Convolution Assignment 3

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The purpose of this assignment is to build a convolutional neural network that, by identifying the unique features of cats and dogs, can classify images of both animals accurately and instantly. The project's dataset came from Kaggle and consisted of 12,500 training and 25,000

test photos, with the same number of dogs and cats in each. Yet, the model will only be constructed using some of the 2000 images.

Question 1:

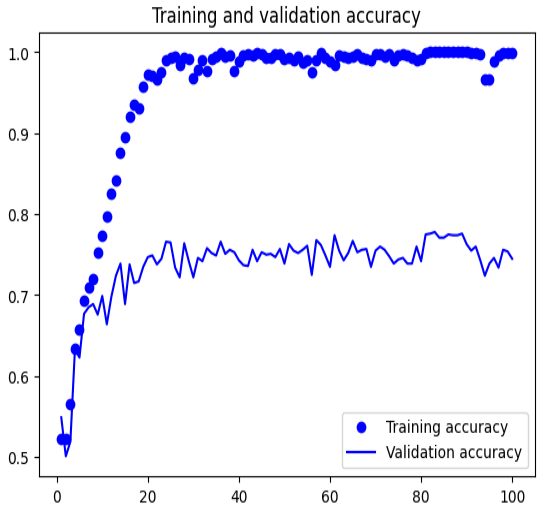
Consider the Cats & Dogs example. Start initially with a training sample of 1000, a validation sample of 500, and a test sample of 500 (half the sample size as the sample Jupiter notebook on Canvas). Use any technique to reduce overfitting and improve performance in developing a network that you train from scratch. What performance did you achieve?

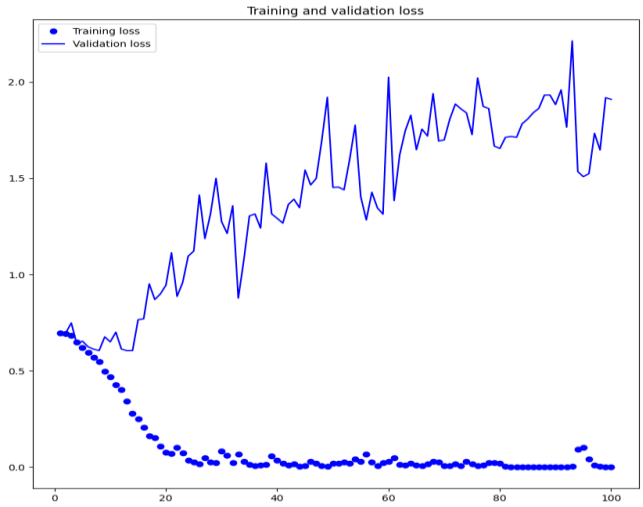
Answer:

With a training sample of 1000 (validation = 500 and test = 500), we studied the Cats & Dogs data set. Because the provided training sample of 1000 has an ability to be overfit, I have employed the technique of a 50% dropout to get around this problem. In addition to convolutional architecture.

Pre-Processing:

- Look over the picture files.
- Create RBG pixel grids from the JPEG data.
- From grids, create floating point tensors.
  Rescaling the 0–255-pixel values to the [0, 1] interval is necessary because neural networks function best with small input values.





Test Accuracy: 74.6

Validation accuracy: 74.5

Question 2:

Increase your training sample size. You may pick any amount. Keep the validation and test samples the same as above. Optimize your network (again training from scratch). What performance did you achieve?

The training sample was increased by 500 (1000–1500), which helped the model perform better. The training sample of 1500 and the validation test of 500 form the basis of all the results below.

DATA AUGMENTATION:

Many machine learning tasks, such as speech recognition, object detection, natural language processing, and image classification, can benefit from the use of data augmentation. It is an effective method that can help machine learning models—especially deep learning models—perform better.

Test Accuracy: 82.2 Validation accuracy: 83.8; this figure simply shows that the results from Question 1 were greater for the reasons listed below:

Question 3:

Now change your training sample so that you achieve better performance than those from Steps1 and 2. This sample size may be larger, or smaller than those in the previous steps. The objective is to find the ideal training sample size to get best prediction results.

The sample size is increased to 2000 .

• The model's performance will be improved because of the 500-data size increase.

• By augmenting the data and increasing the sample size by 500, we could improve our model performance from 82.2 to 81.0.

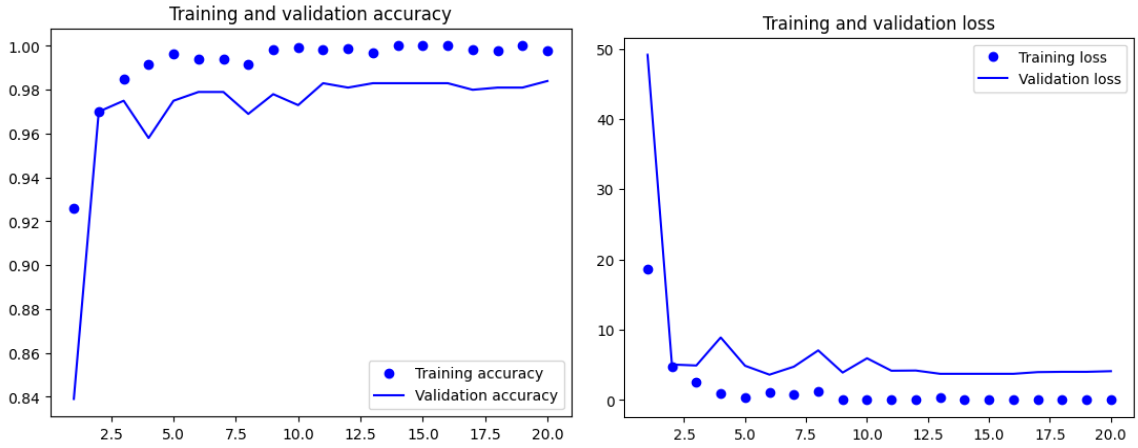
Question 4:

Repeat Steps 1-3, but now using a pretrained network. The sample sizes you use in Steps 2 and 3 for the pretrained network may be the same or different from those using the network where you trained from scratch. Again, use any and all optimization techniques to get best performance.

Answer:

Model pre-trained without Augmentation:

Our train accuracy is 99.8%, which is higher than the accuracy we obtained during the tiny model's initial training phase. Our validation accuracy is 98.4%. The plots indicate that, even with an average dropout rate, we are rapidly overfitting.



model Pre-Trained with Data Augmentation:

Sample collection is always essential when analyzing a model! Strong results on one sample set might not apply to all other sets because different sample sets might present various obstacles. The results of comparison between the trained model with and without augmentation are 99,8 and 97.3, respectively.

Results

Sample	Train Accuracy	Validation Accuracy	Data Augmentation
1000	**99.9**	**74.5**	**No**
1500	**97.9**	**83.8**	**Yes**
2000	**96.5**	**82.9**	**Yes**
Pre -trained	**99.8**	**98.4**	**No**
Pre-trained	**97.3**	**97.8**	**Yes**
Fine -tune	**99.5**	**98.3**	**yes**

Conclusion:

Based on the previous findings, it is obvious that data drives the model. Particularly, increasing the training sample size from 1000 to 2000 results in an increase in test accuracy from 74.6 to 81%. Also, higher accuracy can be obtained with a trained model and augmented data. Overall, we can conclude that we can better predict and generally generalize when we use data augmentation with more data points.