IFT-3710/6759-H25 - Project Guidelines

January 1, 2025

The chief learning objective of this course is to prepare students for tackling real-world machine learning projects. Therefore, all students will participate in teams in the development of one machine learning project. This document describes the general guidelines about this part of the course.

General information

The projects of the course are aimed to resemble as much as possible what real-world machine learning projects look like in either industry or research. Projects comprise the following stages:

1. Literature review
2. Planning
3. Development
4. Analysis of results
5. Written report
6. Oral presentation

Timeline

About the first 4 weeks of the course are devoted to introducing the course, reviewing the core aspects of machine learning and deep learning, and important tools for carrying out machine learning projects, such as Linux, git and PyTorch. After that, you are expected to work on the assigned project from week 5 to the end of the semester. As a final deliverable of the project, you will prepare a short (maximum 8 pages) **technical report** and an oral presentation to be given in front of the teachers and the other students. During the development of the project, there will be **intermediate milestones and deliverables** to facilitate smooth progress. The specific timeline is the following:

- **Week 1-3:** review of proposed projects, expression of project preferences and proposal of own projects. Project assignments and teams formation.
  - By the end of the week 4, all teams should be formed and registered, every student should be in a team.
  - **Deliverable 1 (by the end of week 3: Jan 25, 2025):** 1. Fill out **team registration form: Click here**: working title and members. 2. Submit **project plan**: one-pager containing a brief description of the project, foreseen steps, goals and tentative distribution of work among team members.

- **Week 4-5:** project planning, literature review, first steps.
  - **Deliverable 2 (by the end of week 5: Feb 8, 2025): literature review**: one page review containing a summary of relevant, related literature. Describe how your project is related to and different from the relevant literature.

- **Week 6-9:** project development (phase 1. break (période d'activités libres) in Week 9.)

  - **Deliverable 3 (by the end of Week 9: March 8, 2025):** interim report that contains methods and preliminary results: maximum 4 pages containing a description of the methods developed and planned, relevant changes to the original plan, and preliminary results and/or challenges.

- **Week 10-13:** project development (phase 2)

  - **Deliverable 4 (by the end of Week 13: April 5, 2025):** preliminary report of results and conclusions (at most 4 pages).

- **Week 14-15:** project development (phase 3), preparation of presentations and final report.

  - **Deliverable 5 during these weeks: submit your slides by April 14, 2025** and present your projects in class

- **Week 16:** preparation of final reports.

  - **Deliverable 6 (by April 30, 2025):** final report (at most 8 pages)

- Please submit all the deliverables to **Studium**.
- **It is strictly forbidden to write with ChatGPT.** Since the purpose of the report is to exercise students' abilities (including writing ability), writing with ChatGPT loses this meaning.
- Please prepare all your reports with this **LaTeX template**.

Project assignment

The projects will be developed in **teams of 3–4 students**. A set of projects will be proposed by the instructors, and you are also **welcome to propose your own projects**. At some point during the introductory weeks, you will be asked to form teams and to provide your preferences about the suggested projects or propose your own, in order to distribute the available projects among all teams the best possible way. Some projects may be easier than others, which will be taken into account in the evaluation. Each team is supposed to focus on their proposed project through the whole semester. I would encourage the students to work on a project with reasonable difficulty and dive deep into it.

Project proposal

In order to foster creativity and allow you to work on projects of your interest, you are welcome to propose your own projects. Nonetheless, the project proposal must be accepted by the instructors and the decision will be based on the following criteria:

- The project must involve the use of advanced machine learning methods.

- Works developed prior to this class will not be accepted.

- It must be feasible in terms of computational resources and time constraints.

- The data must be publicly available.

- The project should not raise major ethical considerations.

- Projects that tackle real-world problems with a potentially positive impact will be highly favoured.

Evaluation

Students will be evaluated entirely according to their work on projects and the final grade will be based on the following criteria, all with equivalent weight:

- Difficulty of the project

- Quality and performance of the developed algorithms: suitability of the chosen methods, technical rigour, results, etc.

- Written report: completeness, clarity, technical soundness, analysis, etc.

- Oral presentation: effectiveness, clarity of the presentation, etc.

- Code: clarity, documentation, modularity, extendability, etc.

The evaluation will be at the project level, that is we will consider that the results, the report, the presentation, and the code are the output of the whole team. Detailed instructions regarding the presentations, reports and code will be given. Nonetheless, the grades may be adjusted individually if necessary in the case of participation imbalance (see below).
Important notes: The grade will be binary (pass or fail), not in a letter scale.

Teamwork

Teamwork is an essential feature of machine learning projects, and engineering projects in general, both in research and industry. Therefore, it is a requirement of this class to work on the projects in **groups of at least 3 students**. We recommend to form teams of up to 4 people, but slightly larger teams may be allowed depending on the difficulty and characteristics of the project.
Working in teams does not necessarily mean that every teammate contributes equally to every part of the project. It is up to each team to design their most suitable distribution of the workload. However, we do expect every student to engage in all stages of the project (literature review, design, coding, analysis, writing, presentation, etc.).
In order to encourage effective teams, mitigate imbalances and ensure a degree of fairness in the evaluation, we will adopt several mechanisms, which include:

- Students are free to organise themselves and propose teams to work on specific projects.

- Otherwise, teams will be formed according to the preferences provided by the students.

- During the development of the projects, we will carry out several team-wise meetings with one of the instructors, to not only assess the progress in the project, but also the functioning of the team.

- At the end of the project, each team member will have the opportunity to fill a questionnaire about the functioning of the team and the contributions to each stage of the project.

Communication

During the project development phase, we will facilitate a weekly session of each team with one of the instructor (main instructor or a teaching assistant). The goal of these meetings is to monitor the progress of the project, the smooth functioning of the team and to give you the opportunity to ask questions and get feedback. For daily communication, you are welcome to participate in a **slack workspace (Click the invitation link)** set up for this class. Please send me an email (bang.liu@umontreal.ca) if you do not have access to the slack workspace. You are also welcome to set up a channel for your team within this slack workspace, or use a different means of communication of your preference.
Finally, do not hesitate to contact the instructors if problems arise. We are here to help!

Expectations and potential publication

The goal of this course is learning. That is, you will be expected to work on a problem where machine learning can be applied, perform a literature review, analyse your results, write up a report and present it to the class. Doing all this will certainly guarantee that at the end of the process you will be better prepared for tackling other real-world machine learning projects. Doing all this in a sound way will also certainly guarantee a high grade. We definitely do not expect you to produce a research paper ready for publication. Nonetheless, if you are interested in pursuing a research career or in publishing your work for any other reason, note that this kind of project does resemble to a great extent a research project that could lead to a publication if the outcome can be of interest to a research community. Note that this would probably require extra work after the course is over. If publishing your work is something you would like to consider, feel free to discuss this with the instructors for feedback at any stage of the project.