3D Vision (CS 598) – Fall 2021

Instructor: **Derek Hoiem** (dhoiem)

Overview

Estimation of 3D geometry – shapes, surfaces, and distances – is a primary application of computer vision. This course is intended for graduate students with research interest in 3D vision. Each week a new topic will be explored, first by a lecture of fundamental techniques and concepts, then through individual paper reading and small group discussions. Topics include single-view, multi-view, correspondence-based, and recognition-based methods. The course project consists of survey, proposal, experiments, and report.

Course Objectives

Through this course, you will gain a broad and deep knowledge of state-of-the-art in 3D vision, demonstrated and reinforced by writing short paper reviews and small group summaries. You will also gain experience in methodically identifying and validating a research direction.

Prerequisites

You should have a graduate-level understanding of computer vision, including camera models, feature detection and matching, and recognition. You should be engaged in or interested in research in 3D vision.

General Information

Textbook: Lectures are not based on any particular textbook. See the course web page for suggestions.

To obtain **disability-related academic adjustments** and/or auxiliary aids, students with disabilities must contact the course instructor and the Disability Resources and Educational Services (DRES) as soon as possible. To contact DRES you may visit 1207 S. Oak St., Champaign, call 333-4603 (V/TDD), or e-mail a message to disability@uiuc.edu.

Assignments and Grading

"Satisfactory" performance on all assignments will earn an "A" in the course. Project components will be rated "Satisfactory", "Needs Improvement" (3/4 credit), or "Unsatisfactory" (1/2 credit) and can be resubmitted once without penalty if not satisfactory.

Letter grades will be assigned based on the following thresholds:

95	90	87	83	80	77	73	70	67	63	60	<60
A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F

Paper Reviews and Discussion (50%): For each topic, you should select a paper and submit a review form. You will then meet during class in small groups with others who read the same paper to discuss merits and ideas for future work, and then present your findings to the class. You get 10 points for each satisfactory review and discussion. An unsatisfactory review or missing discussion is worth 5 points. Max points is 100. Satisfactory is the default grade, and written feedback is typically provided only in cases of unsatisfactory submissions.

Course Project (50%):

- **Survey** (15%): You will select a topic to explore with a small group (3-4), perform a literature review, and write a survey (4-6 pages) that includes a taxonomy of key design decisions and techniques, summary of evaluations, assessment of current capabilities and gaps, and identification of new research ideas.
- **Research Proposal** (15%): You will identify a promising research direction and write a research proposal (~2 pages) that includes motivation, related work, proposed approach, contributions, significance, and planned experiments, including a proof of concept experiment that will validate the idea. Most of these sections will be very brief, with some detail on the proof of concept experiment. The survey is a good source of ideas for the research proposal, but other ideas are also ok. Like the survey, the proposal will be performed in a small group (which can be different than the survey).
- **Report** (15%): With your proposal group, you will perform the proof of concept (PoC) experiment(s) identified in the proposal and write a report (~4 pages) including introduction, approach, PoC experimental results, and recommendations for further exploration. Your group will briefly present to the class on your findings.
- **Project Reviews** (5%): After the survey/proposal submissions, you will review one other survey/proposal and provide feedback. Survey feedback will highlight and comment on the most promising identified research directions. Proposal feedback will focus on the proof-of-concept experiment idea and identify any pitfalls or suggestions to make it better.

Late policy: Late paper reviews are not accepted. Other assignments are penalized by 1% of course total grade per day late.

Academic Integrity

All work that you submit should be written solely by you and your group, and you should cite any significant sources of ideas. If any part of your project builds on efforts prior to the semester (e.g. your ongoing research project), be sure to discuss with instructor in advance. *Plagiarism and other integrity violations will go on record at the university, and the minimum penalty will be a zero for the entire assignment.*

COVID-19 Policies

Following University policy, all students are required to engage in appropriate behavior to protect the health and safety of the community. Students are also required to follow the campus COVID-19 protocols.

- **Students who feel ill must not come to class. In addition, students who test positive for COVID-19 or have had an exposure that requires testing and/or quarantine must not attend class.** The University will provide information to the instructor, in a manner that complies with privacy laws, about students in these latter categories. These students are judged to have excused absences for the class period and should contact the instructor via email about making up the work. Students who fail to abide by these rules will first be asked to comply; if they refuse, they will be required to leave the classroom immediately. If a student is asked to leave the classroom, the non-compliant student will be judged to have an unexcused absence and reported to the Office for Student Conflict Resolution for disciplinary action. Accumulation of non-compliance complaints against a student may result in dismissal from the University.
- **All students, faculty, staff, and visitors are required to wear face coverings in classrooms and university spaces.** This is in accordance with CDC guidance and University policy and expected in this class. Please refer to the University of Illinois Urbana-Champaign's COVID-19 website for further information on face coverings. For more details about the University's Covid-19 policy, please visit the website.
- In order to implement COVID-19-related guidelines and policies affecting university operations, **instructional faculty members may ask students in the classroom to show their Building Access Status in the Safer Illinois app or the Boarding Pass**.