Project details

These project details are adapted from 6.7960 Deep Learning by courtesy of Prof. Phillip Isola.

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 computer vision and robotic perception. Application-oriented projects should ask questions that further our understanding of and not just your application area.

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

- (***X-ray classification with deep nets***) Apply deep nets to classifying chest x-ray images for different possible medical conditions. Show that transformers get higher accuracy than convolutional neural networks on this problem. Achieve a high accuracy on the test set. [mediocre]
- (***Medical X-ray classification with transformers and attention supervision***) Identify that neural networks "pay attention" to different portions of images as expert doctors, and determine that this is due to spurious features through ablations or attribution methods. Show how to augment the training procedure to provide guidance via transformer attention maps. Analyze how your system increases robustness to spurious features, and measure how much additional data of this form is necessary to guide training to a solution that generalizes better. [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 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

- **Submit proposal** [10% of grade] (Due: April 15, 11:59pm ET): 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.
- **Submit blog** [90% of grade] (Due: May 13, 11:59pm ET): See blog submission format in the section below. NOTE: you **cannot** submit late for the final project.

Project Ideas

A list of possible project ideas is available here: `https://tinyurl.com/3zxcbtm6`. Please note that these are guiding ideas and that you are encouraged to develop your own ideas outside of this list.

Grading Rubric

Proposal. The project proposal will be evaluated on: Novelty (20 points), Technical Soundness and Content (30 points), Clarity (20 points), Literature Review (20 points), and Formatting (10 points). See the full proposal grading rubric here: `https://tinyurl.com/mueezvhw`.

Blogpost. The project blogpost will be evaluated on: Novelty (20 points), Technical Soundness and Content (30 points), Clarity (20 points), Literature Review (20 points), and Formatting (10 points)[1]. See the full grading rubric here: `https://tinyurl.com/mvscwu6k`.

Formatting

The Proposal. As described in the rubric, the proposal must be up to one page excluding title, bibliography, and figures. Excluding bibliography it must be 3 pages maximum.

[1]The blogpost grading rubric varies slightly in point distribution from the proposal, since we are expecting a fuller exposition of your work as well as results.

Any readable/clear format you would feel comfortable sharing with the world is fine, but we also provide a minimal template as an option: `https://tinyurl.com/yxnc7sy4`.

The Blogpost 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`). Courtesy of Prof. Phillip Isola, 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.

FAQs

- No late submissions will be accepted **even if you have leftover late days**: In order to meet the grading deadlines, we will not be able to accept late submissions for the final project. (Deadline: May 13th, 2025, at 11:59pm ET).
- 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.
- 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, you can find blog posts from the 2023 rendition of 6.7960 Deep Learning: `https://deep-learning-mit.github.io/staging/blog/`. Other high-quality blog-format posts are viewable here: `https://distill.pub/`.