Task 2

A test set of 400 samples was created for experimentation purposes.

Initially the MobileNet V2 was tested , and it showed good performance in the original large size of the part1 dataset as below-
Result
Test_accuracy:0.738281249999999

But results degraded as the size of images were downscaled to the size of MNIST dataset i,e 28x28. This mainly due to the fact that there are many filters in MobileNet V2 whose span is greater than 3x3, this reduces obtaining meaningful information from small sized images like 28x28.
Result
Test_accuracy:0.0390625

The next Model architecture was inspired from the paper ' A Branching and Merging Convolutional Network with Homogeneous Filter Capsules', this paper is the recent STOA paper for mnist dataset, hence as a general intuition this was used here, but was found not to give expected results in part1 dataset,
Result
Test_accuracy:0.19140625000000003

Although it gave expected results in the original MNIST dataset, so just to increase Non-Linearity, Relu was used after each Convulutional block and it improved the results significantly.Algowith that dropout were added to the model to prevent overfitting .
Result
Test_accuracy:`0.6640625`

`Hence This model was used for further tasks.`

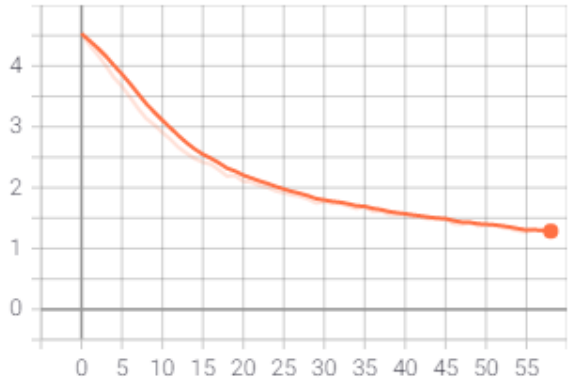
Part1

For this part the dataset was augmented, as because the size of dataset were small , to increase the size of the training set image augmentations were used , but no augmentation involving flip,rotation or crop was used because this kind of augmentation for the given dataset could generate noisy and mislabeled samples.

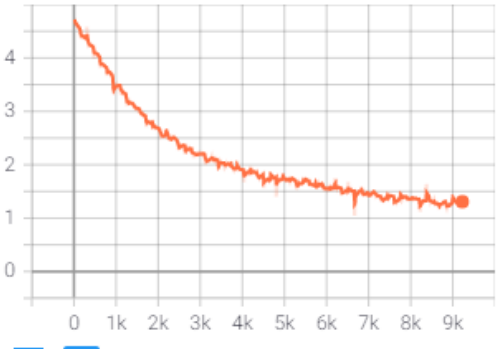
Results and metrics for complete dataset(62 classes)

