

ASSIGNMENT 5 (PART 1)

Transfer Learning using VGG16 & ResNet18

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Task-1

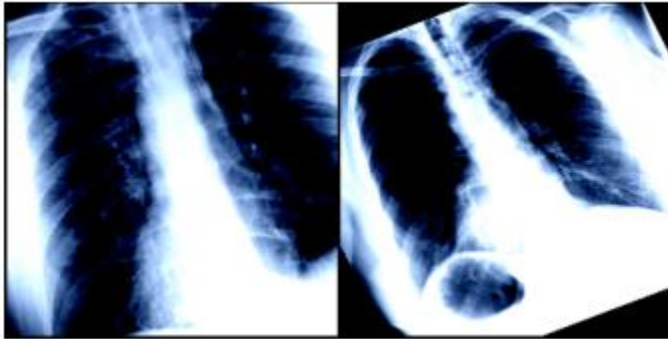
ResNet-18

Experiment 1:

Learning Rate = 0.0001, Epochs = 5, Batch Size = 8, Momentum = 0.9

Best Images: with true labels

['normal', 'normal']

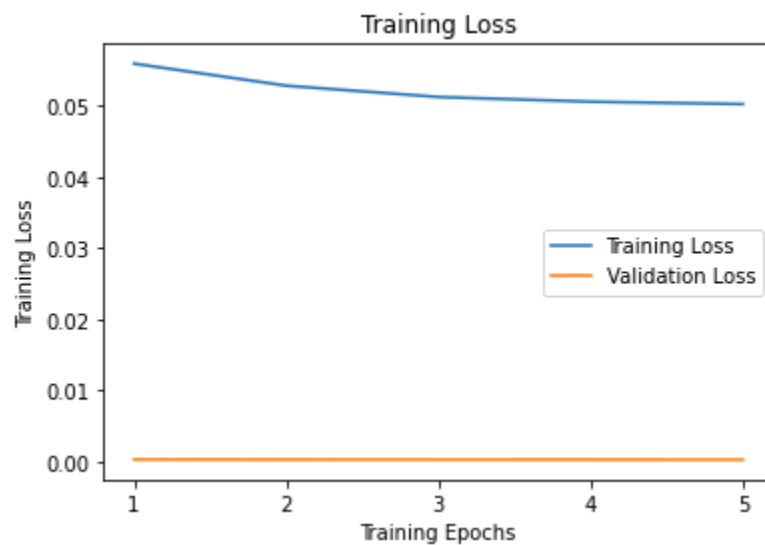
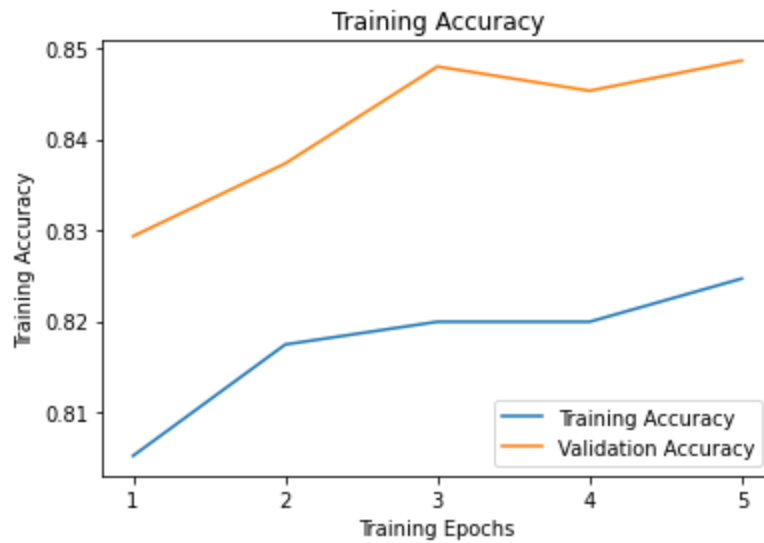


Worse Images: with true labels

['infected', 'normal']



.)



```
print(confusion_matrix)
```

```
tensor([[504., 111.],  
        [116., 769.]])
```

```
print('F1 Score: ',f1_batch)
```

```
F1 Score: 0.8437912169834042
```

