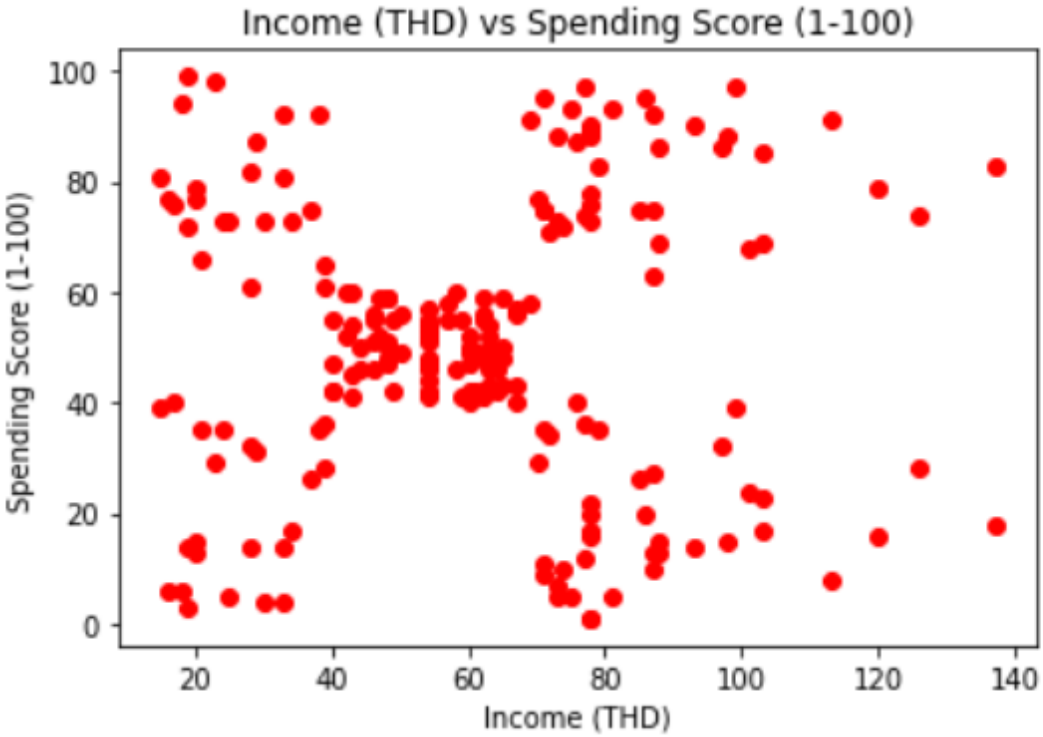