Train_Loss

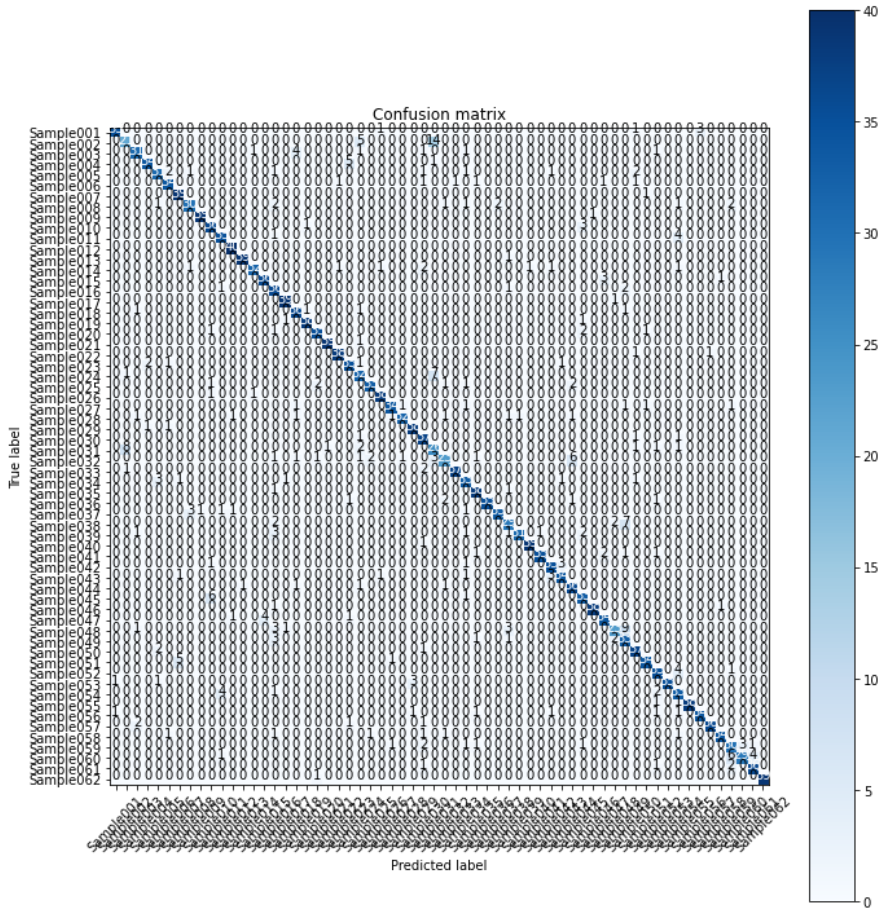
epoch
tag: Train_Loss/epoch



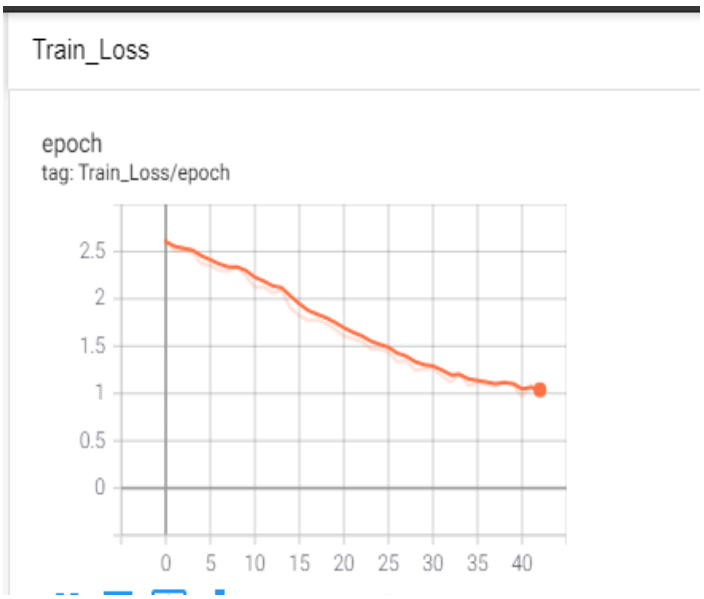
iter
tag: Train_Loss/iter

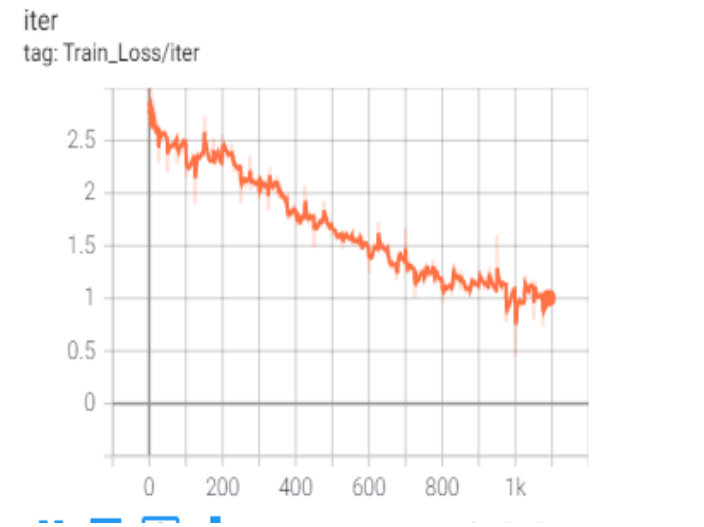



```
Convergence epoch 55
Convergence Time: 1907.9600670337677 s
Average train loss: 1.2845 +-0.0171
Train_accuracy: 0.8620967741935484
```

