 3 – Unsupervised Learning

K-Means Clustering

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K-Means Clustering

- Clustering is an unsupervised machine learning technique. It is the process of division of the dataset into groups in which the members in the same group possess similarities in features.

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- It is the simplest and commonly used iterative type unsupervised learning algorithm. In this, we randomly initialize the K number of centroids in the data (the number of k is found using the Elbow method which will be discussed later in this article) and iterates these centroids until no change happens to the position of the centroid.

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Let’s go through the steps involved in K means clustering for a better understanding.

1) Select the number of clusters for the dataset (K)

2) Select K number of centroids

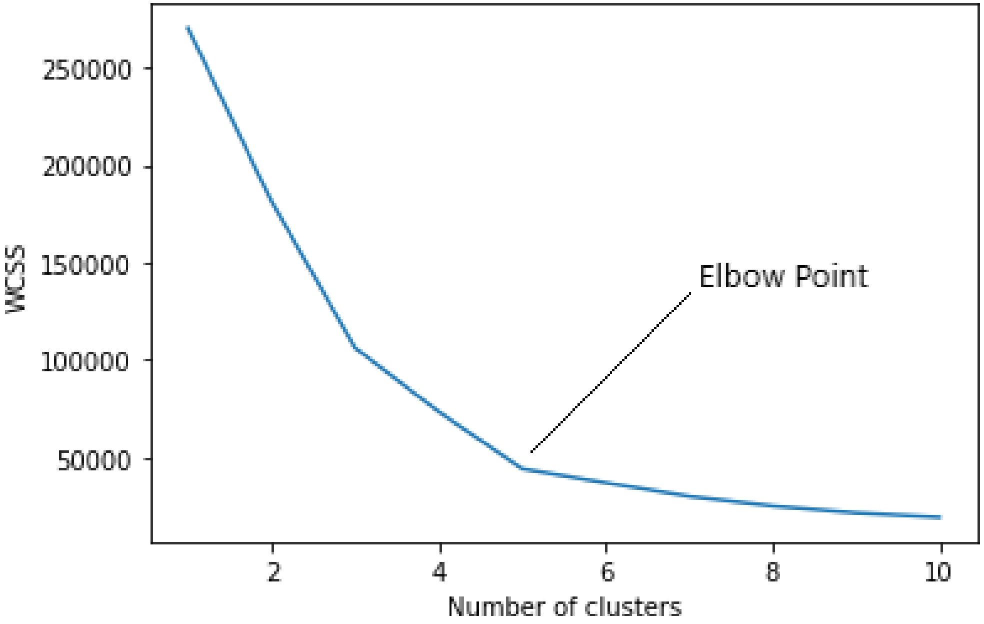
3) By calculating the Euclidean distance or Manhattan distance assign the points to the nearest centroid, thus creating K groups

4) Now find the original centroid in each group

5) Again reassign the whole data point based on this new centroid, then repeat step 4 until the position of the centroid doesn’t change.

