

CONVOLUTION NEURAL NETWORKS

ASSIGNMENT 3 REPORT

INTRODUCTION

Considering the dataset of Cats and Dogs. There were two basic methods to using convnets to classify Cats and Dogs: developing a network from scratch versus using a pretrained convnet. While short datasets can result in overfitting, we observed various strategies to reduce overfitting while training a network for prediction, including data augmentation and regularization.

PROCEDURE

We produced 6 Scratch Models and 3 Pre-Trained Models in various configurations. The number of layers, nodes, optimizers, dropout rates, and other variables vary between these configurations.

SCRATCH MODELS

Models	Training size	Validation size	Test size	Validation accuracy	Test accuracy	Test loss
Model 1	1000	500	500	0.7756	0.775	0.5131
Model 2	1000	500	500	0.8180	0.818	0.4318
Model 3	1000	500	500	0.747	0.747	0.5300
Model 4	1000	500	500	0.8010	0.801	0.4300
Model 5	5000	500	500	0.8810	0.881	0.6273
Model 6	10000	500	500	0.8960	0.896	0.3276

PRE- TRAINED MODELS

Models	Training size	Validation size	Test size	Validation accuracy	Test accuracy	Test Loss
Model 7	1000	500	500	0.9750	0.975	0.1741
Model 8	5000	500	500	0.9780	0.978	0.1046
Model 9	10000	500	500	0.9800	0.980	0.0595

OBSERVATIONS

- Model 3 of the cats and dogs dataset with training = 1000, Validation = 500 Test= 500 recorded the lowest accuracy of 74.7% which results in overfitting.
- Models 1 ,2 ,4 and were created using the identical Training, Validation, and Test samples as Model 3. The model's performance is optimized by using data augmentation and dropout approaches to reduce overfitting. We can see that the Accuracy has increased when compared to the first model.
- The Model 5 and 6 were created using a larger Training sample of 5000 and 10000, respectively. I applied the Maxpooling , Data Augmentation, and Dropout methods, with a drop rate of 0.5 and a premature stop. The accuracy of the models was enhanced tremendously to 88.1% and 89.6%, respectively.
- Models 7, 8, and 9 were pre-trained with training sizes of 1000, 5000, and 10000. We can see that the Validation and Test Accuracy have been greatly improved with 97.5%, 97.8% and 98.0% respectively.
- In both Scratch and Pre-trained models, the Training sample size of 10000 had the maximum accuracy.

SUMMARY

To recap, the size of a training sample is important in improving model accuracy since it prevents the problem of overfitting. Moreover, hyper tuning characteristics such as max-pooling and data augmentation, as well as the dropout methodology, help to improve the model's performance even further.

We observe an enormous rise in accuracy when the models are pre-trained, implying that pretraining the model, together with the training sample size, has a major effect.