CONVOLUTION NEURAL NETWORKS
ASSIGNMENT 2 REPORT

INTRODUCTION:

We will analyze the performance of developing a convolution neural network using the Cats and Dogs example. There were two broad approaches to classifying Cats & Dogs using convnets: Training a network from scratch, versus using a pretrained convnet. By experimenting with different sample sizes and reducing Overfitting Techniques (Using Data augmentation, Dropout) for scratch and pre-trained model during the model-building step.

METHODOLOGY:

We created 6 Scratch Models and 3Pre-Trained Models in a variety of setups. These configurations differ in terms of the number of layers, nodes, optimizers, dropout rates, and other characteristics.
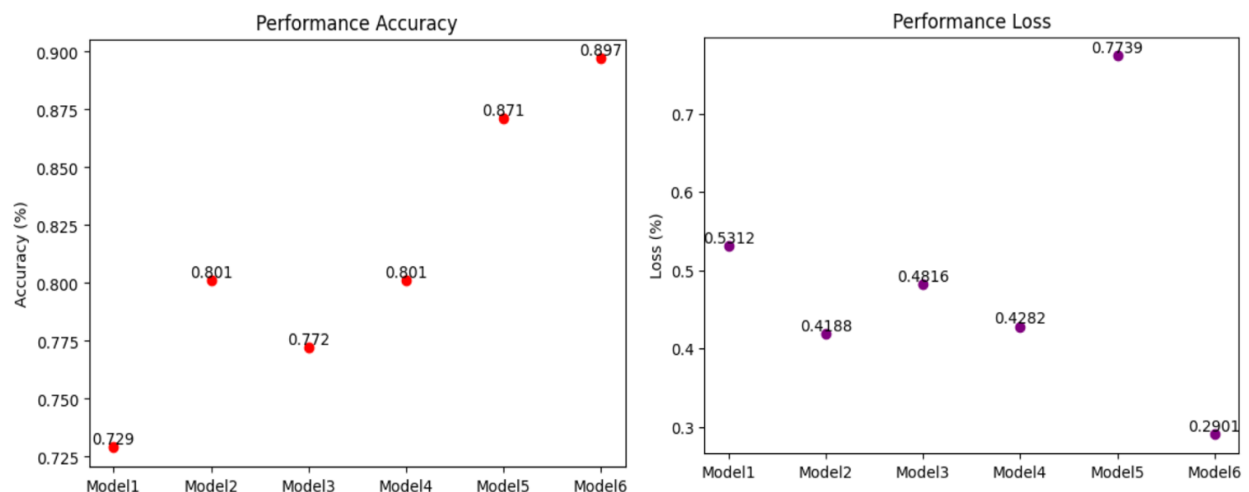
SCRATCH MODELS:

MODELS	TRAINING SIZE	VALIDATION SIZE	TEST SIZE	VALIDATION ACCURACY	TEST ACCURACY	TEST LOSS
Model 1	1000	500	500	0.7290	0.729	0.5312
Model 2	1000	500	500	0.8010	0.810	0.4188
Model 3	1000	500	500	0.7720	0.772	0.4816
Model 4	1000	500	500	0.8010	0.801	0.4282
Model 5	5000	500	500	0.8710	0.871	0.7739
Model 6	10000	500	500	0.8970	0.897	0.2901

PRE-TRAINED MODELS:

MODELS	TRAINING SIZE	VALIDATION SIZE	TEST SIZE	VALIDATION ACCURACY	TEST ACCURACY	TEST LOSS
Model 7	1000	500	500	0.9756	0.975	0.1688
Model 8	5000	500	500	0.9810	0.981	0.0844
Model 9	10000	500	500	0.9910	0.991	0.0346

RESULTS:

- The Model 1 of cats and Dogs example with a Training sample of 1000, Validation sample of 500 and Test sample of 500 generated extreme low Accuracy of 72.9% which results in Overfitting as the built Model has a very small Training size.

- The Models 2,3 and4 were built with same Training, Validation and Test sample as the Model 1.The performance of the model is optimized by using Data augmentation, Dropout methods as a measure to reduce the overfitting. We can see that there's an increase in the Accuracy as compared to the first model.

- The Model 5 and 6 ware built with an increased Training sample of 5000 and 10000. I used the Maxpooling, Data augmentation and dropout methods with a drop rate of 0.5 and Early stopping. It was observed that the model trained with a large Training sample size leads to give a better and improved accuracy. The Accuracy was increased to 87.1% and 89.7% in respective models.

- The regularized model (Scratch Models) seems to provide improved accuracy as compared to unregularized model(Pre-Trained Models).

- The Models 7,8 and 9 were Pre-trained with a Training size of 1000,5000,10000 respectively. We can see that the Validation and Test Accuracy has been increased tremendously.

- Overall, the Training sample size of 10000 have the highest Accuracy in both scratch and Pre-Trained Models.

- The best Model that generated the highest Accuracy and the lowest loss is the Model 9.

Performance Accuracy / **Performance Loss**
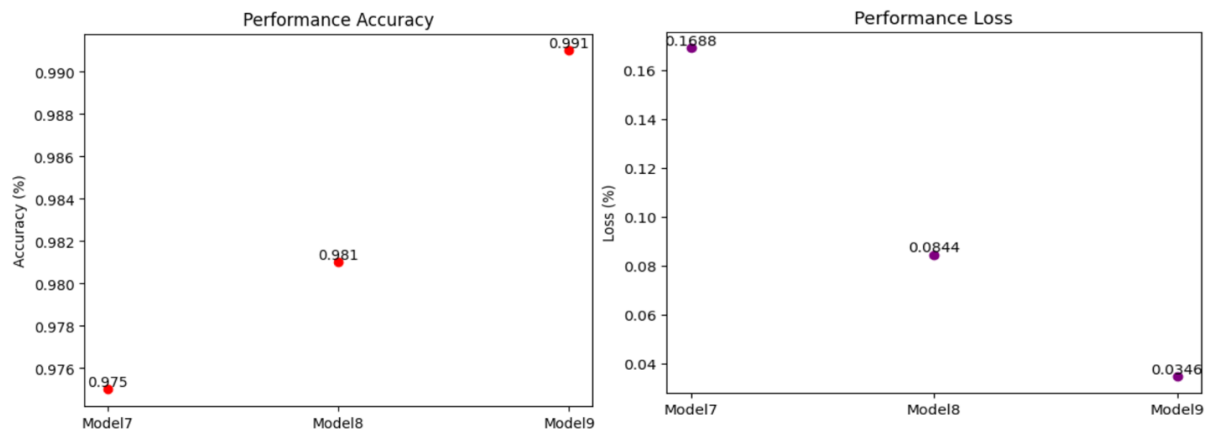
CONCLUSION:

To summarize, the size of the training sample plays a significant in enhancing model accuracy since it overcomes the problem of overfitting. Furthermore, hyper tuning factors like as max-pooling and data augmentation, as well as the dropout approach, contribute in further improving the model's performance.

We can see a substantial rise in accuracy when the models were pre-trained, thus we conclude that pretraining the model, together with the training sample size of the model, has a significant effect.