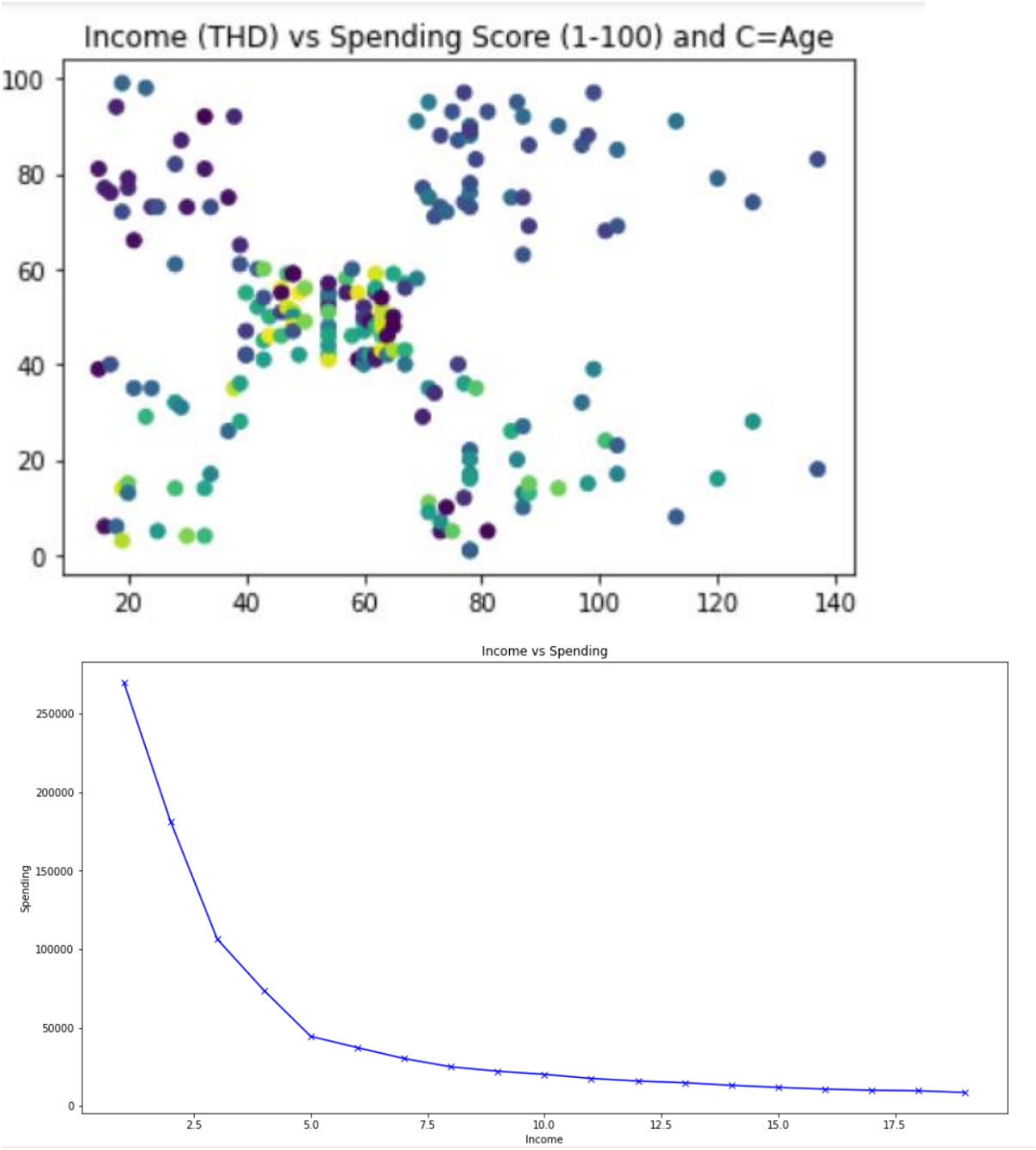
# Report for Assignment 5

