DSA4212 Year 2022-2023
Assignment No: 1

Deadline: 23:59, 19th of March 2023

1 Task

The two following files

1. `assignment_1_train.npz`
2. `assignment_1_test.npz`

contain a training and a test dataset of images. The purpose of this assignment is to design an efficient deep-learning pipeline to classify these images. Starting from a randomized network (ie. no pre-training), you are given a computational budget of 120 seconds of compute time on a standard `Google-Colab` server with a standard GPU. Optimize the final test accuracy of your model.

1. You can use `JAX` as a deep-learning framework: you are allowed to use a higher-level library on top of `JAX` such as FLAX and OPTAX (or other) if you wish to.
2. If you wish, you are allowed to use `Pytorch`, or `TensorFlow`, or any other framework instead of `JAX`.
3. You are allowed to use a data-augmentation library (eg. albumentations, imaug, etc...)
4. You are allowed to use `pytorch` data-loaders, or any other data-loading library.
5. Compilation time (i.e. `jax.jit`) is not included in the 120 seconds constraint.
6. Initial data-loading, image pre-processing, etc.., are not included in the 120 seconds constraint. If in doubt, please ask me.
7. Estimation of the final test accuracy is not included in the 120 seconds constraint.

2 CANVAS Submission

There are (at least) 3 files to submit:

1. A pdf report. This report should not include any Python code. Instead, it should give an overview of the strategies explored, as well as a description of the final deep-learning pipeline. It should be at the very most 5 pages, but can also be significantly shorter (ie. do **not** write a long report, just for the sake of writing a long report).

2. A Jupyter notebook describing some (not necessarily all) of the experiments that you have performed. This can be split in several notebooks if necessary.

3. A minimal Jupyter notebook that reproduces your final deep-learning pipeline. This jupyter notebook should perform the training of your neural network under 120 seconds, as well as estimate the final test accuracy. This Jupyter notebook should be reproducible: anyone should be able to run it from scratch on a fresh `Google Colab`.

For submitting your work, you will:

1. Zip all your files into a **single zip-file**

2. Use the naming convention GROUPXX`.zip` where XX is your 2-digit group number (i.e. 01, 02, etc...).

3. Make sure that the pdf-report includes the name and student number of all the students in the group.

4. Upload the file on CANVAS.

Do not include anything else in the zip-file except the pdf report and the jupyter notebooks.

2.1 Grading

The following components will be taken into account:

1. **[30%]** Final test accuracy, as compared to other DSA4212 groups.

2. **[30%]** Clarity and reproducibility of the Python code and pdf report

3. **[30%]** Quality and appropriateness of the numerical experiments

4. **[10%]** Proper citation and acknowledgement of resources used (eg. books, github code, articles, blog-posts)

3 Remarks:

Please make sure that:

1. you start your training from a randomized network.
2. the final accuracy that you are reporting is evaluated on the test set.
3. you do not use in any way the test dataset during training time.

Failure to any of the above 3 items will necessarily lead to a zero mark for the “Final test accuracy” component of the assignment.