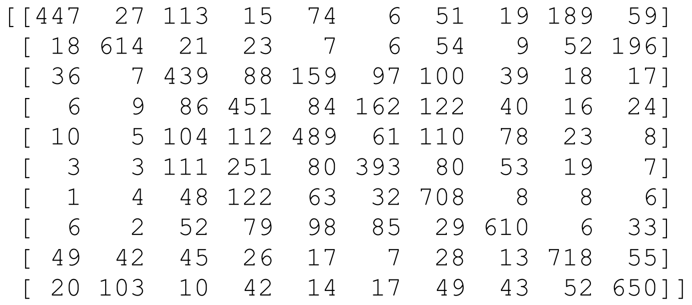
## SIT 789

## Task 5.1: Deep learning for Computer Vision

### 2.1 a) Confusion matrix of the network trained on CIFAR10 dataset



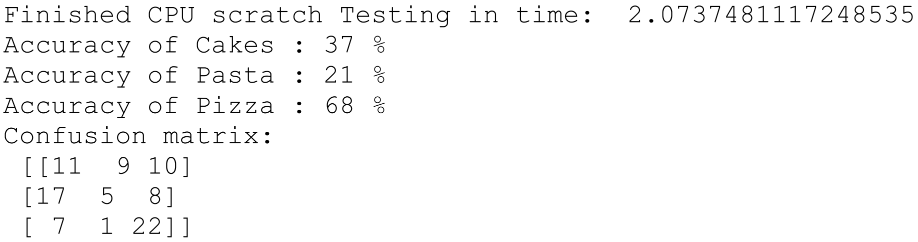
```
[[447  27 113  15  74   6  51  19 189  59]
 [ 18 614  21  23   7   6  54   9  52 196]
 [ 36   7 439  88 159  97 100  39  18  17]
 [  6   9  86 451  84 162 122  40  16  24]
 [ 10   5 104 112 489  61 110  78  23   8]
 [  3   3 111 251  80 393  80  53  19   7]
 [  1   4  48 122  63  32 708   8   8   6]
 [  6   2  52  79  98  85  29 610   6  33]
 [ 49  42  45  26  17   7  28  13 718  55]
 [ 20 103  10  42  14  17  49  43  52 650]]
```

### 2.1 b) Training on Food dataset and 2.2) Using CIFAR10 weights to finetune on Food dataset

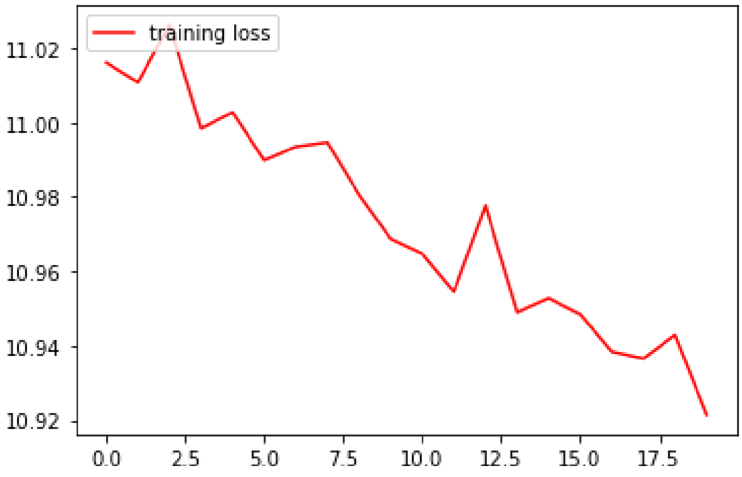
We can observe that when we use pretrained weighed to finetune on existing dataset, the training process is much more efficient as the networks already knows features from CIFAR10 dataset, this allows us to train on a small dataset with higher accuracy. When we use randomly initialised weights then because of the small size if Food dataset, the model is not able to converge and yields a higher accuracy. The loss goes down to 0.005 in training from scratch whereas while using pretrained weights the loss goes down to 0.001

### Comparison between training from scratch and fine-tuning

### A) Scratch Training

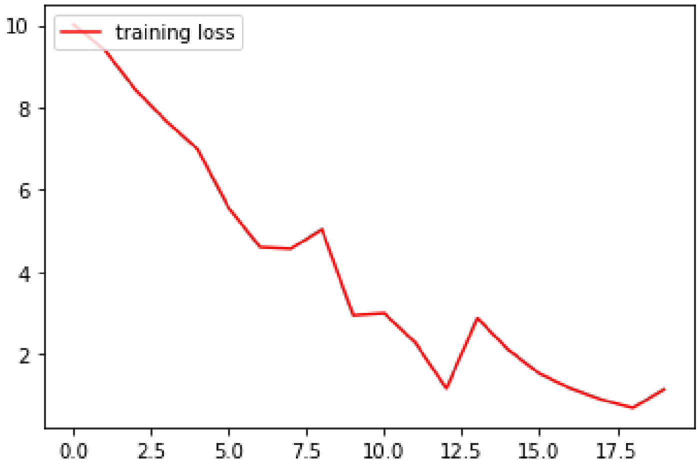


```
Finished CPU scratch Testing in time:  2.0737481117248535
Accuracy of Cakes : 37 %
Accuracy of Pasta : 21 %
Accuracy of Pizza : 68 %
Confusion matrix:
 [[11  9 10]
 [17  5  8]
 [ 7  1 22]]
```



**B)**

```
Finished CPU finetuned Testing in time:  1.1277508735656738
Accuracy of Cakes : 81 %
Accuracy of Pasta : 92 %
Accuracy of Pizza : 87 %
Confusion matrix:
 [[25  2  3]
 [ 2 27  1]
 [ 0  6 24]]
```



### 3) Deep Learning on GPU

**Train/Test times as compared on GPU vs CPU**

We can see that training and testing time while using GPU is very fast as compared to CPU.

*(This also allowed me to train the network for longer epoch thus giving a higher accuracy.)*

**CIFAR10:**

**Local CPU: i5 9th gen**

The total time take on local CPU for training: 91 seconds for 2 epochs (batch size 4)

The total time take on local CPU for testing: 6.1 seconds

The total time take on Colab GPU for training: 15 seconds for 2 epochs (batch size 128 as had to put load on GPU)

The total time take on Colab GPU for testing: 4 seconds

*The test time is similar as it also includes the data copy to GPU*