

ADVANCED MACHINE LEARNING ASSIGNMENT 3 REPORT

INTRODUCTION:

We will evaluate the efficiency of creating a convolution neural network using the Cats and Dogs example in this report. By making adjustments and determining which sample size and methodology are more beneficial during the model-building phase. Using convnets, there are basically two ways to classify dogs and cats: Using a pre-trained network and building a network from scratch.

METHODOLOGY:

In this, we have created three pre-trained models and six scratch models utilizing a variety of setups. These configurations differ in terms of the quantity of layers, nodes, optimizers, dropout rates, and other factors.

Scratch Models:

MODELS	TRAINING SIZE	VALIDATION ACCURACY	TEST LOSS	TEST ACCURACY
MODEL 1	1000	0.7250	0.544	0.725
MODEL 2	1000	0.8220	0.4068	0.822
MODEL 3	1000	0.7800	0.4803	0.780
MODEL4	1000	0.7970	0.7970	0.797
MODEL 5	5000	0.8760	0.718	0.876
MODEL 6	10000	0.8840	0.3935	0.884

Pre-Trained Models:

MODELS	TRAINING SIZE	VALIDATION ACCURACY	TEST LOSS	TEST ACCURACY
MODEL 7	1000	0.9780	0.205	0.978
MODEL 8	5000	0.9800	0.1079	0.980
MODEL 9	10000	0.9730	0.0873	0.973

RESULTS:

- The Model 1 of cats and dogs example produced an extremely low Accuracy of 72.5% with a Training sample size of 1000, Validation sample size of 500, and Test sample size of 500, leading to overfitting because the created Model had a very tiny Training size.
- All the 1,2,3 and 4 models were built with a training sample size of 1000 and 5,6 are increased to 5000 and 10000 respectively. All the models from the 1st to 9th models were built with same validation sample size of 500 and test size of 500.
- Data augmentation and dropout techniques are used to optimize the model's performance and reduce overfitting. When compared to the first model, we can observe that the Accuracy has increased.
- A larger training sample of 5000 and 10,000 was used in the building of Models 5 and 6. I utilized the Maxpooling, Information expansion and dropout strategies with a drop pace of 0.5 and Early stopping. It was discovered that a model trained with a large Training sample size produces a more accurate result. In models 5 and 6, the accuracy was raised to 87.6% and 88.4%, respectively.

- The regularized models appeared to offer improved accuracy when compared to the unregularized model.
- The Models 7, 8, and 9 are the pretrained models and they had training sizes of 1000, 5000, and 1,000,000, respectively. As we can see that both the Validation and Test Accuracy have significantly improved.
- So finally, we can tell that the model 8 which is pre-trained and have a sample size of 5000 have the highest accuracy that is 98%.

CONCLUSION:

To conclude, the size of the training sample has a huge impact on improving model accuracy since it solves the overfitting issue. The performance of the model is further enhanced by hyper-tuning elements including max-pooling, data augmentation, and the dropout technique.

We conclude that pretraining the model, together with the quantity of the training sample, has a major impact because we may observe a considerable increase in accuracy when the models are pretrained.