



Final Project Guidelines and Requirements

Spring 2024, Khoury College, Northeastern University

1 Key Logistics

- Work in groups of 4
- Title and Abstract (1 paragraph), due Feb 12th
- 1-page Proposal, due Feb 20th
- In-class presentations, Apr 10th, 11th, 15th and 17th
(20% of course grade, attendance mandatory on all 4 days)
- Final report and source code, due Apr 21st
(20% of course grade, no extensions)

2 Overview

The aim of the final project is to allow you to pick one topic in AI to pursue in more depth than course assignments permit and build something cool related to it from the ground up. The project should be interesting (and hopefully useful to someone) - but you should also consider feasibility when proposing a project. You might start looking for ideas in your daily life - look for problems that you might want to solve using techniques covered in this course. If you can turn your solution into something that lasts and is used actively beyond the final project deadline, that would be a fantastic outcome!

I encourage you to be ambitious. There are no restrictions on any specific subdomains of AI. As long as they're relevant, go crazy with your initial ideas, and then try and figure out how much of it you can reasonably manage to implement in the given time frame. Consider scaled-down variants of problems if your favorite ideas require lots of training time, or just happen to be complicated. While negative *results* are completely acceptable, negative *effort* is not - i.e. a method not performing as well as intended is fine (and happens more often than you think!), but failure to finish implementing a proposed method will be penalized.

A few example ideas off the top of my head:

- Game bots that play (and maybe even train) against each other in an alternating min-max fashion. Could be extended to model certain privacy challenges (as attacker and defender pairs).
- Constraint satisfaction problems, applied to logistical issues in your daily life, or at Northeastern in general. Example - finding groups for the final project, considering topic and interpersonal preferences.
- Analysis of online text-corpora - this could include sentiment analysis and topic modeling applied to analyze online discourse about recent issues (preferably relevant to the course, such as the ethics of AI)
- An RL agent to do something cool - using more specialized algorithms than the ones discussed in class, using OpenAI Gymnasium to set up the environment.

You may find this a useful resource: (<https://ics.uci.edu/~smyth/courses/cs175/>) for inspiration, ideation, data collection, and some technical matters. Think ahead of what we've already covered in class, and feel free to talk to me about your ideas. Projects involving creative use of LLMs, deep learning, and reinforcement learning are particularly fun - and pose unique challenges that make them a worthwhile learning experience.

3 Deliverables

3.1 Project Title and Abstract (due Feb 20th)

This submission will only need to be a short paragraph (no longer than half a page, with reasonable font sizes) highlighting your key ideas and scope, and a short description of why you think they are worth spending two months of your time on - what makes your project interesting, and useful. In a nutshell, why should anybody care about this particular problem? This abstract will not be graded, but **submission is mandatory, failing which you will lose 50% of points from your final project report grade**. I aim to provide feedback to all groups.

3.2 Project Proposal (due Feb 20th)

The next step is a 1-page write-up of your project. It should contain a brief overview of what you're planning to do and how, with details about scope and methods (including proposed data-extraction steps where appropriate, algorithms/methods to be used (you don't have to explain the algorithm just yet - citations to other work will suffice), data sources, any limitations on existing methods for feasibility, etc.). The key to a good proposal is that it specifies, concretely, an interesting project that can reasonably be completed in the allotted time using a specific AI approach. Yet again, the proposal is not graded, but **submission is mandatory, failing which you will lose 50% of points from your final project report grade**. This is my last chance to catch projects that may be infeasible.

3.3 Source Code & Final Report (due Apr 21st)

Your final write-up should consist of a **maximum** of 6 pages including references. You may use double-column research paper formats if you wish, and the use of \LaTeX is highly encouraged, but not mandatory. Please typeset algorithms, equations, and other mathematical operators as appropriate. A general outline of a project report would include some subset of the following sections (choose as appropriate for your project): a) Abstract, b) Introduction, c) Related Work, d) Problem Statement and Methods, e) Experiments and Results, f) Discussion and Conclusion.

The reader should be able to follow the problem you tried to solve, why it was interesting and relevant today, and what AI method(s) you attempted to use to do so. You should assume the reader is unfamiliar with the specific AI technique you used but is aware of basic computational concepts (such as your colleagues who may not yet have taken this course, but may have taken CS3500 and some introductory mathematics courses). You should report and discuss empirical results along with details about your experimental setup. Make sure that results are visualized or presented appropriately, and are easy to follow. Choosing the right format for your results is half the battle. You should conclude by addressing any potential limitations and discussing ways of improving or extending your work. Depending on novelty and scope, I may invite a (very) small number of groups to work closely with me to extend their project beyond the course's final deadlines.

Grading will be based on the clarity of the writing, the novelty of the project, general interest in the topic, the suitability of the approach selected and applied, and the execution of the methods proposed. Source code must be submitted through a GitHub repository, with detailed comments and documentation to help with reproducibility. Part of your grade will also be based on this. A detailed rubric will be shared closer to the presentations.

3.4 Final Presentation (In Class, Apr 10th, 11th, 15th and 17th, no exceptions, attendance mandatory)

Each group will present their work through an in-class presentation, lasting no longer than 7 minutes, including time for clarification questions. Presentations with live demos are highly encouraged. All group members must be present and are expected to participate equally in the presentation. Points will be assigned on the basis of clarity of presentation (both visual and content-related), formatting of results, ability to answer relevant questions, and adherence to the time limit.