Task 2: Image classification using a CNN with CL1, PL1, CL2 and PL2 as the layers. Use kernels of size 3x3, stride of 1 in the convolutional layers. Use the mean pooling with a kernel size of 2x2 and stride of 2 in the pooling layers. Use 4 feature maps in CL1 and 8 feature maps in CL2.

Hyper parameters: Learning rate - 0.001 Epochs - 10

Experiment:

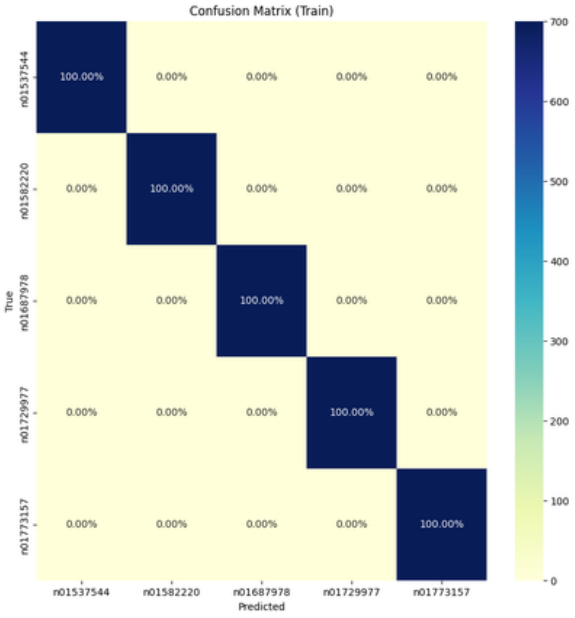
Convolutional neural network is trained from scratch here unlike in the previous task. The same normalized dataset that we used for previous task is used here. The model converged quick without any mode collapse .

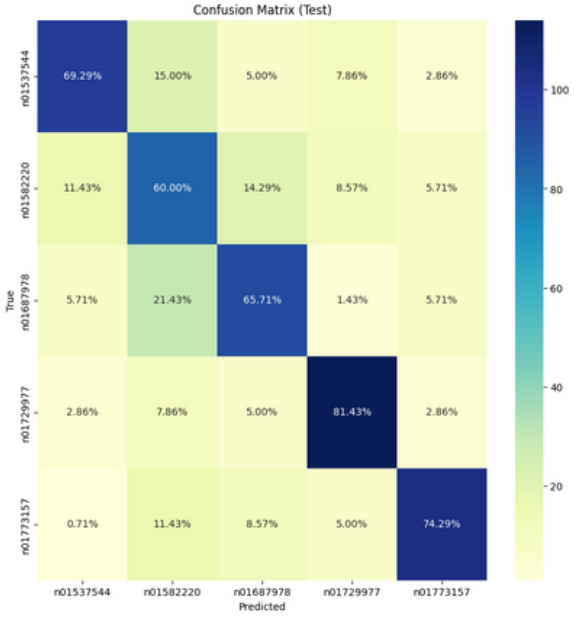
Observations :

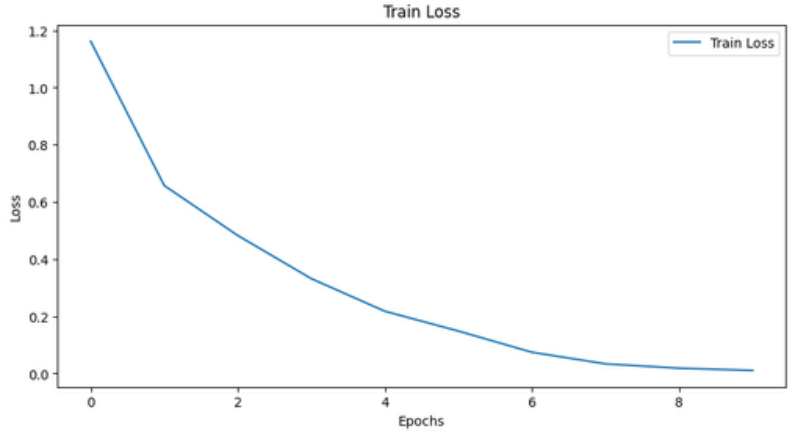
- **Train Loss**: 0.0105
- **Train Accuracy** : 100%
- **Test Loss** : 1.2237
- **Test accuracy** : 70.14%

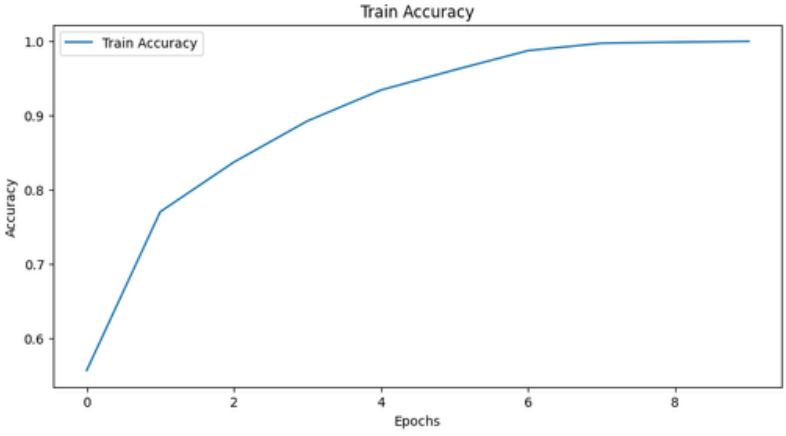
Features:

- **Number of Convolutional Layers** - 2
  - **Kernel Size** - 3x3
  - **Padding** - 1
  - **Stride** 1
  - **Total features** - 6 of size 56 x 56
- **Number of Pooling Layers** - 2
  - **Kernel Size** 3x3
  - **Stride** - 2
- **Total** Parameters - 2098729
- **Non - trainable Params** - 272









Inferences:

- The performance metrics of CNN trained is comparable to that of the pre-trained models like VGGNet and GoogLeNet given the simplicity of our model.
- This is confirmed from the confusion matrix as well as the test and train accuracies.
- The train accuracy reached 100% while the test accuracy is at 70% indicating overfitting of data in the model.
- To improve the accuracy of the model, one effective approach is image augmentation.
- This technique involves generating new training images by applying random transformations such as shifts, rotations, or skews to the existing images. This can help the model learn better by increasing the diversity of the training data