Final project

1 Project details

You will complete a research project on a scientific question related to the topics covered in this course and will write up your findings and insights in the form of a blog, with an emphasis on clear communication. Write the blog you would like to read and would learn something from.

Collaboration. You can work in groups of up to three. Group projects require work proportional to the size of the group (details below).

What we expect. Your project should investigate a scientific question and present the resulting analysis in the format of a blog. Despite being a blog, the writing should be technical, of high quality, and not overly informal. What do we mean by technical writing? Each claim you make should be precise and supported. You can support a claim either by a citation, an experiment, or a mathematical argument. Be sparing with sentences that are subjective or arguable, and only include them with proper context.

The course projects should go beyond re-implementing existing methods and instead seek new insights and understanding of topics discussed in class. It is not enough to do a literature review, nor to directly re-implement a method without making any changes. Projects can explore the theory or applications of deep learning. Application-oriented projects should ask questions that further our understanding of *deep learning* and not just your application area.

For example, here are two possible applied projects, a mediocre one and a good one:

1. ("Drug classification with deep nets") Apply deep nets to classifying molecules by their toxicity. Show that transformers get higher accuracy than RNNs on this problem. Achieve a high accuracy on the test set. [mediocre]

2. ("Adaptive computation time transformers for molecular analysis") Identify that different molecules come in wildly different sizes, and should require different amounts of computation to analyze. Show how to modify a transformer to have depth or width that is adaptive to the size of the query molecule. Analyze how your system trades off time/memory for accuracy, and how properties of the molecule graphs affect this tradeoff. [good]

Length. Your blog should be around 2000–3000 words and contain 4–6 figures/tables visualizing aspects of your study (the word count is not including the tables and figures).

For groups of size 2 we will expect 1.5× as much work and for groups of size 3 we will expect 2× the work. This does not mean 2× the length, but rather 2× the depth of content (a rough measure of depth could be, but does not have to be, the number of experiments you run or the number of hypotheses you investigate). Pragmatically, each group member should be spending 4 weeks worth of work on the project (the last 4 weeks of the class), which equates to about 36 hours of work per member.

Projects related to your outside work. You are welcome to work on a project that is related to your thesis topic or other outside interests. However, the work you do for this

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class should be novel to this class. You should not submit work for which you have gotten, or will get, credit toward another class or degree program. Of course it's fine, and wonderful, if after this class you extend your project into a publication or blog post that you can share with the world.

Evaluation. The blog will be graded by novelty, quality, and clarity of the content. The grade will be determined by how well your blog offers fresh insights and in-depth analysis.

Timeline

1. **Submit proposal** [10% of grade] (**Due: November 14, 11:59pm**): Submit a proposal as a one page pdf. Provide an outline of your plan for the project and questions you will investigate / analysis you'll conduct in the course of it. It may help to define a set of hypotheses you will test. An integral aspect of the proposal is to define a project idea that is both realistic and ambitious in scope. We recommend that you use the project proposal stage to get feedback from the teaching staff on the project's feasibility and whether the proposal satisfies the project expectations of the class.
2. **Submit blog** [90% of grade] (**Due: December 10, 11:59pm**): See blog submission format in the section below.

2 Project Ideas

A list of possible project ideas are available here: https://tinyurl.com/yf2m46z6.

Please note that these are guiding ideas and that you are encouraged to develop your own ideas outside of this list.

3 Grading Rubric

See the grading rubric here: https://tinyurl.com/3jm38xmc.

The project will be evaluated on: Novelty (20 points), Technical Soundness and Content (30 points), Clarity (20 points), Literature Review (20 points), and Formatting (10 points).

4 Formatting

You should submit a single `.zip` file which includes an `index.html`. When we open `index.html` in a standard browser (Chrome), it should render the blog *without requiring an internet connection* (no dependencies on any files other than those in the `.zip`).

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We provide a basic template you may use here:

https://web.mit.edu/phillipi/www/blog_template/index.html

(zip file for this template: https://tinyurl.com/48x4zuay). But you don't have to use this. Feel free to get creative with the look and format of your blog.

5 FAQs

- **No late submissions will be accepted: In order to meet the grading deadlines, we will not be able to accept late submissions for the final project. (Deadline: December 10 2024 at 11.59pm).**
- You can change your final project from the proposal (the grade will not depend on similarity to the proposal), at the risk of not getting feedback from the proposal stage. However, you can come to office hours to discuss with course staff.
- This year we will not publish your submitted blogs, so you can consider that they will be kept private amongst the course staff. You are welcome to self-publish your finished projects.
- If you would like to see examples, the blog posts from last year are viewable here: https://deep-learning-mit.github.io/staging/blog/. Other high quality blog-format posts are viewable here: https://distill.pub/ although we acknowledge that Distill sets a high standard.