Assignment 3
Report

Introduction

For this assignment, cat-vs-dog image (downloaded from Kaggle competition) is used to analyze the relationship between the training sample size and the choice of network.

Methodology

Three different training sample sizes 1000, 1500, and 2000 are selected for analyzing the relationship between the training sample size and the choice of network. To prevent overfitting for the training sample, data augmentation and dropout techniques were applied. Additionally, pretraining was also considered to improve performance.

My findings

My findings are presented in table 1 and table 2.

Table 1: Test accuracy for different training sample sizes with and without data augmentation and dropout

Training Sample Size	Test Accuracy (No dropout & augmentation)	Test Accuracy (with dropout & augmentation)
1000	70.5%	85.7%
1500	74.4%	89.9%

2000	73.1%	87.9%

Table 2: Test accuracy for different training sample sizes with and without pretraining

Training Sample Size	Test Accuracy (No Pretraining)	Test Accuracy (with Pretraining)
1000	70.5%	97.4%
1500	74.4%	97.9%
2000	73.1%	97.5%

My findings Analysis

Seeing from the above table, the test accuracy generally improves when I increase the training sample size. However, this trend is not linear, and there are instances where a larger training sample size does not necessarily result in higher test accuracy. For example, in the case of the 1500 training sample size, the test accuracy with pretraining is significantly higher than that with the 2000 training sample size.

Furthermore, we can see that pretraining the network can lead to significantly higher test accuracy, regardless of the training sample size. Pretraining is particularly effective when the training sample size is small, as we can see from the results for the 1000 training sample size.

Limitations and Future Work

The limitations of this finding include the use of a single dataset and the consideration of only one type of image classification task. Future work can explore the relationship between training sample size and choice of network in other image classification tasks and datasets. Moreover, the effect of other factors, such as transfer learning and hyperparameter tuning, can be examined to further improve the performance of the machine learning algorithm.

Conclusion

To sum up, my findings indicate that a larger training sample size can be beneficial for improving test accuracy in the cat-vs-dog image classification task. However, other factors, such as network architecture and pretraining, can also play an important role in achieving high performance. Pretraining the network can lead to significantly higher test accuracy, particularly when the training sample size is small. These findings have important implications for the design of machine learning algorithms for image classification tasks.