## K Means

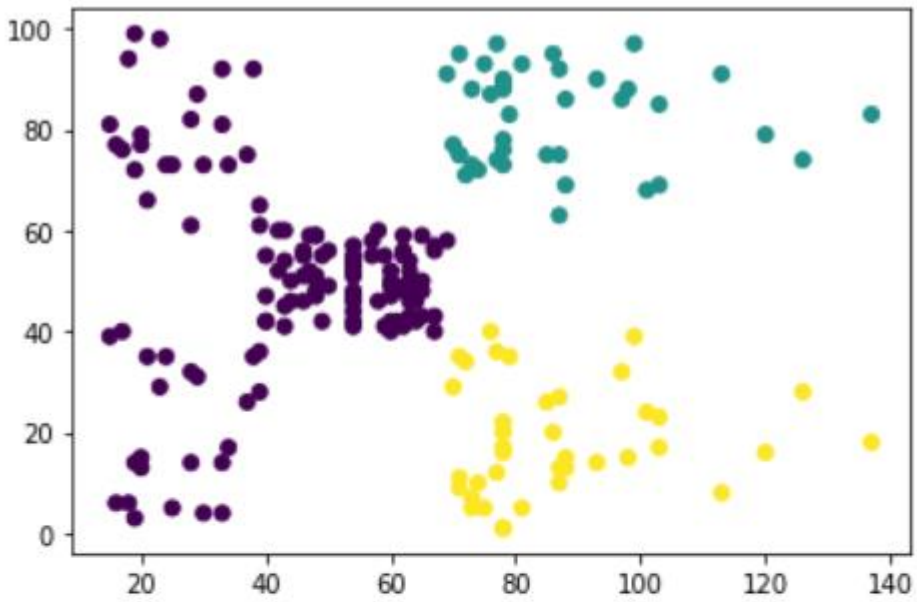
I have taken Mall Customers dataset from Kaggle. Here we had three features Gender, Age, Income and Spending. I plotted these separately.

