EECS 542 – Advanced Topics in Computer Vision

University of Michigan, Electrical Engineering and Computer Science

Syllabus for Fall 2021

Administrivia

Instructor: David Fouhey (`fouhey` at `umich.edu`)

GSI: Wallace Sui (`hcsui` at `umich.edu`)

Class: Monday/Wednesday 10:30PM – noon, 1050 FMCRB + Zoom Call-in

Course Information: This course will use Piazza for announcements, updates, and discussions and gradescope for turning in assignments. Email David if you have personal questions. Use Piazza otherwise. This ensures questions get answered once and only once, and your peers can answer your questions too!

Description

This is a graduate-level course incorporating two components. The first is weekly group-driven reading and active discussion and debating of work in computer vision. The second are projects that find a particular problem; make a concrete hypothesis and experiments to test it; and execute them computationally using realistic data. Throughout, you are expected to meaningfully contribute, engage with the material, and engage with the class.

Textbooks

There is no textbook.

Format

Each class will be 80 minutes and will generally consist of the following format:

1. Critical presentation of the work by 3 presenters:

    (a) Introduction and Background (10 minutes – Presenter A)
    (b) Paper 1 (10 minutes – Presenter B)
    (c) Paper 2 (10 minutes – Presenter C)
    (d) Pros & Cons of Papers and Discussion Topics (10 minutes – All Presenters)

2. Small group discussion in Groups of 5 (20 minutes – breakout groups/rooms)

3. Large group synthesis discussion (20 minutes – together)

I intend to enable people to participate remotely via Zoom as needed. You do not need to be in a remote section or receive prior permission to do so. You can simply call into the Zoom line. In however, I expect active participation in the remote options. Some of the format may change due to various COVID policies. In particular, if presentations under the current policies become burdensome, I may switch the presentations to be done before class.

Work and Evaluation

This is a graduate-level highly participatory class and it is assumed that if you put in a strong effort and come prepared, you will do well. There are grades as an accountability mechanism, but the point is not the grades themselves. I expect most people to do well. However, keep in mind that getting graduate credit for a class often involves getting some sort of A, and it is hard to give you an A if you have not turned in a substantial amount of work. Your grade will be based on:

1. (20%) One presentation done, in a group of 3 but with a clear individual component;

2. (20%) One paper review per class (24 with the lowest **6** grades dropped);

3. (10%) Participation in general and in the peer review parts of the class, consisting of: attendance in class; peer reviews of presentations; peer reviews of proposals, preliminary report, final report.

4. (50%) A semester-long project, consisting of: a writeup of a proposal of an paper we read (5%); a proposal of your project (5%); preliminary report (10%); final report (10%); final presentation (10%); holistic evaluation by instructor and peers (10%).

Grading Standards

Your project will be graded on a normal 0-100 basis. Some fraction of grading will be done on a ✓+/✓/✓–/0 basis to avoid arguing worrying about the nuances of grading a three paragraph paper review. These mean (along with their corresponding numerical scores):

- ✓+: Exceptional work (97%) – in the top 5% of the work. It is not **normal** to get this.

- ✓: Normal work (94%) – this work is fine and appropriate for a graduate-level class and done well, but not exceptionally so. This does not mean that you did poorly (this will not be given for ok-to-poor work).

- ✓–: Poor work (85%) – this work does not engage with the material in enough detail, is sloppy, or otherwise bad. I'll provide feedback for grades that are a ✓– to help you understand why they are a ✓–.

- 0: No work (0%) – this is work that does not exist, or is in the instructor's view a clear lack of good-fath effort (e.g., just a series of meows).

Class Presentation (20%)

Description: You will present a paper or background for a set of papers during the course of the semester. This will be partially an individual effort (your part of the presentation), and a group effort (the total presentation). The goal of the group is to tell a coherent **30 minute story** that teaches us about the two papers, the background, and their contributions. As an individual, your goal is to tell **the most important part of the paper or background material in 10 minutes**. That's short!

Expectations (Presentation): Along with two other people, you are expected to prepare a single coherent 30-minute presentation, summarizing the two papers, the background material and critical issues. You should also prepare three discussion questions, and one, succint, well-defined question that we can vote on at the end of class.

The format consists of:

1. *Presenter A* presents background material for 10 minutes. What are some common themes? What's some core technology that each thing uses?

2. *Presenter B* presents the first paper for 10 minutes. What are the specific details of paper 1 that are important for everyone to understand?

3. *Presenter C* presents the second paper for 10 minutes. What are the specific details of paper 2 that are important for everyone to understand?

4. *All Presenters:* Summarize the pros and cons of the paper and present a list of discussion topics. One should be yes/no question that can be voted on.

Miscellaneous advice: Doing the presentation without coordination is a terrible idea. You should *summarize* the most important parts of the papers and area and point out the strengths, and weaknesses. You should not try to explain everything in a your presentation. Going substantially over your allotted time is one of the worst sins of presentations, so practice your talk, including actually talking (even to an empty room). One slide a minute is roughly about the fastest pace you can do comfortably.

Your submission: Please submit your slides, exported by pdf, to gradescope on the day of your presentation.

