

1. Increase Number of Epochs

Number of Epochs	Accuracy (%)	Elapsed Time (s)
2	85.88	18
4	90.16	31
6	93.52	46
8	94.76	70

We can easily see that the accuracy of the algorithm is directly influenced by the number of Epochs. With more epochs we have better accuracy, but the algorithm also takes more time to finish.

The Epochs is the number of times the dataset is passed through the neural network once, when we increase that number it means we are giving to the neural network the same dataset more than one time.

It isn't worth it increasing a lot the number of epochs, we will only get a small increase in the accuracy and a big increase in the elapsed time.

2. Increase Layer Size (with 4 Epochs)

Layer Size (1st Filter, 2nd Filter)	Accuracy (%)	Elapsed Time (s)
(4,4)	85.88	18
(8,4)	91.48	41
(4,8)	95.20	32
(8,8)	97.08	43

We can see that the filter size has a lot of impact in the accuracy and in the performance.

We can easily see by the first and last result that increasing the filter size of both layers to the double, we had an increase of 11.20% in the accuracy.

We can also see by the second and third result that in this case the second filter is the most important one. We had better results in the third result than in the second.

3. Add One Layer and play with Layer Size (with 4 Epochs)

Layer Size (1 st Filter, 2 nd Filter, 3 rd Filter)	Accuracy (%)	Elapsed Time (s)
(4, 4, 4)	85.36	34
(8, 8, 8)	96.20	46
(4, 4, 8)	90.48	33
(4, 8, 4)	90.32	37
(8, 4, 4)	88.52	45

We can see that the layer size increases the accuracy and the elapsed time.

A very interesting result can be seen if we analyze the last 3 results. We can see that increasing the third filter layer size, we achieve the highest accuracy and the lowest elapsed time of the 3 results. While increasing the first filter layer size (last result) we achieve the lowest accuracy and the highest elapsed time. We can conclude that the last filter layer size is the most important for the accuracy of the algorithm.

In all this results we shouldn't trust 100% on the elapsed time result because it depends a lot on the other processes running by the computer processor.

4. AlexNet

In this part of the report I tried to use the same options as before so we could compare the both algorithms.

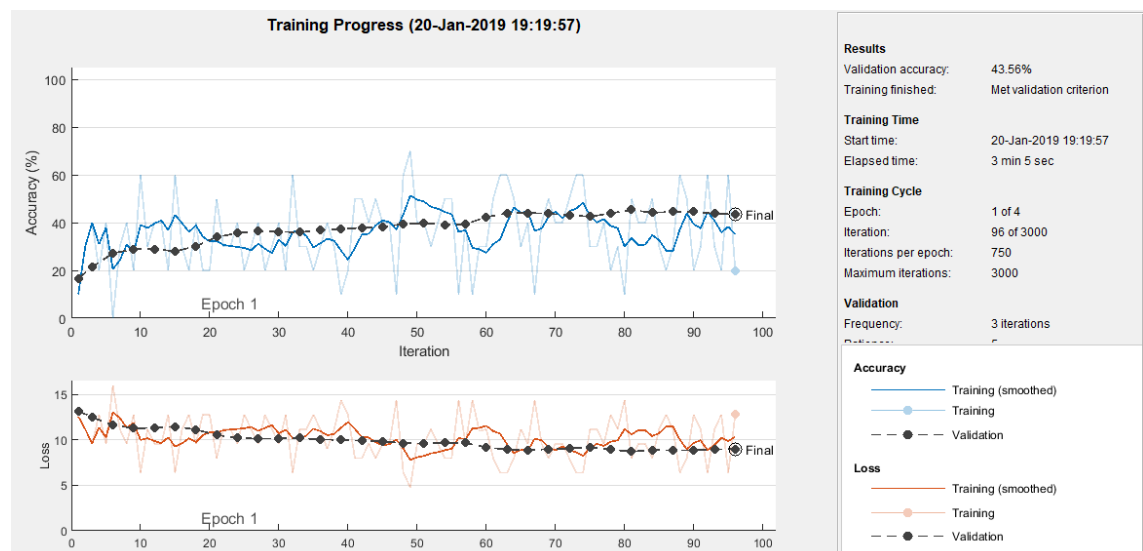
The options I used were the following:

```
layers = [
    imageInputLayer([28 28 1])

    %layersTransfer
    fullyConnectedLayer(numClasses,'WeightLearnRateFactor',20,'BiasLearnRateFactor',20)
    softmaxLayer
    classificationLayer];

options = trainingOptions('sgdm', ...
    'MiniBatchSize',10, ...
    'MaxEpochs',4, ...
    'InitialLearnRate',1e-4, ...
    'Shuffle','every-epoch', ...
    'ValidationData',imdsValidation, ...
    'ValidationFrequency',3, ...
    'Verbose',false, ...
    'Plots','training-progress');
```

And the results obtained were the following:



We can see that the results are bit awkward probably because of some option I shouldn't have changed.