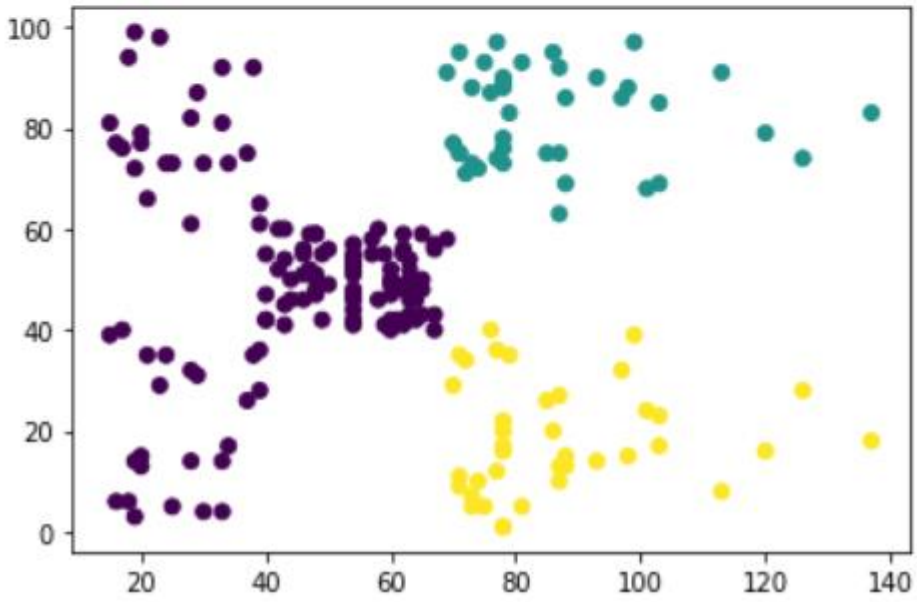


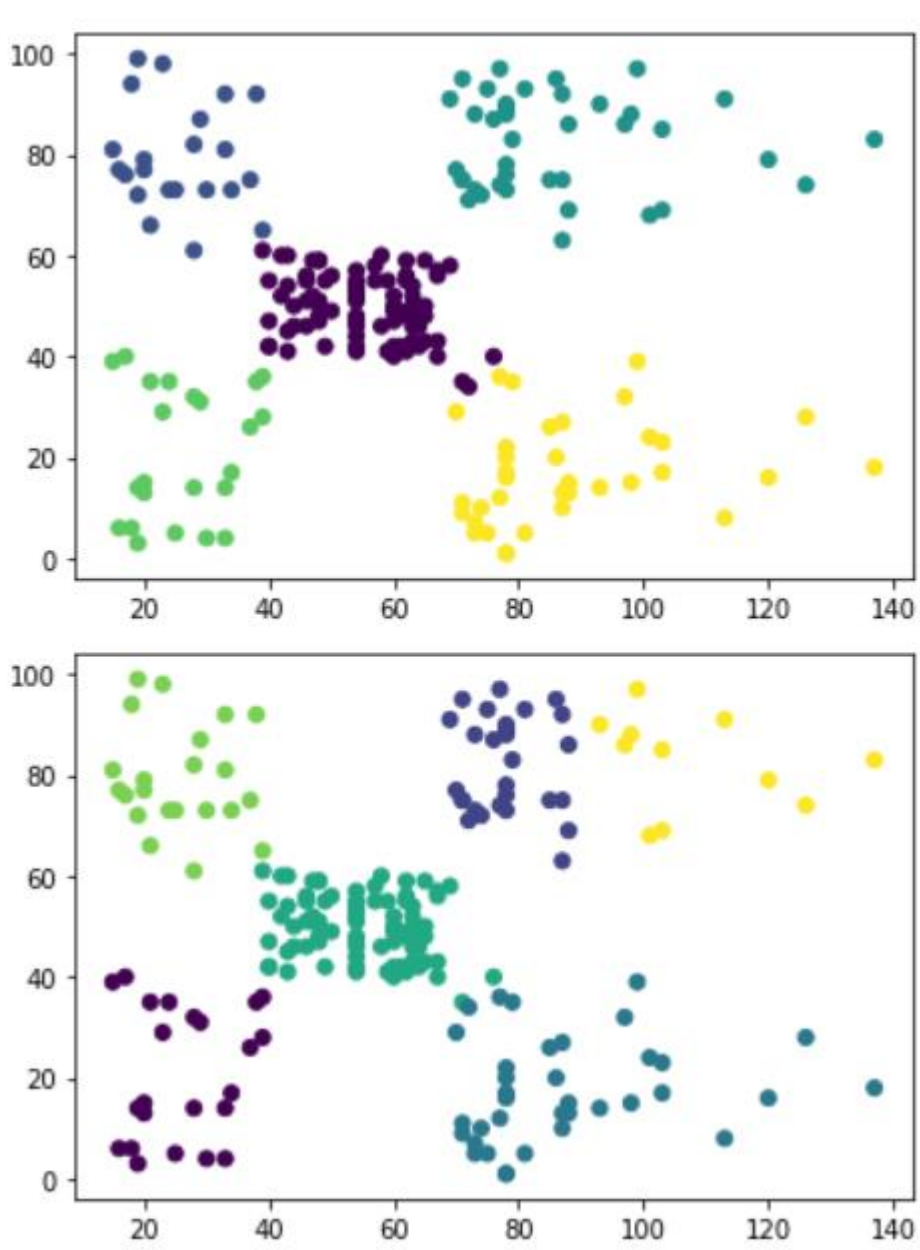

Spending score vs age plotting




Using K Means we get clusters.


100
80
60
40
20
0
20
40
60
80
100
120
140


100
80
60
40
20
0
20
40
60
80
100
120
140




Then we used `silhouette_score` to find the best cluster size.