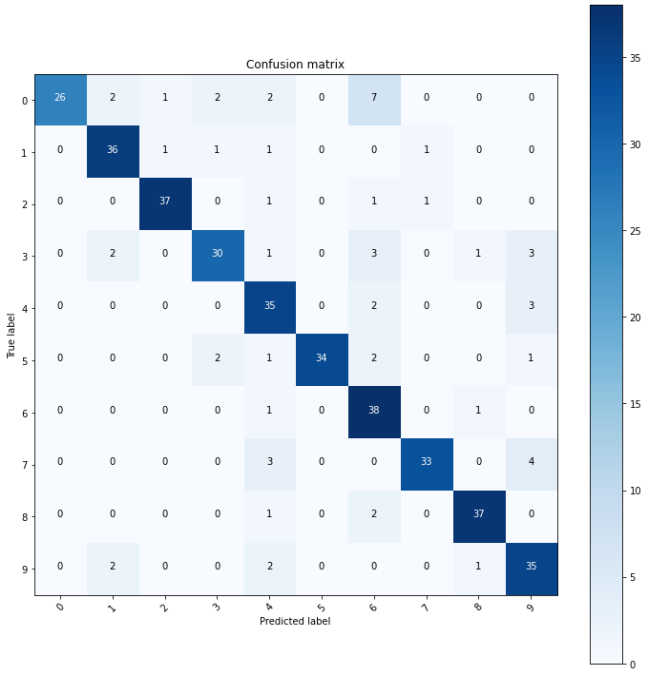


Results and metrics for cFor(0-9) classes-






```
 Convergence epoch 40
Convergence Time: 223.8778576850891s
Average train loss: 1.0198 +-0.0440
Train_accuracy:0.84
```



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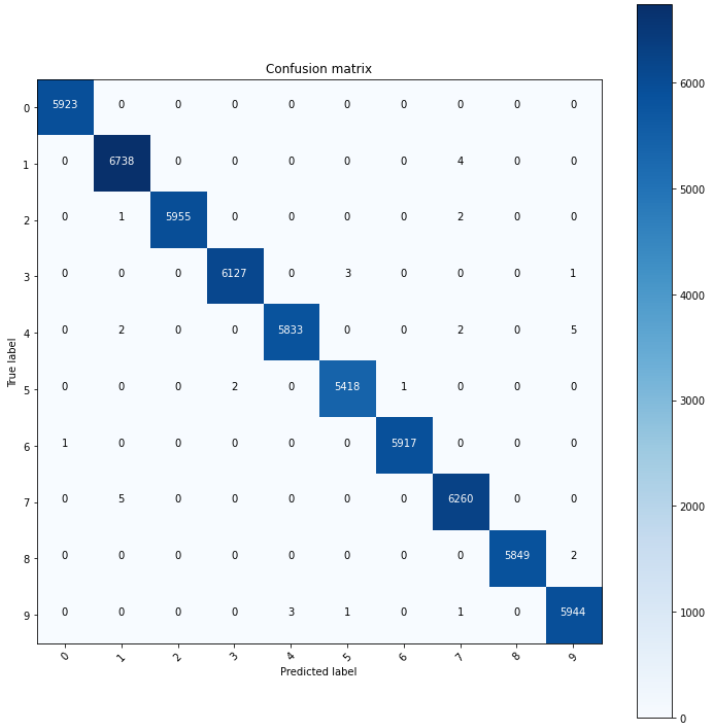
The results provided by Mobilenet v2 could be seen below.

