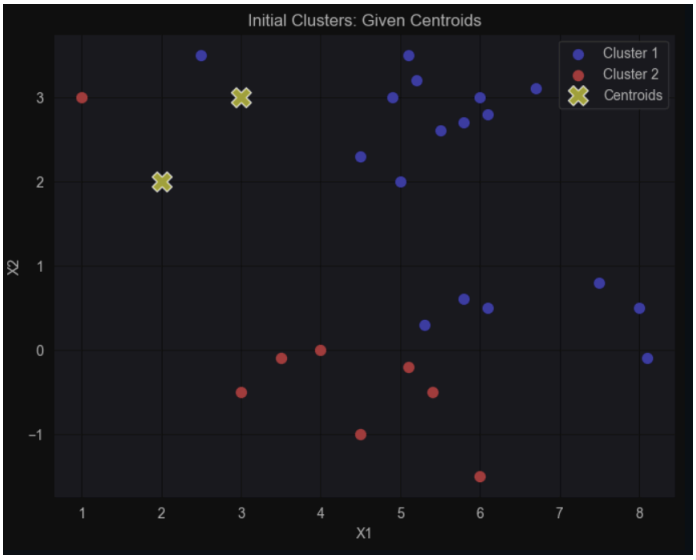
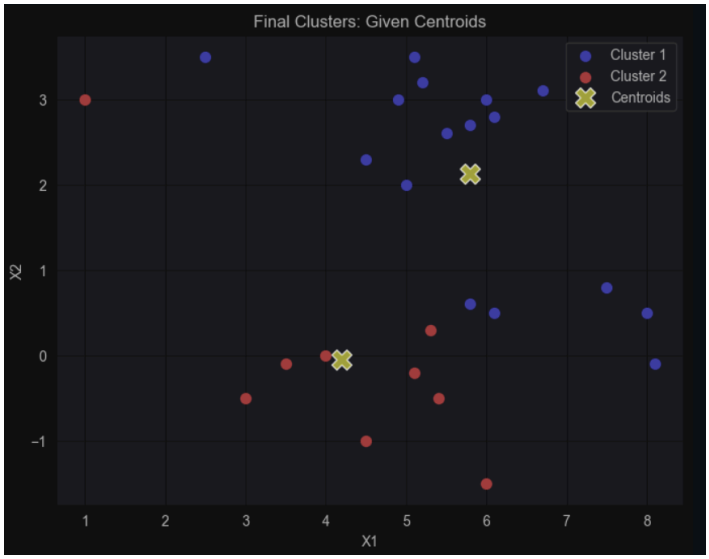
Machine Learning Assignment-04 Report