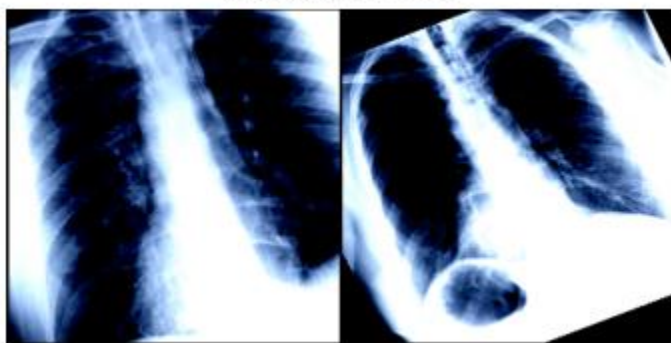
Final Accuracy of the network on the 1500 test images: 84 %

Experiment 2:

Learning Rate = 0.01, Epochs = 5, Batch Size = 8, Momentum = 0.95

Best Images: with true labels

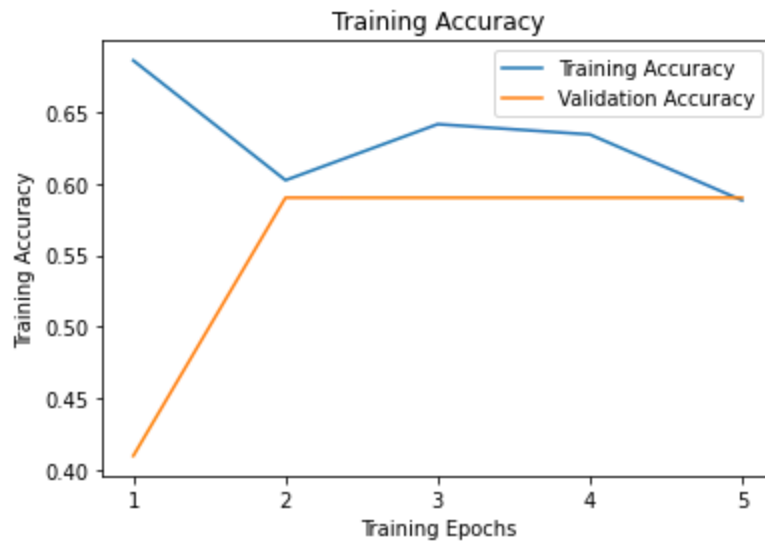
['normal', 'normal']



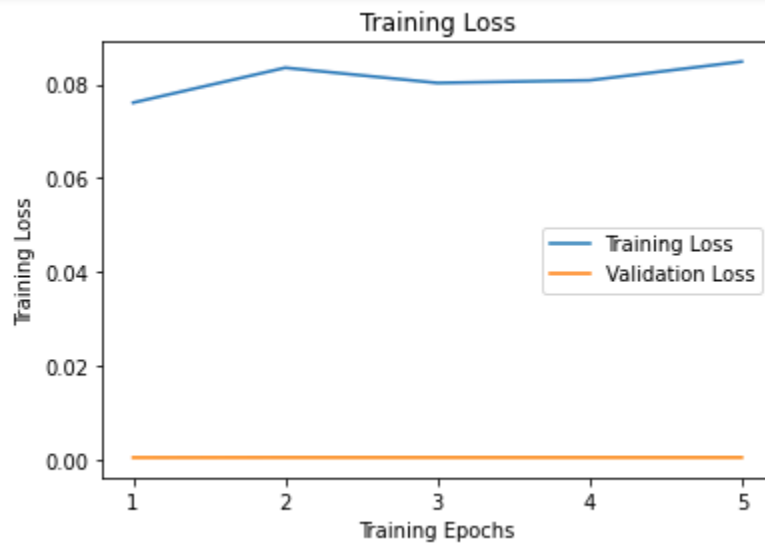
Worse Images: with true labels

['infected', 'normal']





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```
print(confusion_matrix)
```