Part2

The results of the model with the pretrained weights from the first part are as follows:

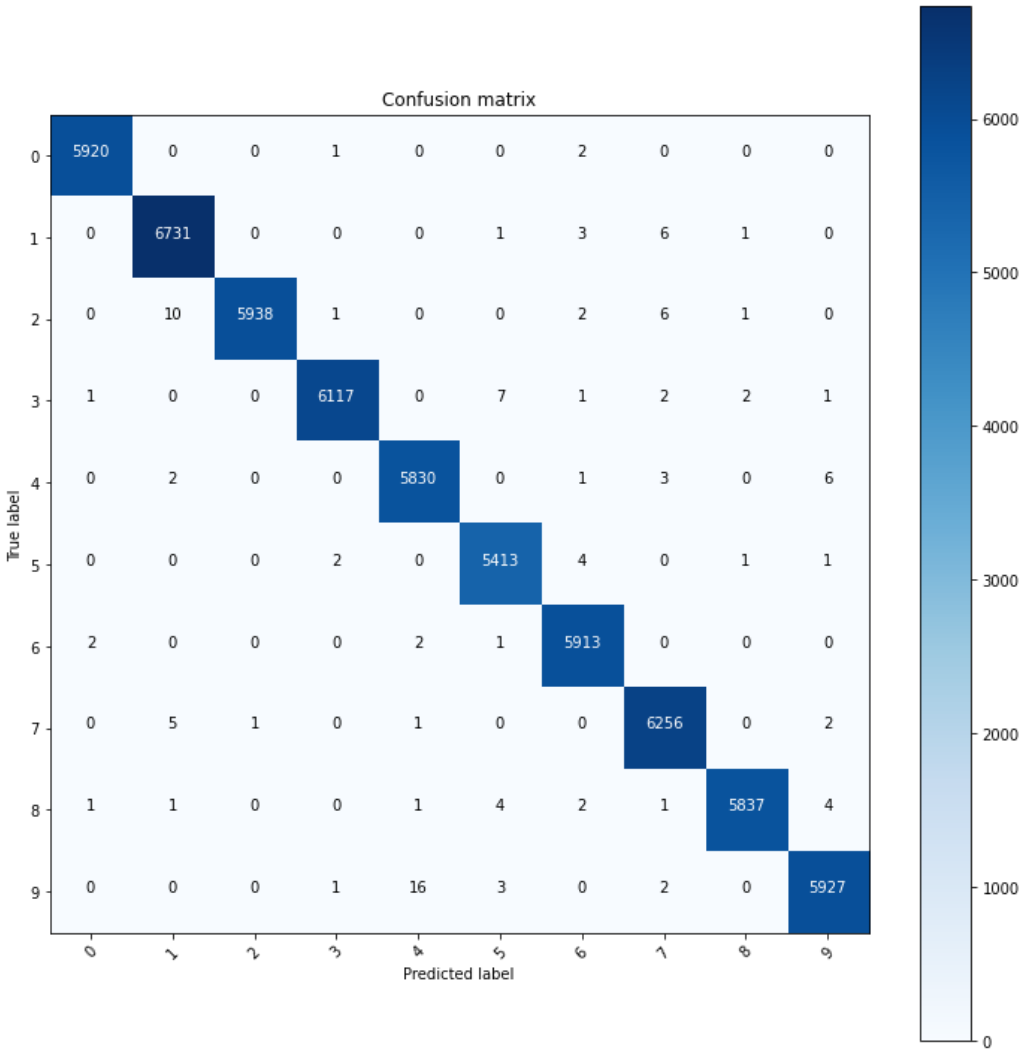
```
convergence epoch 33
convergence Time: 1534.2143957614899 s
Average train loss: 0.0135 +-0.0004

Test_accuracy:0.9954999999999997
```



The results of the model without the pretrained weights from the first part are as follows:

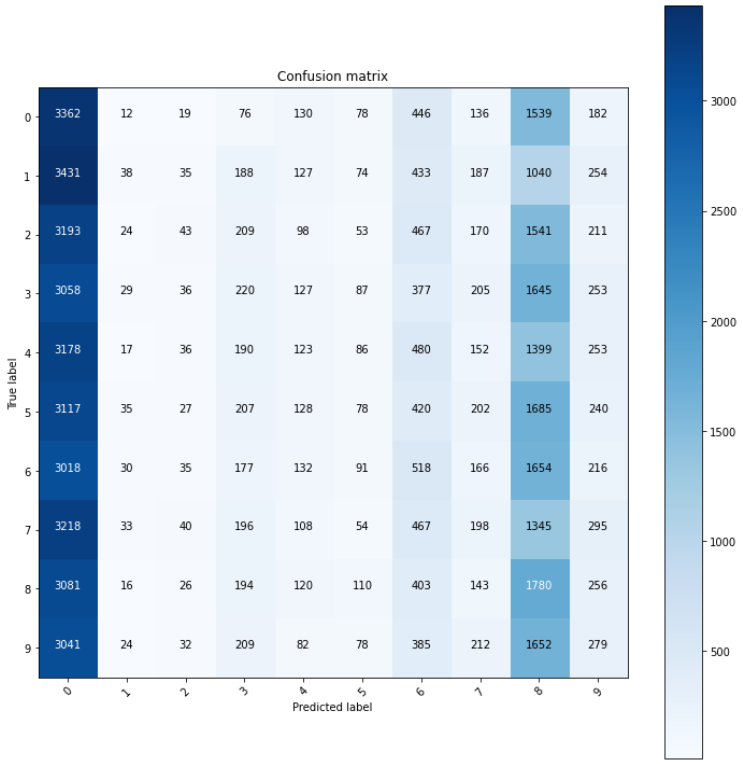
```
Convergence epoch 13
Convergence Time: 630.5595891475677
Average train loss: 0.0170 +-0.0012 s
Test_accuracy:0.9957000000000005
```



Part 3

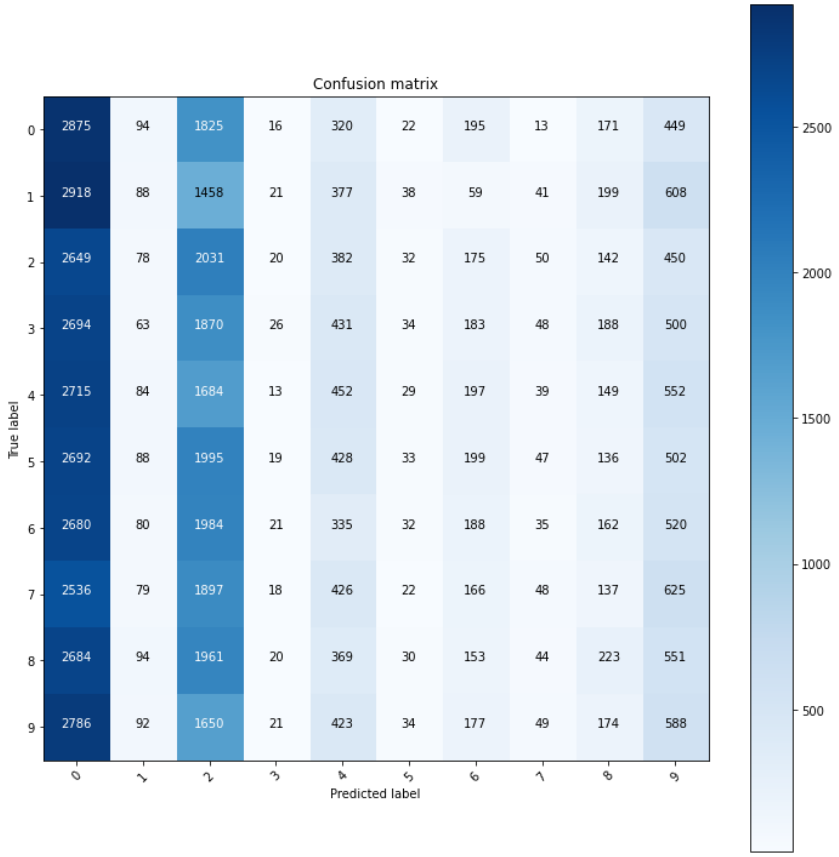
The results of the model without the pretrained weights from the first part are as follows:

```
Convergence epoch 4
Convergence Time: 315.5340414047241 s
Average train loss: 2.3102 +-0.0010
Test_accuracy:0.0116
```



The results of the model with the pretrained weights from the first part are as follows:

```
Convergence epoch 3
Convergence Time: 253.81242299079895 s
Average train loss: 2.3114 +-0.0027
Test_accuracy:0.0042000000000000006
```



The results of the 3rd part clearly indicate that the dataset to be noisy and mislabeled and hence in both the cases. i.e pre trained and non- pre trained the results are poor.