STATISTICAL METHODS IN AI
Neural Network Exercise - Report

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Question 1: Model Building

- Layers = 6
    - Layer 1 = 224*224*3 neurons (Input Layer - Each pixel of input image is a neuron)
    - Layer 2 = 128*3 neurons
    - Layer 3 = 128 neurons
    - Layer 4 = 64 neurons
    - Layer 5 = 32 neurons
    - Layer 6 = 9 neurons (Output Layer - Number of classes)
- Layer 2 to 5 are hidden layers
- ReLU Activation function used because the inputs and outputs are both positive and negative
- Dropout rate in the dropout layers is 40%

Question 2: Training Code

- Training Step - Cross-entropy loss used because it works best for minimising multiclass log loss and gives the best weights
- Stochastic gradient descent was also used

Question 3: Overfit to a Small Dataset

Part (a)

Training accuracy = 1

Validation accuracy = 0.367 (<<1)

Therefore, we see high overfitting.

Part (b)

Effect of overfitting reduced by:

- Dataset Augmentation
- Weight Decay
- Dropout

Training accuracy drops to 0.22 and so does the validation accuracy. However, we have managed to reduce overfitting.

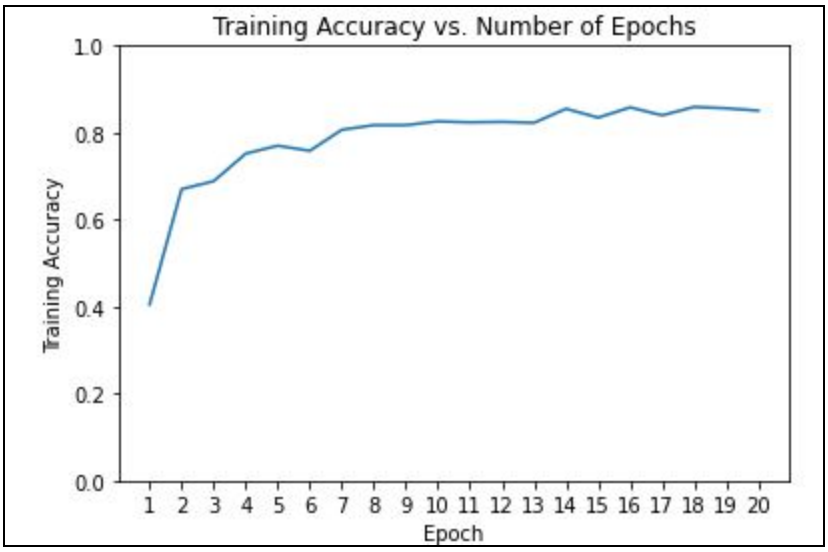
Question 4: Fine Tuning

Used AlexNEt architecture by modifying its last layer to get output as ours i.e. 9 classes.

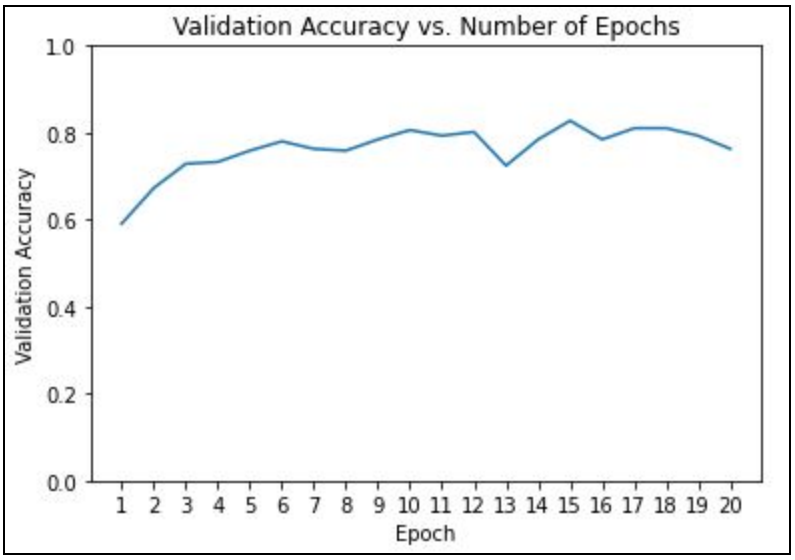
Question 5: Report result

- Accuracy:

- Training:



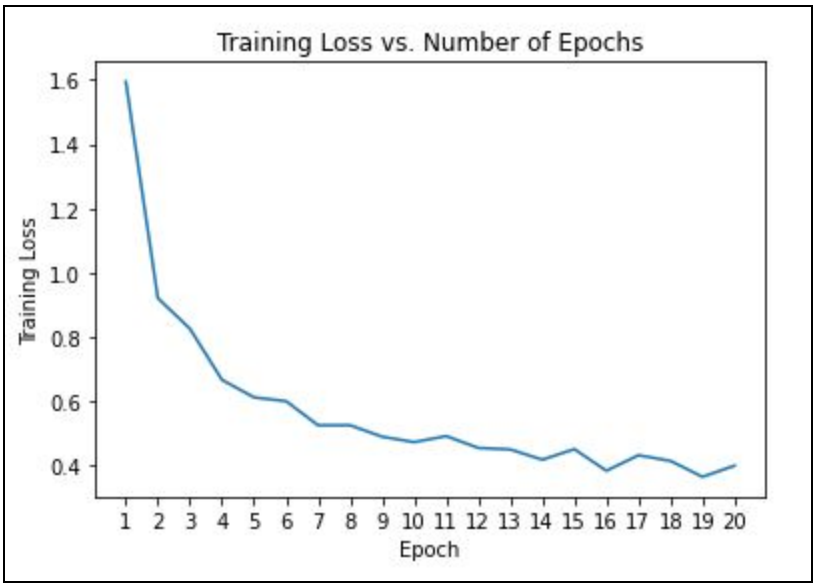
- Validation:



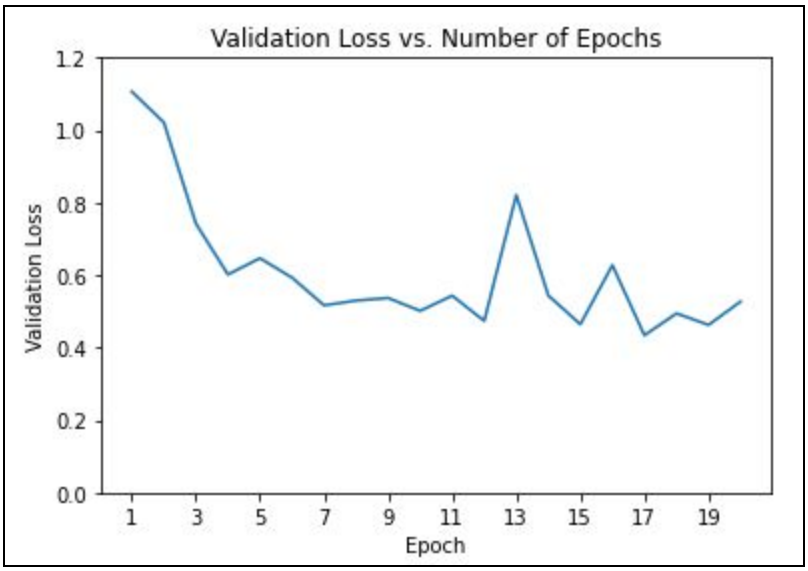
Both the accuracies increase steeply in the first few iterations and then converge as the number of iterations increase.

- Loss:

- Training:



- Validation:



Loss in both cases is very for first few iterations and then decreases over the iterations and converges to a low stable value.

- Final Accuracy is approx 83%.

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Final Validation Accuracy = 0.827586
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We notice that our accuracy has increased considerably over the MLP accuracy. This is why we prefer pre-trained models (AlexNet) over Image-based Datasets.