```
tensor([[ 0., 615.],  
        [ 0., 885.]])
```



F1 Score: 0.37106918238993714



Final Accuracy of the network on the 10000 test images: 59 %

VGG-16

Experiment 1:

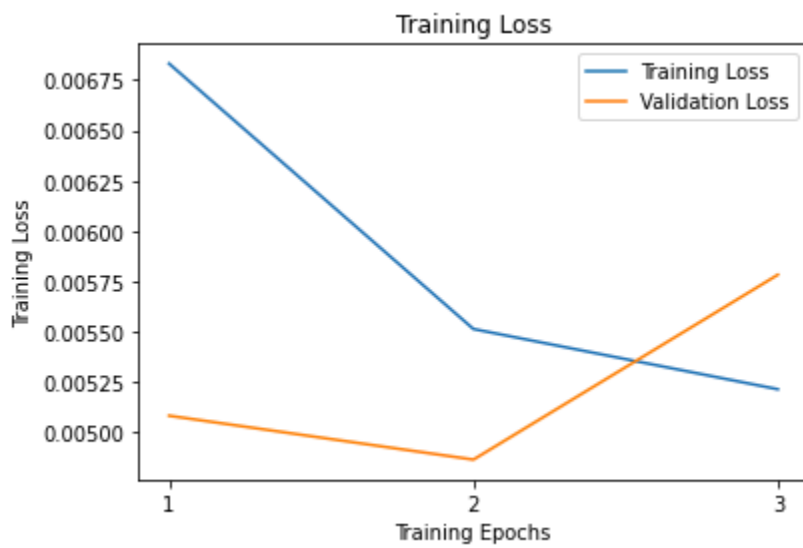
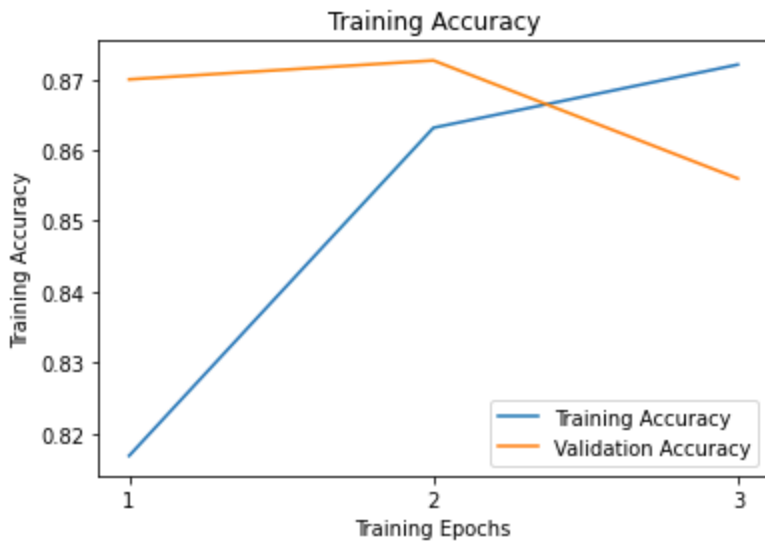
Learning Rate = 0.001, Epochs = 3, Batch Size = 60, Momentum = 0.9

Best Images:



Worse Images:





```
tensor([[436., 179.],
        [ 37., 848.]])
```

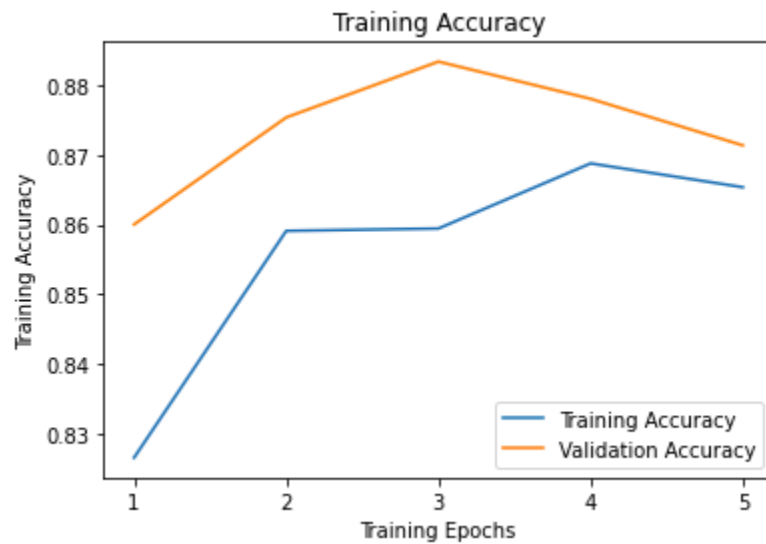
```
f1_batch = f1_score(label,
print('F1 Score: ',f1_batch)
```

