

Assignment 2: Convolution

Purpose

The purpose of this assignment is to apply convolution networks (convnets) to image data.

This assignment aligns with the following module outcomes:

- MLO 1: Apply convnets to image data.
- MLO 2: Explain the relationship between sample sizes and the use of training the convnets from scratch versus using a pretrained network.

Getting Started:

In this assignment, you will accomplish the following:

1. Apply convnets to image data.
2. Explore the relationship between sample sizes and the use of training the convnets from scratch versus using a pretrained network.

As you saw in the chapter “Deep learning for computer vision,” convnets can be used successfully to classify images. Specifically, consider the Cats & Dogs example. There were two broad approaches to classifying Cats & Dogs using convnets: Training a network from scratch, versus using a pretrained convnet. While small datasets can lead to overfitting, thus making training a network for prediction more difficult, you also saw several techniques to reduce overfitting, and these include data augmentation and regularization.

In this assignment, you will examine the relationship between training samples and the choice of training your model from scratch, versus using a pretrained convnet. Specifically, answer the following questions:

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 (like in the text). Use any technique to reduce overfitting and improve performance in developing a network that you train from scratch. What performance did you achieve?
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?
3. Now change your training sample so that you achieve better performance than those from Steps 1 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.
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.

Write a report summarizing your findings. What is the relationship between training sample size and choice of network?

Instructions (what to submit?):

All work must be your own. Copying other people's work or from the Internet is a form of plagiarism and will be prosecuted as such.

You will upload the following to your github account.

1. Your Python or R code, and well-documented knitted output as html/pdf/word.
2. A summary, graph/table, that summarizes your results. This graph or table should clearly indicate what "your" final conclusions or story will be.

You should adhere to the following:

- Remember to use the same repository for the class that you used in Assignment 1.
- Create a new folder under that repository. Call it Assignment 2.
- Upload all files to that folder.
- Provide the link to your git repository in Canvas for the assignment. The git link should end in .git.

Due dates are listed in the Assignment Schedule document.