Advanced Machine Learning Convolution Assignment 2

The objective

How will a model's performance be affected based on the training size? I plan to find out whether a model will have an easier time making predictions based on a smaller or larger data size. Utilizing the data augmentation technique, I plan to see how large of a data size we will need for optimal results.

Question 1

Initially the model didn't have high accuracy with the training size of 1000. I utilized data augmentation technique to reduce overfitting and I noticed that the accuracy for all the models increased and Model four had the best accuracy among the tested models. From this increase in performance, I conclude that the data augmentation process would be the best technique to utilize.

Question 2

Keeping the validation and tests training samples the same as in previous. I increased the training to sample to 3500 for models 3 and 4 and the accuracy came up to 99%. Increasing the training size gave the model gained more images to look at and was better able to correctly recognize them.

Question 3

I first decreased the training sample from 1000 to 500 and this decreased the model accuracy with Model 2 having the worst decrease with an accuracy result of 56%. I then tried to increase the sample size from 1000 to 4000 and the accuracy results improved across the board. This proves the hypothesis that the size of the sample used to train the model with the data augmentation technique is an effective way to reduce overfitting and gain the best results in terms of accuracy.

Question 4

Using the pre-trained network and the same training sample sizes was a huge factor in understanding the model's ability to increase performance and avoid overfitting. Model 2 still had the best performance across all the models, and this showed that there is a strong correlation even in the pre trained network. Across the models the loss was at a minimum. A model will tend to avoid overfitting when given more data to learn from.

Overall Summary

There are multiple methods to improve a model's effectiveness and accuracy. Techniques such as Data augmentation: Generating additional training data by applying random transformations, such as rotation, zooming, flipping, and shifting, to the original images. This helped the model learn more robust features and reduce overfitting.

Other methods such as Dropout and regularization are other great factors. Dropout involves randomly dropping out some neurons during training and can help prevent overfitting by forcing the network to learn more robust and generalizable features. Regularization works by adding regularization terms to the loss function, such as L1 or L2 regularization, can also help prevent overfitting by discouraging the network from learning complex and unnecessary features.