Deep Learning - WMAI017-05.2024-2025.1B

Assignment 2

Starting date: 6 December 2024
Submission deadline: **23:59, 21 January 2025**, extendable until January 31.

Lecturers   Dr. Matias Valdenegro, Ivo de Jong, Dr. Matthia Sabatelli.
General guidelines:

- The tasks are targeted at groups of three students. Please make sure that the load is well divided: every student should contribute.

- Please take advantage of the practical sessions to ask your questions about the tasks.

- A reviewer should be able to understand plots independently; be sure to label axes, a legend for colors, use an easily readable font size, etc.

- Refer to all plots, tables, code blocks, etc. in your report.

- Please note that you should not use ChatGPT or any other LLM to do this assignment.

- Submit the report as a PDF file and source code as a zip file through Brightspace.

Homework Assignment

Learning Objective: The aim of this assignment is for students to learn to use Deep Learning frameworks and to code a small project where they train neural networks for a given task.

Step 1. Each group selects a topic for their projects and writes a short proposal (max 1 page) about what they would like to do. Consider the following information:

- Dataset, task, and model you will use.

- General idea or motivation for the problem.

- Short description of what you will do (train models, use X evaluation metrics, etc)

Some general project ideas are available below:

- Implement and reproduce a research paper.

- Reproduce a figure from a paper (that involves training a network).

- Train a model on a new dataset and provide a correct evaluation.

- Collect some data, possibly label it, and train a model on a task.

- Reproduce a machine learning concept on a dataset and compare several models, for example bias-variance trade-off, vanishing or exploding gradients on deep networks, and long-term dependencies on sequence models.

Your project must be a coding one and you should train deep neural networks using python DL framework of your choice (tensorflow, keras, pytorch, mxnet, etc).

Consider that the project should take around 40 hours of your time (10 hrs per week for around 4 weeks). Submit the proposal as a PDF file in Brightspace, deadline is latest December 13. You will

get feedback and accept/reject within a couple of days. If you have doubts about your project being accepted before submitting, you can ask the coordinator via email.

Rejection might come because the project is too difficult or might take you much more than the allocated time, and then changes can be made to adapt requirements.

Step 2. Once your project topic is accepted, start working on your project on your own time and during the practicals. Attend practicals and ask questions to TAs or via email to the coordinator.

Step 3. By the project's end (current deadline is January 21, flexible deadline until January 31), you should submit two files:

1. A written report (5-10 pages), indicating what you did in your project, results, analysis, to what degree you fulfilled your goal, and include source code as attachments. Any source code you reused from past projects or from the internet can be used but must be properly cited and referenced. It should be clear what is new for this project and what is reused from the internet. This will be 70% of your assignment grade.

2. A 5 minute video presentation and PDF slides, presenting your project, focusing more on what you did and what results you obtained. It is aimed for your student colleagues as audience. This will be 30% of your assignment grade.

Make sure that your report is readable and understandable, and that it contains all necessary details for someone else to reproduce your results. Any use of material should be clearly cited and quoted/referenced, including a paper that you might reproduce.

Evaluation Rubric

Report and Project (70%)

What we will evaluate and in what weight is described below:

30% Project quality and consistency with the learning outcome. Did the group train a model on a task of significant difficulty (not a toy dataset like MNIST)? Did the group succeed to a certain degree with respect to their own goals? Failure is not unexpected and generally acceptable, if students tried enough (model variations, different datasets, preprocessing, etc) this also counts as success. Failure to achieve the task without explanation or further reasons will decrease the grade significantly. The project should be approx 40 hours of work. Significantly less than this standard will decrease the grade.

40% Model training. Are the models correctly trained? Is there a validation/test set? Is overfitting correctly detected/absent? Note that a model overfitting is not by itself a bad outcome, but this should be detected properly by the group.

30% Report structure and content, citations, figure/table referencing, proper reuse of previous work. Overall grade for the format, structure, and content of the report, does it follow like a scientific paper? Are the steps performed by students well described? Is the project reproducible to a certain degree? (We cannot expect full reproducibility, but only to a good amount). There is no need to describe the general methods that were used if they are covered in the lectures, only what is specific to the project.

The report should be understandable and clearly written/structured, we will not be checking grammar or typos, but overall description of the project. If parts are not understandable, points can be deducted or marked as incorrect.

Video Presentation (30%)

The presentation is meant for each group to practice their presentation skills and be able to shortly present their project. The following items will be evaluated and their weights:

40% Overall slide and presentation quality (clear figures, understandable text, presentation delivers key points).

50% Technical details of project and implementation.

10% Keeping to time and overall presentation time pacing.