Grading: ✓+/✓/✓–/0 by instructor, but also taking into consideration peer feedback.

Paper Reviews (20%)

Description: You are expected to write short paper reviews about the papers we read over the course of the semester – one per class. You can pick any of the papers that we read for the class, but you must submit this review *before* the paper is covered in class. The purpose of these is to incentivize you to read carefully and critically.

Expectations: You should write three **short** paragraphs (about half a 8.5"x11" page of text that is single spaced, 11 point font total) covering:

1. a brief summary in your own words;

2. the strengths of the paper;

3. the shortcomings of the paper.

These should be full sentences and full paragraphs, not bullet points or sentence fragments. Here are some things you should think about:

1. What might be the limitations of the approach and its assumptions: where might it fail, even if all of its components work as intended?

2. What might this paper have done that was previously impossible?

3. What are broader take-aways from the paper that can be applied elsewhere?

4. What's the most important part of the paper or the method?

5. Do the experiments justify the paper's argument?

Be sure to separate the paper *in retrospect* from the paper *when it was published*, and always remember that while criticizing (in hindsight) is often easy, it is equally important to learn to see the good in papers.

Your submission: Please submit a pdf of your review to gradescope

Grading: ✓+/✓/✓–/0 by instructor. The final grade will be the average of the best 18 of these (i.e., you can drop 6).

Participation and Peer Review (10%)

Description: This is a discussion based class. You are expected to actively and meaningfully participate in it. You are expected to come to classs and participate in the following peer review components. You will be assigned to one of thirteen panels for peer evaluation duties. Your peer evaluations will be done independently and submitted via a Google form but will be passed on directly to the people you are evaluating (with identifying info removed).

1. Every 2.5 weeks the panel will evaluate the presentations (i.e., on the 12th, Panel D will write reports).

2. Panels will be asked to give feedback on proposals, preliminary and final reports.

Grading: On five randomly selected (i.e., by `random.random`) days, I'll take attendance. These get graded as follows: (✓+: 5; ✓: 4; ✓–: 2,3; 0: 0, 1). I will reserve the use of this grade to penalize for failure to do peer reviews or do quality peer reviews.

Project (50%):

Description: You will complete a project over the course of a semester in groups of 3-5 that put ideas that we explore in the course to the test. An ideal project is a publishable paper. You will present the following deliverables:

- *Re-Proposal (individual):* As a practice exercise, each **individual** will submit a proposal for a paper that we have already read.

- *Proposal (group):* Towards the beginning, you will form groups and present a proposal.

- *Preliminary report (group):* Towards the end of the semester, you will submit an abbreviated format 4-6 page paper that your peers and the instructor will evaluate. You should describe what is left, and what you hope to deliver. You will get feedback on this plan.

- *Final report (group):* At the end of the semester, you will submit a full format 8 page paper that your peers and instructor will evaluate. This should be in CVPR format, include good figures, be adequately referenced. A perfect version of this would be publishable as one of the papers we read during the class.

- *Final presentation (group):* Format is yet to be determined.

Here is what is expected:

- *Project:* The project should aim to test a concrete hypothesis and have the experiments and data to do it properly. Of course, research does not always go the way you want, so if you do a well-designed experiment and get a negative result, this is fine – you should investigate it thoroughly and write it up properly and accurately.

- *Writeup:* The writing should teach a reader about what the project set out to do, how it tried to do it, and what experiments were done. It should be written well and include good figures.

- *Presentation:* The presentation should teach an audience about what the project set out to do, how it did tried to do it, and what experiments were done. It should include good figures, and be logical and engaging.

A great writeup and presentation are so clear that they can be understood by a half-interested person who is eating a sandwich and who wants to be checking their email. Great writing and presentations typically take multiple *full* redos.

Grading: Your grade will be decided in five parts.

1. 10% Project Re-Proposal

2. 10% Project Proposal

3. 20% Peer and instructor review of preliminary report;

4. 20% Project quality, graded by the instructor. This takes into consideration the ambition, amount and quality of work done, and general thoughtfullness as well as peer evaluation.

5. 20% Final report quality, graded by the instructor. This takes into consideration the writing, presentation, and figures.

6. 20% Final presentation quality, graded by the instructor.

Homework Policies

You are free to discuss with each other as much as you want – that's the entire point of the class. But:

1. Your work must be your own, unless you cite it properly

2. Your reviews must be written individually.

Please be reasonable about this. I will generally not grant extensions on things, except for exceptional circumstances.

General Remarks

1. *Accommodation:* If you think that you need an accommodation for a learning disability, please let me know. We will work with the Office of Service for Students with Disabilities (https://ssd.umich.edu/ to make proper accommodations.

2. *Counseling Center:* The Counseling Center staff (https://caps.umich.edu/) are trained to help you deal with a wide range of issues, such as how to deal with exam-related stress and other academic and non-academic issues. Services are free and confidential and do not impact student records.

Academic Integrity

All students in the class are: (a) presumed to be decent and honorable; (b) bound by the College of Engineering Honor Code; and (c) expected to read, understand, and follow the honor code. Information about this can be found here: https://elc.engin.umich.edu/honor-council/.