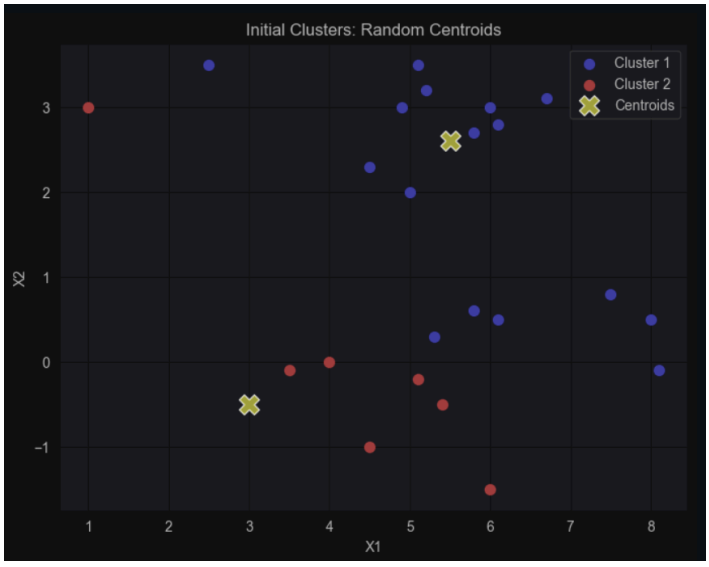
Section: B

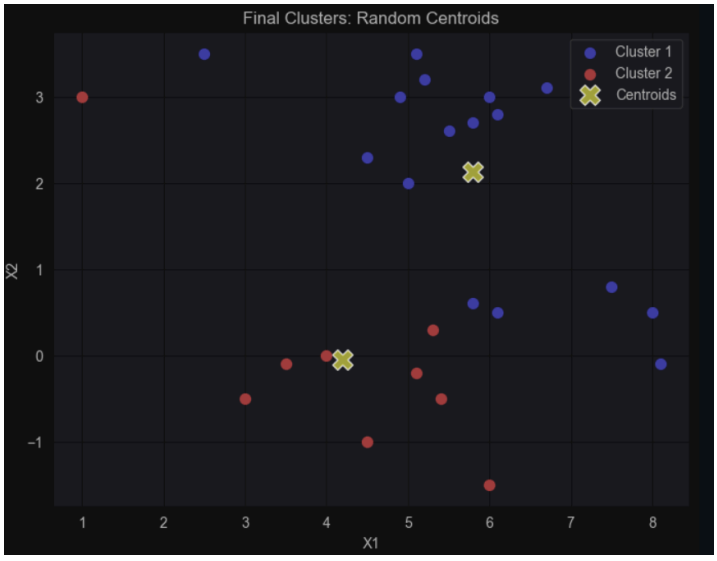




Running algorithm Initialization of centroids with the given coordinates in the assignment as u1 = (3.0, 3.0), u2 = (2.0, 2.0). Got the position of Final Centroids position for u1 and u2, respectively, as:

```
[[ 5.8         2.125     ]
 [ 4.2        -0.05555556]]
```



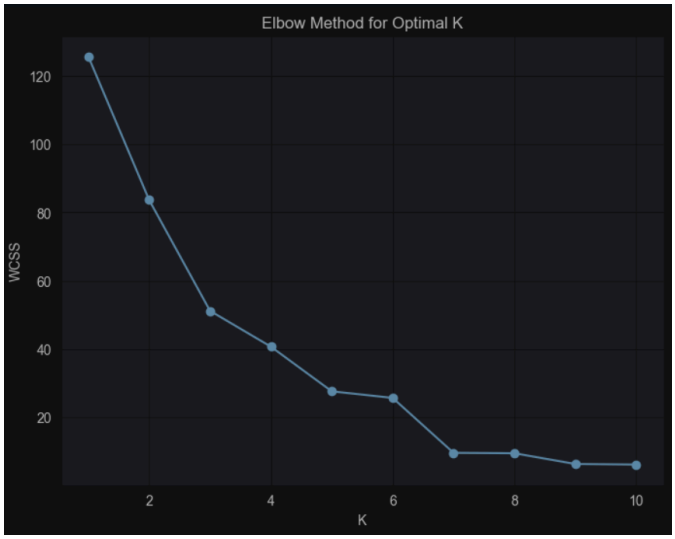


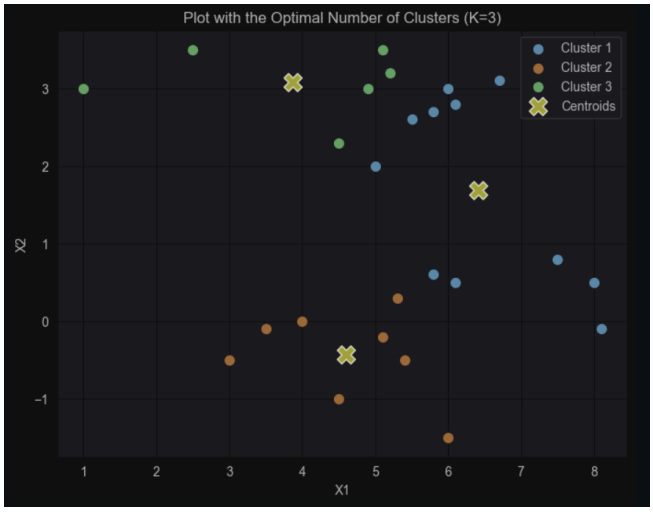
Running algorithm Initialization of centroids with the random coordinates generated in the code as u1: (5.5 2.6), u2: (3. -0.5). Got the position of Final Centroids position for u1 and u2, respectively, as:

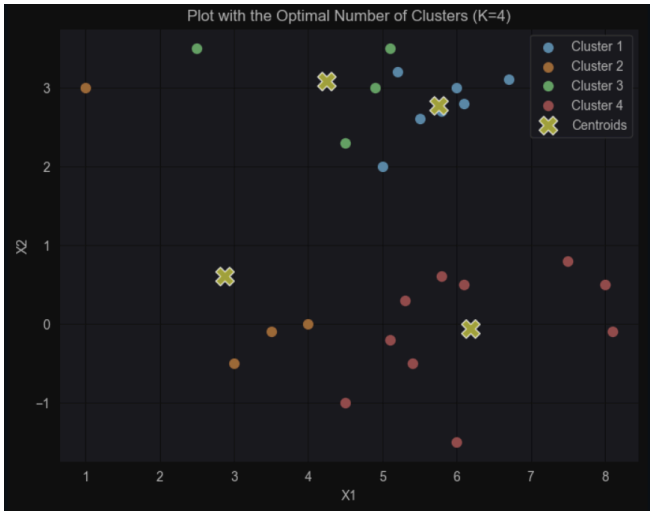
```
[[ 5.8         2.125     ]
 [ 4.2        -0.05555556]]
```

This is the same as the given centroids assignment, which means both the time's algorithms got the optimal solution at the end under the given threshold.

This plot shows the WCSS values w.r.t Different values of K, using the Elbow Method, we can clearly see that the WCSS decreases very quickly At K=3 and K=4, Therefore one can be reported As the best and optimal value of K for the given data points.



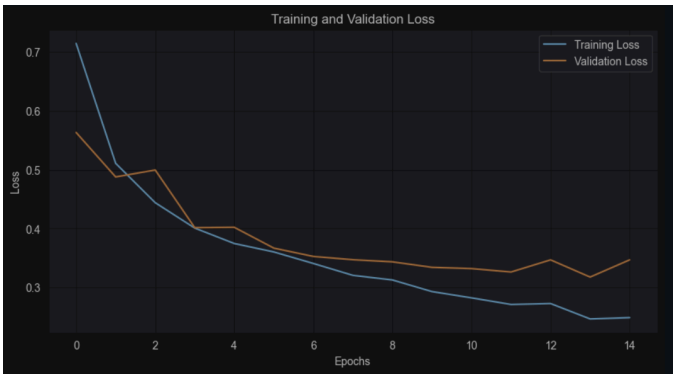




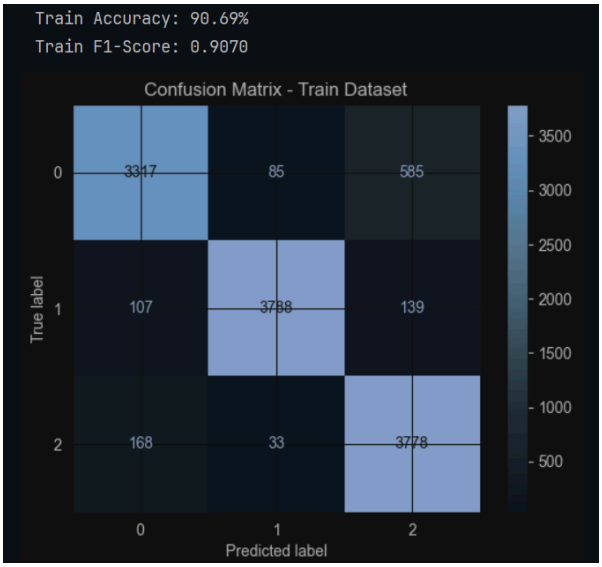
The cluster plots with K = 3 and K = 4, The best and optimal value of K = 3, because for K = 4 the datapoint at (1, 3) is very far from cluster2 and nearer to cluster3 but still that datapoint is labelled with cluster2 also there are many such points in K = 4 which seems to be wrongly labelled but K = 3 there is no doubt which datapoint belongs to which cluster Therefore in my point of view the best and optimal value of **K = 3**.

