Final Project Guidelines

Objectives.

1. Do a research project. Write a project report.

2. Give a 15-minute presentation on your project in class (12-minute talk + 3-minute Q&A).

3. The project must be related to machine learning, preferably related to the content of the course (but not required).

Teams. Each project should be done by a group of 1-2 students. (Teams with more than 2 students must seek the instructor’s approval.) Students in the same group will receive the same grade for the final project.

Submission instructions.

- Submit your project report on Gradescope.

- Each team should submit a single .pdf file. You may include links to other materials (e.g., website, code) in your project report. All project reports will be shared with the class (and possibly future students).

- Project reports should be written in LaTeX. It is recommended (but not required) that you use the LaTeX style files from one of the following conferences: ICML, NeurIPS, ICLR.

- Submissions are limited to 8 pages for the main paper, with unlimited pages for references and appendix. Material beyond the first 8 pages will be read at the discretion of the reviewers.

Timeline.

(All deadlines are 11:59pm on the due date.)

- Mar 9: Decide on teams and project titles.

- Apr 13 – Apr 27: Give a presentation on your project to the class.

- May 15: Submit your project report.

- May 19: (Optional) submit your ratings/reviews to all projects.
Grading. The projects will be graded out of 50 points (with up to 9 bonus points) based on the following rubric:

- **Meeting the deadlines** (10 points):
  - (5 points) Sign up for teams and project titles (in a Google spreadsheet) by Mar 9. Confirm your presentation date after a date is assigned.
  - (5 points) Show up on time to give a project presentation and answer questions. All students on the team must show up in person. Exceptions (e.g., Zoom and recorded presentations) must be requested in advance with good reasons.

- **Project presentation and report** (40 points):
  We will run a lightweight peer-review process to score your final projects. Each student will be asked to (optionally) submit a score for every project. The instructor and TAs will join the process as reviewers (each with twice the weight as a student in class).

  The presentation and the report should count for about 20 points each. The following criteria are provided as guidelines. You can discuss/post your criteria on Ed/Canvas.

  - Is the project related to machine learning?
  - How original and creative are the idea and the execution?
  - Does the project show a deep understanding of the relevant research areas/topics?
  - Is it clear from the presentation and the report which parts are the authors’ contributions?
  - Is the project useful to students/researchers in the machine learning community?
  - Is the presentation well-organized? Does it give a good overview of the project?
  - Does the presentation make you want to learn more about the project?

If part of your project (1) was done before this semester or (2) was used or will be used as projects for other courses, you should make this clear in your project report.

The average score (of all teams) will be curved to be at least 28 points (out of 40).

- **Evaluation** (with up to 9 bonus points):

  - You will be asked to (optionally) submit a score (22, 28, 34, 40 points) or declare COI for each project. These scores will be normalized so that all reviewers have the same mean and variance. The final score of a project is obtained by taking the average of the normalized scores.

  - (Top reviewers) If your evaluation is among the top 20% of most accurate evaluations (measured by $\ell_2$-norm of the difference), you will receive 3 bonus points.

  - (Top projects) The top 20% projects will receive 3 bonus points. The top 10% projects will receive 3 more bonus points (so 6 in total).

  - Names/titles/reports of the top reviewers/projects will be announced on the public course homepage. You can opt out if you prefer.
Examples of project ideas. A general approach you should follow is to (1) pick a machine learning problem that you are interested in, (2) implement state-of-the-art/widely-used algorithms for that problem, (3) explore when existing algorithms do not work well and how they can be improved, (4) try to improve previous algorithms or design/analyze new algorithms for this problem.

We provide project topics from previous years to show you the variety and possibilities of what you can do. We highly encouraged you to choose a topic that excites you the most (which probably should not come from this list).

- Adversarial Attacks in CNN Gender Classification
- Bayesian Neural Networks
- Can We Distinguish Real and Generated Images?
- Computer Vision Techniques for Game Flow Tracking
- Diffusion Models in Computer Vision
- Digit Classification with the MNIST Database
- Directed Acyclic Graph Discovery With Perturb-Seq Data
- Flow Navigation via Reinforcement Learning
- Linear Reinforcement Learning
- Machine Translation From Speech
- Non-Negative Matrix Factorization for Single-Cell RNA Sequencing Data
- Nonparametric Density Estimation under Distribution Drift
- Perturbed Gradient Descent for Variational Quantum Algorithms
- Preventing AI Collusion Through Platform Intervention
- Privacy-Preserving Machine Learning
- Redundancy-Reduction Proxies for Self-Supervised Learning
- Robust Mean Estimation for Few-Shot Classification Meta Learning
- Sparsification in Graph Neural Networks
- Stability in Adversarial Reach-Avoid Games
- Tensor PCA and Its Empirical Study
- Visualizing Non-Convex Optimization Landscapes