```
F1 Score: 0.8534798534798534
```

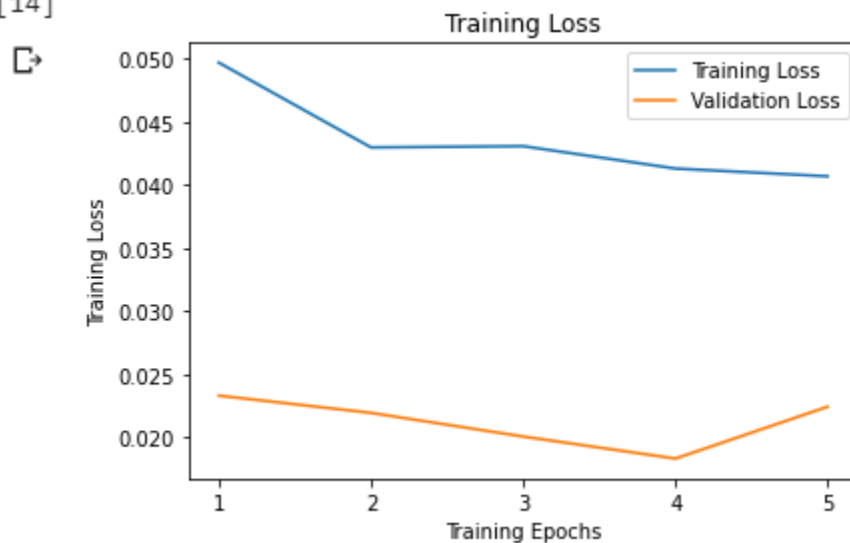

Final Accuracy of the network on the 1500 test images: 85 %

Experiment 2:

Learning Rate = 0.001, Epochs = 5, Batch Size = 8, Momentum = 0.95



[14]



```
print(confusion_matrix)
```

```
tensor([[571., 44.],  
       [149., 736.]])
```

```
📄 F1 Score: 0.8991596638655461
```

```
📄 Final Accuracy of the network on the 1500 test images: 87 %
```

Critical Analysis

Training on full data set, In my experiments VGG was performing better although it was taking a little higher time to learn. While learning I noticed that decreasing batch size was increasing accuracy. I was able to get highest accuracy in case of VGG16 as 87% and in case of ResNet18 it was 84%.

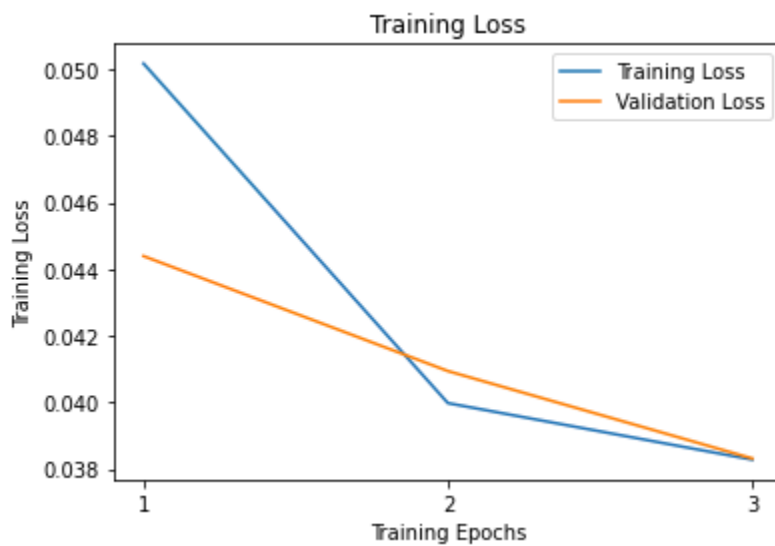
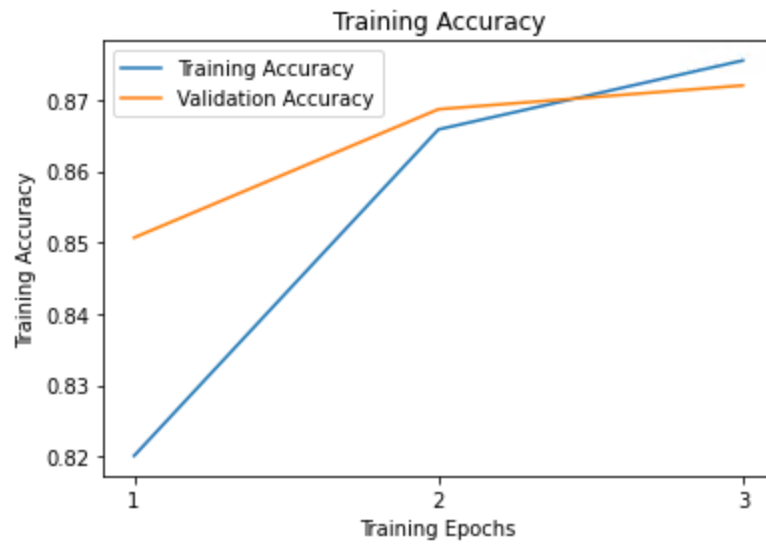
I noticed that by increasing the batch size to 60 incase of ResNet was drastically decreases the performance, I joined the same number of FC layers in the end, but I don't why this happened. For both the experiments I used learning rate 0.001 and I tried 0.0001 but I didn't get good results with that. Moreover, I set momentum to 0.9 or 0.95.

Task 2

ResNet-18

Experiment 1:

Learning Rate = 0.0001, Epochs = 5, Batch Size = 8, Momentum = 0.95 with Last layer unfreeze