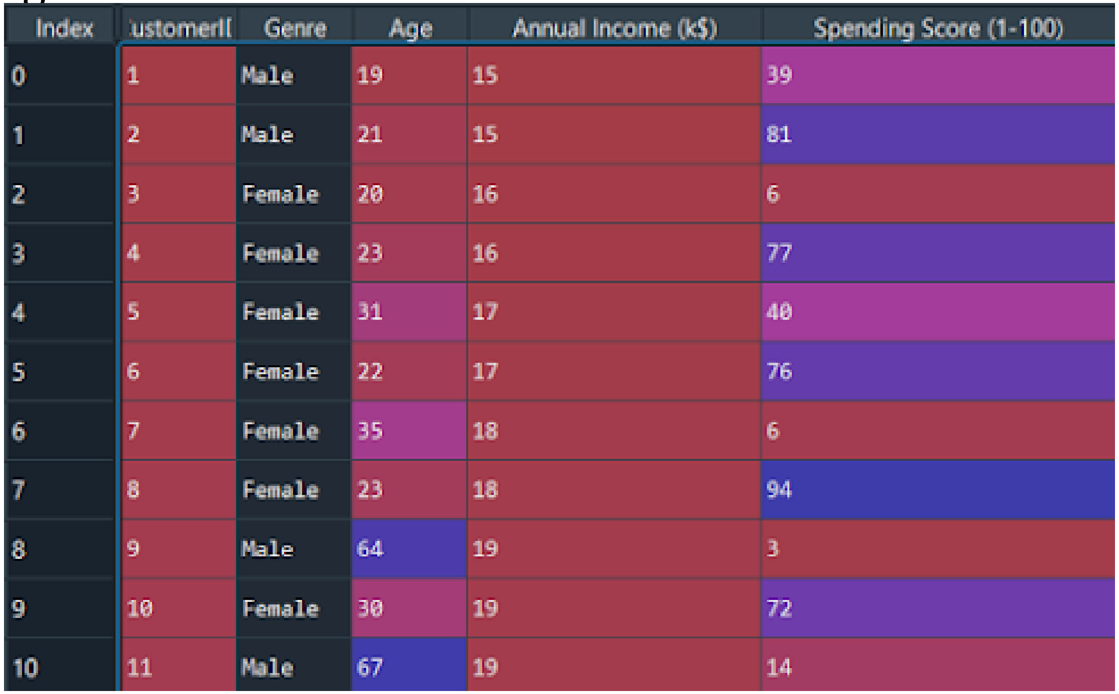
Elbow Method

In the Elbow method, we are actually varying the number of clusters (K) from 1 – 10. For each value of K, we are calculating WCSS (Within-Cluster Sum of Square). WCSS is the sum of squared distance between each point and the centroid in a cluster.



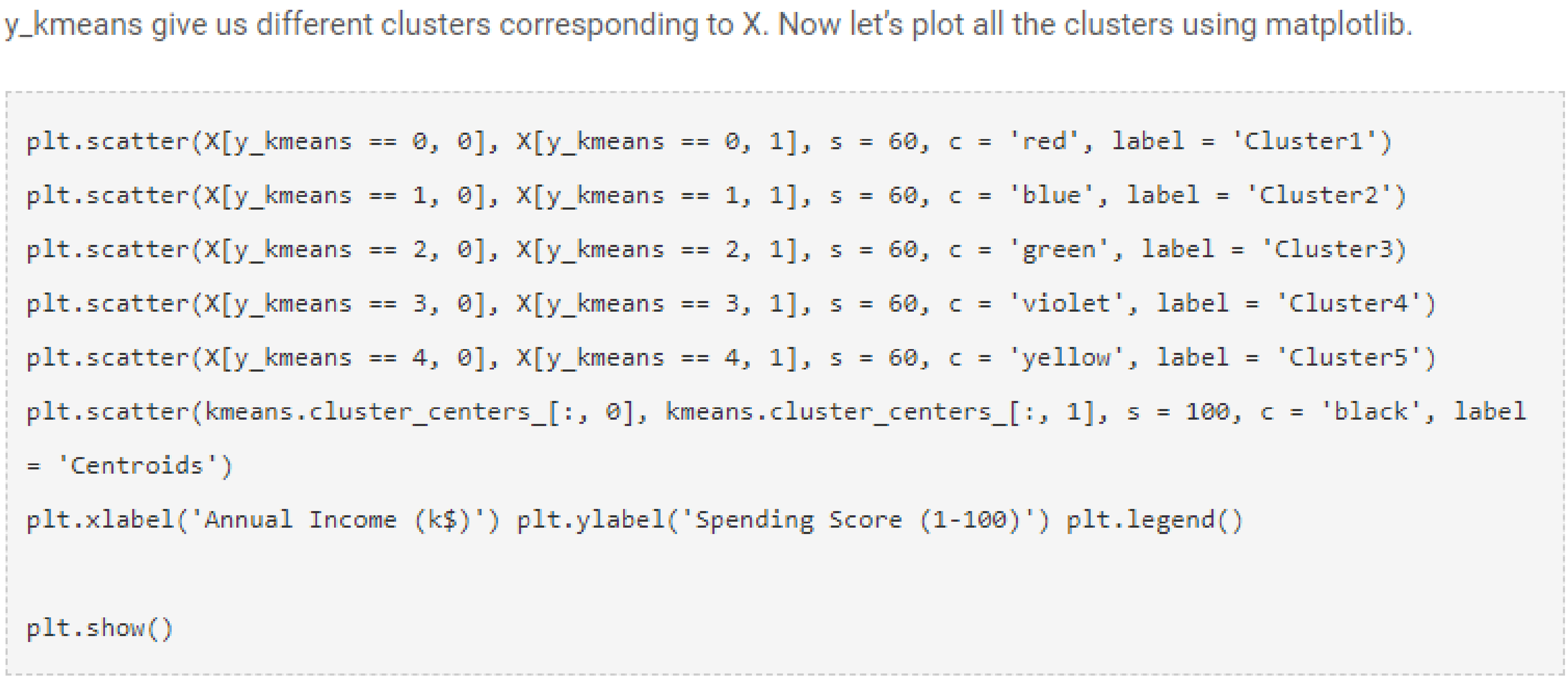
Implementation

Dataset we are using here is the Mall Customers data (Download here). It’s unlabeled data that contains the details of customers in a mall (features like genre, age, annual income(k$), and spending score). Our aim is to cluster the customers based on the relevant features annual income and spending score.



Index	ustomerI[	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
5	6	Female	22	17	76
6	7	Female	35	18	6
7	8	Female	23	18	94
8	9	Male	64	19	3
9	10	Female	30	19	72
10	11	Male	67	19	14

Contd...