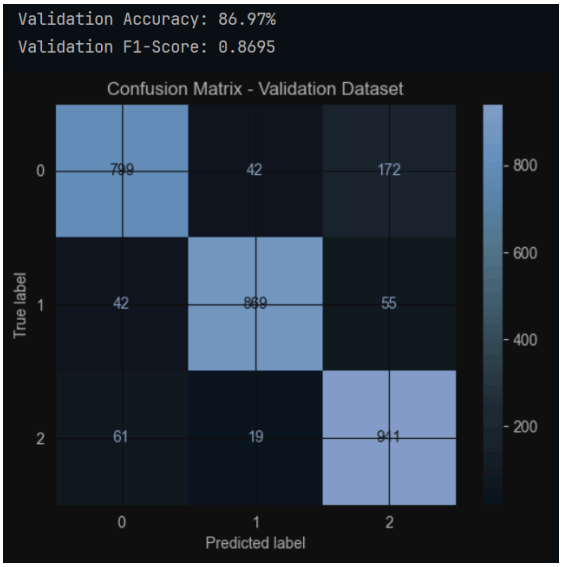
Section: C

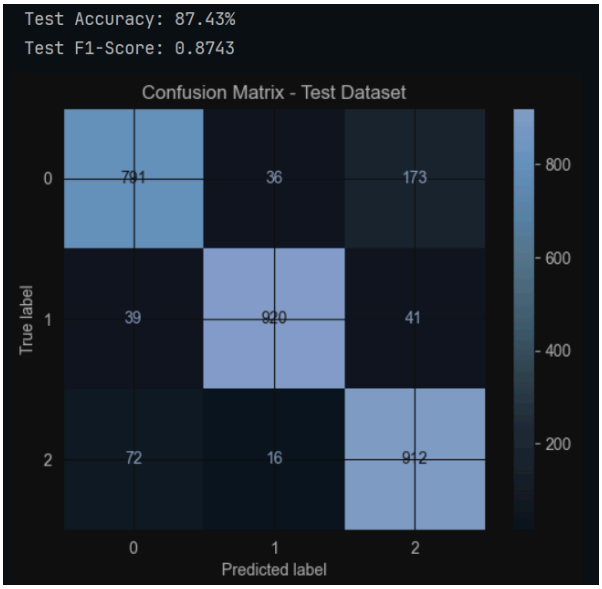
For CNN model Training and Validation, the loss Curve and Accuracy Curve.



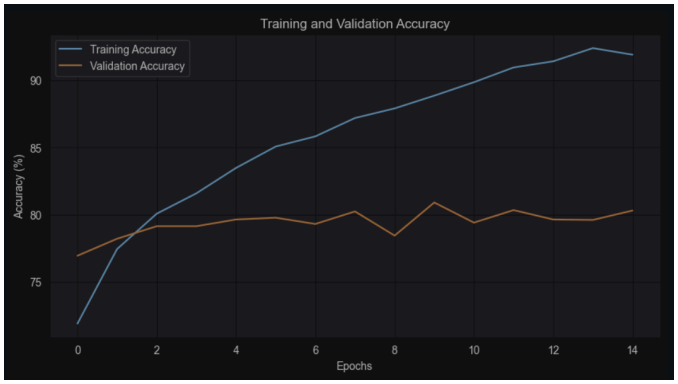
Confusion Matrix for Train, Test and Validation for CNN model