```
print(confusion_matrix)
```

```
tensor([[504., 111.],  
       [ 87., 798.]])
```

```
print('F1 Score: ',f1_batch)
```

```
F1 Score: 1.0
```

```
Final Accuracy of the network on the 1500 test images: 88 %
```

Experiment 2:

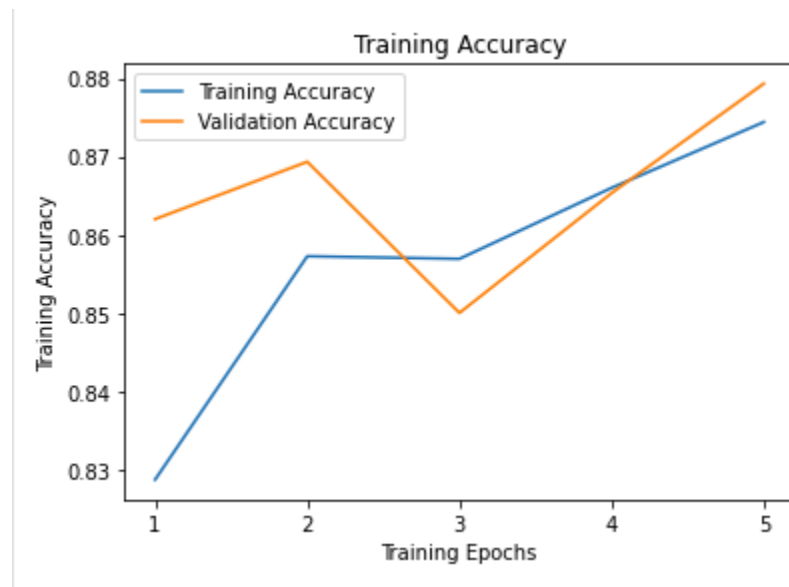
VGG-16

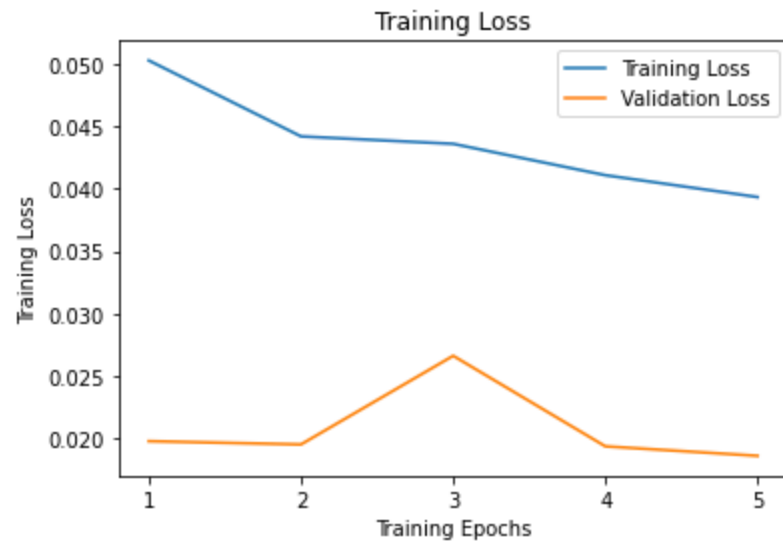
Experiment 1:

Learning Rate = 0.001, Epochs = 5, Batch Size = 8, Momentum = 0.95 with Last CNN layer unfreeze

Best Images:

Worse Images:





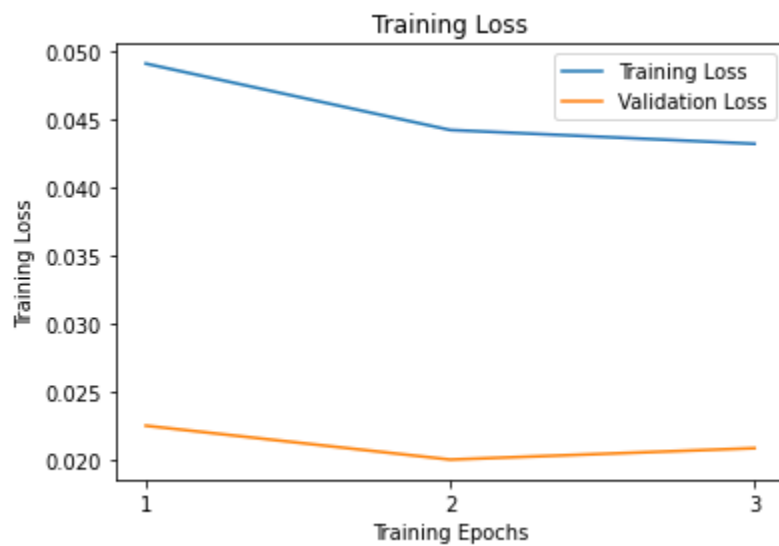
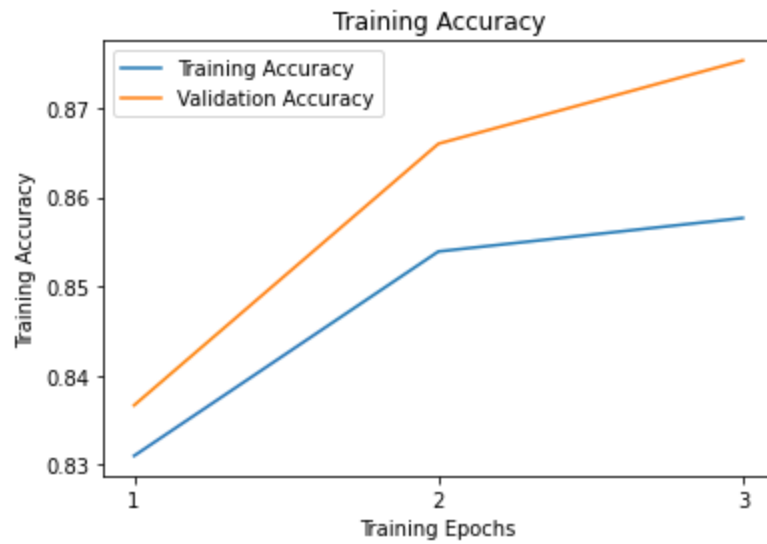
```
tensor([[518., 97.],  
        [ 84., 801.]])
```

```
F1 Score: 0.5555555555555555
```

```
Final Accuracy of the network on the 1500 test images: 87 %
```

Experiment 2:

Learning Rate = 0.001, Epochs = 3, Batch Size = 8, Momentum = 0.95 with all CNN layers unfreeze



```
print(confusion_matrix)
```

```
tensor([[547., 68.],
        [119., 766.]])
```

```
print('F1 Score: ', f1_batch)
```

```
F1 Score: 0.9111111111111112
```

🔗 Final Accuracy of the network on the 1500 test images: 87 %

Best Images:

Worse Images:

Critical Analysis

Training on full data set, If we compare 3 epochs of Full VGG network, it has highest F1 score, although accuracy remains the same to 87% which we received in FC layer. So, again, by more epochs this score can increase to near 90% or go beyond that.

ResNet-18 with Full unfreeze layers outperforms VGG as with 3 epochs it gives 88% accuracy with 1 F1 score.

Github Link: https://github.com/hmamirchishti/MSDS18022_COVID19_DLSpring2020