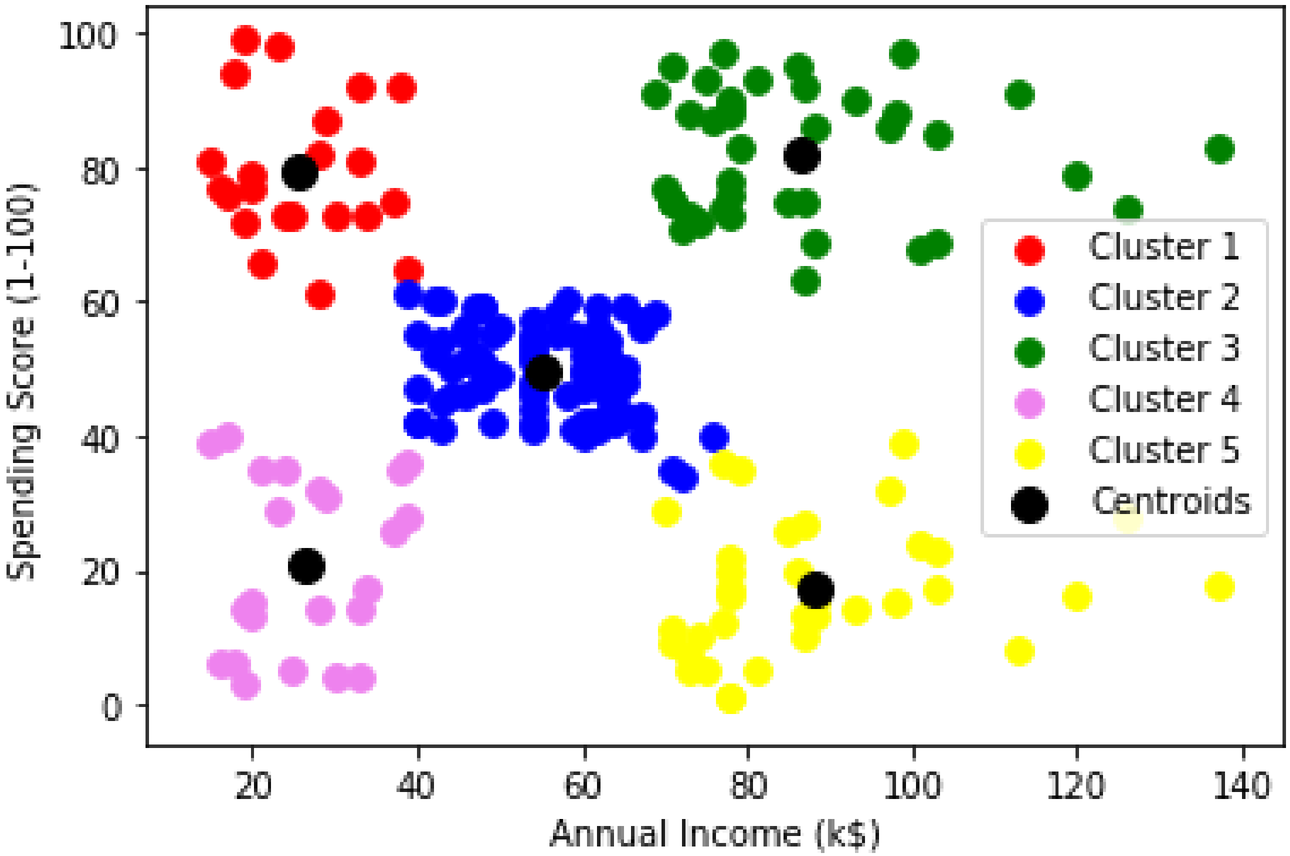


y_kmeans give us different clusters corresponding to X. Now let's plot all the clusters using matplotlib.

```
plt.scatter(X[y_kmeans == 0, 0], X[y_kmeans == 0, 1], s = 60, c = 'red', label = 'Cluster1')
plt.scatter(X[y_kmeans == 1, 0], X[y_kmeans == 1, 1], s = 60, c = 'blue', label = 'Cluster2')
plt.scatter(X[y_kmeans == 2, 0], X[y_kmeans == 2, 1], s = 60, c = 'green', label = 'Cluster3)
plt.scatter(X[y_kmeans == 3, 0], X[y_kmeans == 3, 1], s = 60, c = 'violet', label = 'Cluster4')
plt.scatter(X[y_kmeans == 4, 0], X[y_kmeans == 4, 1], s = 60, c = 'yellow', label = 'Cluster5')
plt.scatter(kmeans.cluster_centers_[:, 0], kmeans.cluster_centers_[:, 1], s = 100, c = 'black', label
= 'Centroids')
plt.xlabel('Annual Income (k$)') plt.ylabel('Spending Score (1-100)') plt.legend()


plt.show()
```

Cluster formation



thank
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