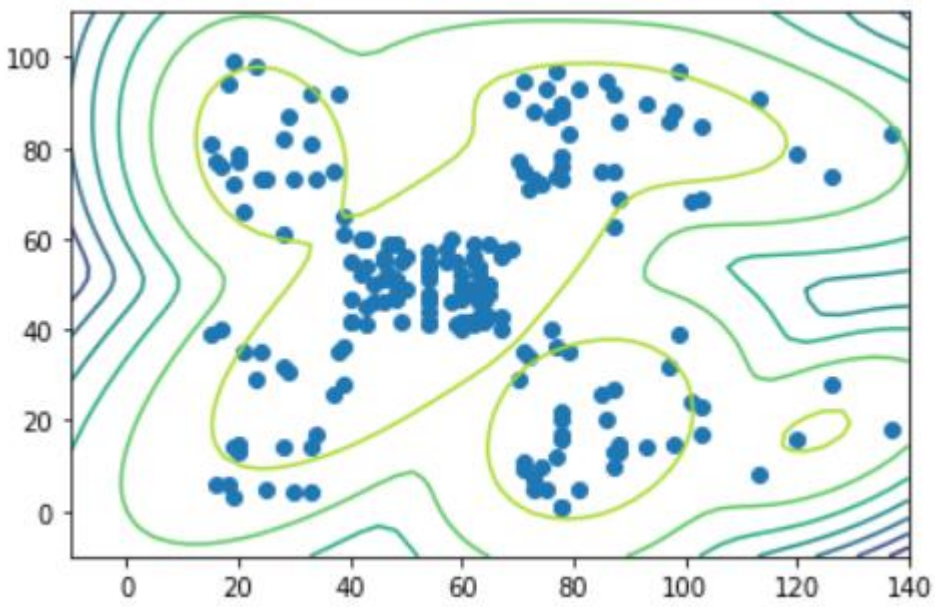
```
For n_clusters = 2, silhouette score is 0.2965167311215868
For n_clusters = 3, silhouette score is 0.4671264942977645
For n_clusters = 4, silhouette score is 0.49369523511548846
For n_clusters = 5, silhouette score is 0.5541446796204179
For n_clusters = 6, silhouette score is 0.5410411871359793
For n_clusters = 7, silhouette score is 0.5327101345818385
For n_clusters = 8, silhouette score is 0.45854013950590267
For n_clusters = 9, silhouette score is 0.4581689704998002
For n_clusters = 10, silhouette score is 0.4505873675162661
For n_clusters = 11, silhouette score is 0.44515537320416854
For n_clusters = 12, silhouette score is 0.4400443397643773
For n_clusters = 13, silhouette score is 0.42365237726710364
```

```
For n_clusters = 14, silhouette score is 0.4186349372846408
For n_clusters = 15, silhouette score is 0.4204044838281923
For n_clusters = 16, silhouette score is 0.4334916895508394
For n_clusters = 17, silhouette score is 0.43051731261305654
For n_clusters = 18, silhouette score is 0.41899366690089124
For n_clusters = 19, silhouette score is 0.4294838009211467

 Using silhouette_score we get  silhouette score is maximum for 5
clusters with score 0.5541446796204179.
 So, the optimul number of clusters is 5.
```

## Gaussian Cluster GMM

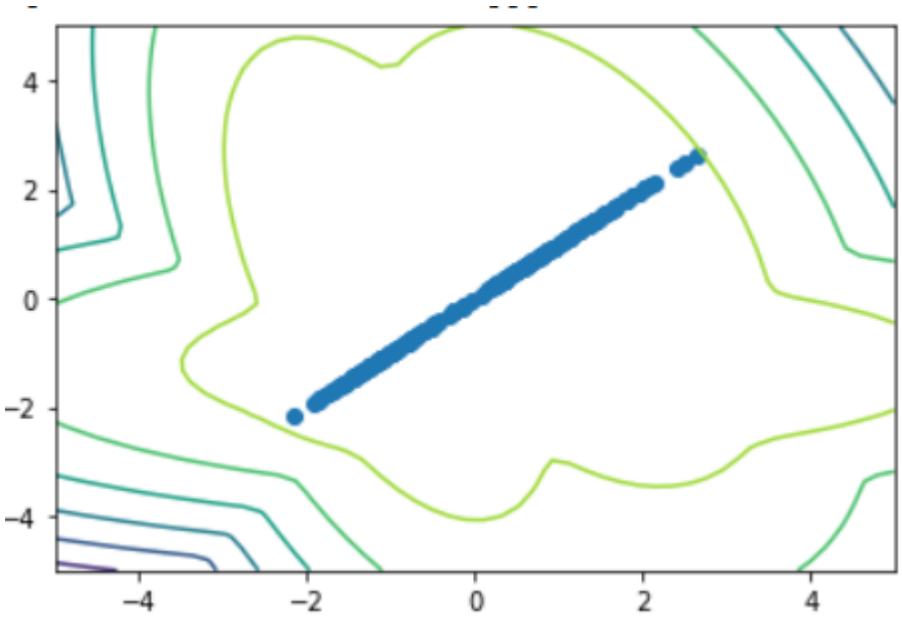
Using inbuilt function from SKlearn we get clusters,




## PCA

Then we used PCA on the same dataset. We reduced the dimension of the dataset to 2. I sot two feature `Principal Component 1 and Principal Component 2. Then we applied K Means and GMM here also.`

`Using K means I get cluster,`




And using GMM on this we get clusters,