Deep Learning Practical 5

Getting better performance out of a neural network

Practical overview

Welcome to the fifth deep learning practical. This practical has the following purpose:

- Ensure you have understood how to work through the steps need to train a neural network model.
- Go through the steps involved in the training of an effective neural network architecture for a challenging dataset.
- Understand the methods we can use to improve the performance and generalisation of our model.
- Chat with the staff about any questions about the module.

Working Environment

You will need a GPU to run the exercises in this practical. You might use NCC, following the steps in the previous practical. Hopefully, the GPUs are available and things are working smoothly. If you do face any issues, you can possibly use Google Colab for this practical.

Building an Effective Classifier

In this exercise, we are going to build an effective neural network that performs well on a difficult dataset. You will have already learned the techniques needed to do this in Lectures 3 and 4.

Hopefully, you are now more comfortable with PyTorch programming. So let's go through a Notebook and train a neural network on a challenging dataset.

Caltech101 is a well-known image dataset used for object recognition tasks in computer vision. It was introduced in 2004 and contains images of objects from 101 distinct categories, plus a background category, making a total of 102 classes. The number of images per category ranges from around 40 to 800, with most categories containing approximately 50 images. The images have varying sizes, and the objects are centered and occupy a significant portion of the image, but there are variations in scale, lighting, and viewpoint, making it a challenging dataset.

The dataset is primarily used for benchmarking image classification algorithms and assessing the performance of feature extraction and learning techniques in computer vision.

- **Official Website:** `https://data.caltech.edu/records/mzrjq-6wc02`

- **Torchvision Documentation:** `https://pytorch.org/vision/main/generated/torchvision.datasets.Caltech101.html`

You can get the exercise Notebook here: ⤢ Practical 5 - classifier
The notebook itself should contain all instructions you will need for the exercise.

You can find the answer here: ⤢ Practical 5 - Answer

Class competition

Once you've received the test accuracy, let the staff know and see if you can beat the leaderboard. You can try any other models/architectures from the internet.

Dive into deep learning, chapter 8

You may wish to enrich your learning by chapters 8 from the dive into deep learning book, for example practicing in both JAX and PyTorch:

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https://d2l.ai/chapter_convolutional-modern/index.html
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