

ECE4179 Neural Networks and Deep Learning

Project Description

Due Date: 23rd of May (End of Week 11), 11.55 pm

1 Overview

Deep Learning is a powerful tool that has exploded in popularity over the last decade. It is finding uses in almost every field with new applications being explored every day. There is still a lot of research to be done with Neural Networks with much we still don't understand. Your task is to come up with a new Deep Learning application or perform some experiments to further our knowledge of Neural Networks. You may explore any area, even those not covered in lectures or labs.

2 Project Brief

Before starting your project you must submit a brief, no longer than 1 page, with the following:

1. Your name and student ID
2. A brief background into the problem/task you wish to explore
3. A brief overview of your proposed method/solution
4. Any initial research you have conducted (with citations)
5. Your proposed datasets/training environments (you do not need to provide the dataset at this point)

Project briefs must be submitted via Moodle before the end of week 8 (02/5/2021 11:59pm) and must be approved before you start your project (you may submit your project brief earlier than this to get it approved sooner). Feel free to consult your lecturer about possible project ideas.

The project brief is here to ensure you have come up with a project idea as soon as possible so you can start your research and planning. We only ask for a general idea for your project and what you write in your brief does not set your overall project "in stone". We understand that details of the project may change after more research (especially technical details). If the project topic changes too much from the initial idea a new project brief may need to be submitted.

3 Project Details

- Projects are to be completed individually. If you work in a team, then you are free to consult among project partners and also could share some parts of the code.
- All projects must be submitted as a “technical” or “lab” report (see Monash engineering [“Writing an Engineering lab report”](#) or [“Writing an Engineering technical report”](#)). Report Style will depend on your project.
- You must also demonstrate in the form of short presentation (5 minute per person) highlighting the general problem/task you explored as well as a high level overview of your method and results. The presentation is conducted during your scheduled lab time via Zoom.
- Project report, and code are all due at the end of week 11 (6/11/2020 11:59pm).
- Reports are to be submitted as a PDF. Code should be submitted in a format that is easy for us to run - i.e. we should only need to run a single Python script or Jupiter notebook per “experiment”.
- All projects must be suitably “novel” and contain a significant amount of work (aka no “basic classification”, anything too similar to labs or any simple implementation of an existing algorithm). But note we are NOT expecting ground-breaking research.
- You must use Pytorch for all of your deep learning algorithms. You are allowed to use Matlab or any other software to preprocess your data.
- Any form of plagiarism must be avoided. Your codes will be checked against publicly codes to find any possible similarities.

4 MonARCH

4.1 Datasets

A reminder that your HOME directory on MonARCH has a cap of 200MB, and your user folder in ds21, where you should be uploading everything, has a cap of 5GB. Any datasets too large to fit in your user folder must be provided to the ECE4179 lecturer and will be uploaded to a read-only shared folder (that all students will have access to). Make sure you leave room for model checkpoints as large NN models can take up a significant amount of space! It is a good idea to pre-process your data before uploading, this includes resizing all images to the desired size etc (which will also help keep your dataset under 5GB and speed up your training loop). Basic Pytorch in-built datasets that will be uploaded to the shared folder are:

- MNIST
- Fashion MNIST
- CIFAR10
- STL10

To prevent multiple copies of the datasets, do NOT download these datasets to MonARCH yourself. To use them simply set the root directory of the Pytorch dataset to the shared directory `“/mnt/lustre/projects/ds21/SHARED”`

4.2 GPUs

Additional documentation and video demonstrations regarding the use of MonARCH GPU's will be provided in the coming weeks. Some general constraints to keep in mind:

- Students will only be allowed 1 GPU per job (they are all P100s)
- Each student will only be allowed to run 1 job at a time
- Students may have up to 10 submitted jobs (in the queue) at a time (this includes a job currently running)
- Each job has a max run time of 2 hours

5 Final Recommendations

1. Do not over-commit! **The last 10% of a Deep Learning project is the most difficult part and you often don't know how difficult it will be until you get there.** Start slow and build up until you get to your last "grand idea" (collecting results as you go!).
2. Start early! Depending on the project you may need to spend weeks "fine tuning" hyper-parameters and various other specific details of your project implementation. The right set of hyper-parameters could take your algorithm from "not working at all" to "working perfectly".
3. [Transfer Learning!](#) As we've learnt/will learn in labs a good pre-trained feature extractor can give you a jump start in your training, even when your task isn't classification!
4. Have a look at existing code. Even though you must come up with your own original contribution you don't have to re-invent the wheel. Have a look at existing projects online and see what basic functions/classes/methods you can use, this includes lab code (all with proper citation of course).
5. Have a look at [Kaggle](#) for datasets.
6. Have a look at this [Google sheet](#) for ideas and inspiration.