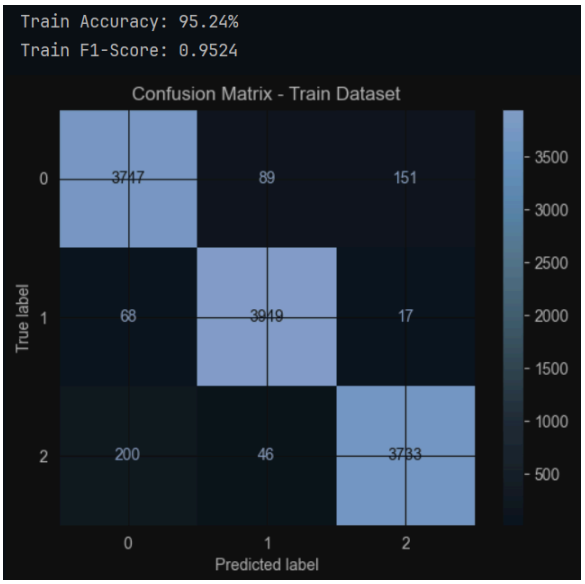


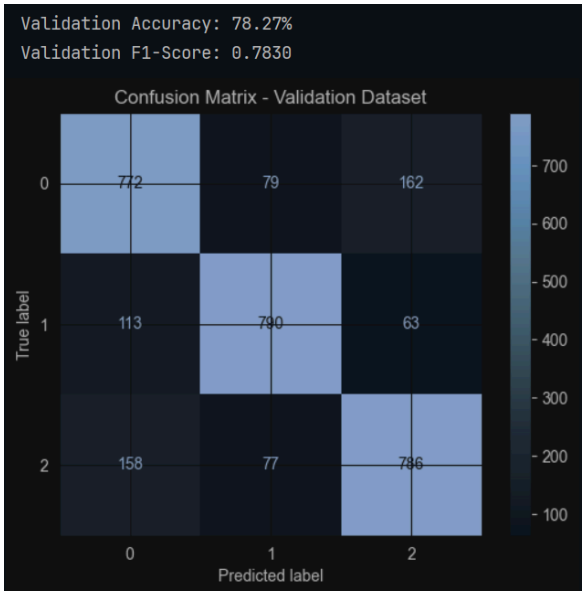


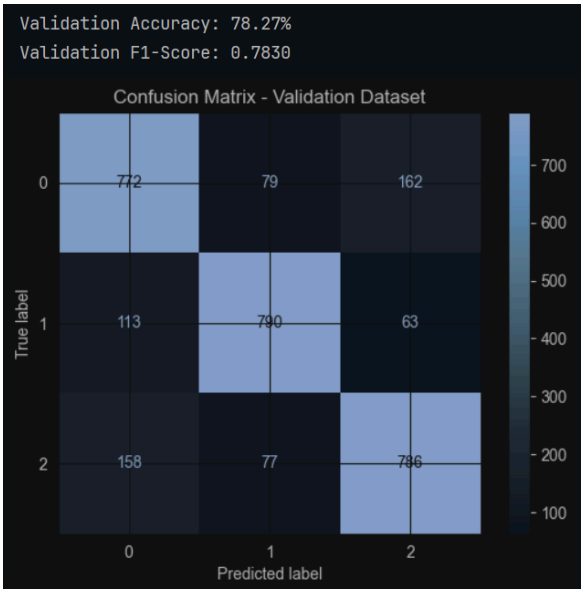
For MLP model Training and Validation, the loss Curve and Accuracy Curve.



Confusion Matrix for Train, Test and Validation for MLP model.







(Section C: 7)

Observations and Comparison of CNN and MLP Model: The CNN model outperforms the MLP model in terms of accuracy and F1-score, which means that CNN is better at extracting spatial features from the image data. CNN: Shows relatively fewer misclassifications across all the chosen classes in training, validation, and test datasets, Indicating a better ability to generalize. On the contrary, MLP: More misclassifications compared to CNN, particularly in the test and validation sets, implies that MLP could be a more efficient network in terms of spatial dependency learning of data as it is completely connected. MLP: The model's loss and accuracy graphs show that it is overfitting, which is the main issue resolved by the CNN model in comparison to other neural networks. Convolutional layers that comprise pooling operations and the capability of spatial hierarchies help the CNN perform very well on the data type of images. Its lack of mechanisms to take advantage of spatial locality puts MLP in a less-than-ideal position about this work.

Therefore, the better model was found to be CNN for this assignment's task.