
# EN.601.776 Modern Topics in Machine Learning Generalization

## Course Information

**Meeting Times:** Tue/Thu 3:00 – 4:15pm
**Location:** Bloomberg 176
**Instructor:** Jess Sorrell (jess@jhu.edu)
**Office Hours:** Monday 3-4pm EST or by appointment.

## Course Prerequisites

EN.601.475/675 Machine Learning or instructor permission. Mathematical maturity wil be assumed.

## Course Structure

This course will closely follow a similar course taught by Surbhi Goel at Penn. It will be a mix of lectures and student presentations of research papers with open-ended discussion. Lectures will be recorded, paper discussion will not. To bring different perspectives to each paper, and practice research skills beyond paper summarization, we'll be taking inspiration from Alec Jacobson and Colin Raffel's role playing seminar. For every paper we read as a class, every student will have some role in presenting that paper. The possible roles are:

- Reviewer: You've been assigned to review the paper for a top ML conference. Summarize the contributions of the paper, state strengths and weaknesses, and justify your decision to accept or reject the paper.
- Archaelogist: Your job is to understand the context of the paper within the landscape of related work. Summarize at least one older paper that influenced the paper under discussion, and one new paper that cites the paper under discussion.

- Grad student: You are a PhD student who wants to start a new reseach project in this area. What are some follow-up project ideas based on this paper, or interesting questions this paper leaves unanswered? (These could be ideas for course projects later on!)
- Quanta correspondent: You're a writer for Quanta Magazine, and you want to write a popular science article about this paper. How would you describe the work to a broad audience of scientists and mathematicians, who do not necessarily have a machine learning background?

  You can also take a personal spin on your journalistic role, and instead focus on a lead author of the paper. What is their research background? Have they worked in academia, industry, or elsewhere? Who are their collaborators? Have they always worked in this area? Why did they choose this problem. You are invited to reach out to authors to ask them questions about their work, just make sure you do so politely and that you do your own research first!

## Planned Coursework and Grading Breakdown

The following plan is tentative and subject to change. There will be about 16 papers we read as a class over the semester. For each paper, there will be 2 reviewers, 1 archaeologist, 1 grad student, and 1 quanta correspondent. This means that each student will be assigned some role on about 8 papers. Each student will be assigned the reviewer role on 3-4 papers. PhD students are encouraged to take the reviewer role on 4 papers.

In addition to in-class discussion, we will be discussing the papers we read on Courselore (see Canvas for the invitation link). Everyone assigned to a paper will contribute to the Courselore discussion according to their role. The expectation here is a few paragraphs summarizing the findings from your role, no more than a page. The posts to Courselore should be submitted prior to the in-class discussion for that paper.

The discussion will be greatly improved by additional participation from the entire class, so please contribute as much as you can!

**Reviewer role (10% per paper).** Depending on how many times this role is assigned to a student, the total weight of this role will be 30-40% of the final grade.

- 5% for in-class presentation
- 5% for Courselore review

**Other roles (20-30%).**

- Half of the grade for each paper will be for in-class presentation
- The other half will be for Courselore participation

**Course Project (40%).** This course includes a semester long project with one of the following aims:

- answering a novel question related to the theory of replicable learning
- improving existing results related to course material

- summarizing a related area of recent research not covered in discussion
- empirically evaluating existing theoretical results to establish practical limitations

Students are encouraged to work in pairs. If you prefer to work in a larger group, please contact me for approval first.

- Project milestone 1 (1-2 page written proposal, week 5): 10%
- Project milestone 2 (2-4 page preliminary results write up, week 9): 10%
- Project milestone 3 (presentation, week 13): 10%
- Project milestone 4 (4-6 page paper, finals week): 10%

**Policy on lateness/absence.** Because so much of this course is driven by in-class discussion, participation and timeliness is very important. If you expect to miss a class when you have an assigned role for that day's paper, please try to find another student to take your role and let me know as soon as possible so I can reassign you to another paper. If you are not able to find another student to take your role, you will receive a 0 for the presentation component of that paper, though you can still receive full points for the Courselore participation component if it's completed on time (before the in-class discussion).

## Course Resources

There is no textbook for this course. Paper list coming soon!

## Academic Integrity

Students are expected to adhere to the JHU policy on academic honesty. Instances of plagiarism or cheating will result in disciplinary action.

**Use of Generative AI:** Below is a list of specific cases in which generative AI may be used or not be used. If you would like to use an AI tool in this course for some case that is not covered below, please contact me for clarification. If it's reasonable and does not interfere with the learning objectives for the course, it is likely to be approved.

Use of generative models (e.g. chatGPT, Gemini, Claude) is permitted in the following cases:

- Assisting with generating ideas and scoping for the final project
- Generating boilerplate code to be used for presenting the results of empirical evaluations (e.g. generating plots)
- Rephrasing student-generated text to improve presentation.
- Searching for bugs in papers

- Finding related work (I often don't find AI very helpful for this, so if you're successfully using it for this purpose, let me know!)
- Generating slides for the final presentation

Use of generative models is prohibited in the following cases:

- Generating an implementation of an algorithm that is being evaluated for the final project
- Generating a writeup for the final project
- Generating the Courselore discussion of a paper
- Generating a paper summary that is then read verbatim in class

Please also be aware that I am unlikely to approve a project proposal that I suspect a generative model could receive a C or better on without significant human involvement.

I will create a separate conversation on Courselore where we can discuss helpful uses of AI for digesting papers, or complain about cases in which it seems particularly unreliable, with the goal of learning from each other. While it is not a specific learning objective of this course, I encourage you to use the class as a testbed for the use of AI tools in research, and to share your experiences with the rest of us.

## Accommodations

Any student with a disability who may need accommodations in this class must obtain an accommodation letter from Student Disability Services, 385 Garland, (410) 516–4720, studentdisabilityservices@jhu.edu.