ECE 4310/6310 Introduction to Computer Vision
FALL 2020

MEETING TIME: 2:00 pm - 3:15 pm

MEETING LOCATION: Biosystems Research Complex G100

INSTRUCTOR(s): Dr. Adam Hoover, 313A Riggs Hall, 656-3377, ahoover@clemson.edu

OFFICE HOURS AND PROCEDURES: Open Zoom Tuesday/Thursday 5-6 pm. Other times by appointment. Both the TA and I respond regularly to email.

COURSE MODALITY: Hybrid (online synchronous to start semester)

COURSE DESCRIPTION: The purpose of a computer vision system is to take data (usually in the form of one or more images) and produce information. For example, a computer vision system might inspect bottles for proper volumes, identify abnormal tissue in a medical image, recognize a fingerprint, or tell an automated door when it is safe to close. This course teaches the mainstream theories of computer vision used to build such systems. Several examples (such as optical character recognition) are implemented in assignments.

COURSE PREREQUISITES: ECE 2230.

STUDENT LEARNING OUTCOMES: Upon successful completion of the course, students will be able to apply mainstream computer vision theories in the engineering (design, implementation, testing and debugging) of modern devices and systems. Graduate students will additionally be ready to apply computer vision to advanced research problems within the focus areas of intelligent systems and computer systems architecture.

REQUIRED MATERIALS: The student is required to have a laptop computer, internet connectivity capable of transmitting and receiving video, a video camera and a microphone.

COURSE WEBSITE: http://www.cecas.clemson.edu/~ahoover/ece431/

ADDITIONAL HELP: http://homepages.inf.ed.ac.uk/rbf/CVonline/

TOPICAL OUTLINE:

  Machine vision sensors and paradigms (1 week)
  Image processing basics (histograms, smoothing, convolution, edge detection) (2 weeks)
  GUI event-driven programming (1.5 weeks)
  Segmentation, region properties and algorithms (2 weeks)
  Matched filters, ROC curves and evaluation (2 weeks)
  Active contours (snakes), energy minimization (1.5 weeks)
  Tsai's camera calibration model and method, system latency (2 weeks)
  Accelerometers and gyroscopes, motion data, activity recognition (1 week)
  Deep learning (1 week)
  Range cameras, 3D data, and surface segmentation (1 week)

CLASS CANCELLATION POLICY: Class is cancelled if the instructor is more than 30 minutes late.

GRADING POLICY:

ECE4310: 100% eight labs (12.5% each)
ECE6310: 80% eight labs (10% each), 20% semester project
Grade scale is 90-100 A, 80-89 B, 70-79 C, 60-69 D, <60 F

SUBMITTING WORK: All labs are to be submitted online to the assign server. Instructions are given in each lab handout.

ATTENDANCE POLICY:

1. The university will assign students a day of the week they are to come this class; on other days, they must attend online.
2. Attendance is optional on days students are to come physically.
3. Online attendance is mandatory.
4. For an unavoidable absence, inform the instructor via email.
5. To maintain physical distancing, individuals arriving first to the classroom should sit farthest from the door. Similarly, at the conclusion of class, students closest to the door should leave first.
6. While on campus, face coverings are required in all buildings and classrooms. Face coverings are also required in outdoor spaces where physical distance cannot be guaranteed. If a student does not have a face covering or refuses to wear an approved face covering, the instructor will ask the student to leave the academic space and may report the student's actions to the Office of Community & Ethical Standards as a violation of the Student Code of Conduct. If the student's actions disrupt the class to the extent that an immediate response is needed, the instructor may call the Clemson University Police Department at 656-2222.
7. Note that the University may convert to a purely online mode at any time. University classes are initially in a purely online mode and will remain so until Sept. 21.
8. Synchronous online instruction will be conducted via Zoom.

ACCESSIBILITY STATEMENT: Clemson University values the diversity of our student body as a strength and a critical component of our dynamic community. Students with disabilities or temporary injuries/conditions may require accommodations due to barriers in the structure of facilities, course design, technology used for curricular purposes, or other campus resources. Students who experience a barrier to full access to a class should let the instructor know and make an appointment to meet with a staff member in Student Accessibility Services as soon as possible. You can make an appointment by calling 864-656-6848 or by emailing studentaccess@lists.clemson.edu. Students who receive Academic Access Letters are strongly encouraged to request, obtain, and present these to their instructors as early in the semester as possible so that accommodations can be made in a timely manner. It is the student's responsibility to follow this process each semester. You can access further information here: http://www.clemson.edu/campus-life/campus-services/sds/.

TITLE IX STATEMENT: Clemson University is committed to a policy of equal opportunity for all persons and does not discriminate on the basis of race, color, religion, sex, sexual orientation, gender, pregnancy, national origin, age, disability, veteran's status, genetic information or protected activity in employment, educational programs and activities, admissions and financial aid. This includes a prohibition against sexual harassment and sexual violence as mandated by Title IX of the Education Amendments of 1972.

SAFE CAMPUS: Clemson University is committed to providing a safe campus environment for students, faculty, staff, and visitors. As members of the community, we encourage you to take the following actions to be better prepared in case of an emergency:

a. Ensure you are signed up for emergency alerts (https://www.getrave.com/login/clemson)
b. Download the Rave Guardian app to your phone (https://www.clemson.edu/cusafety/cupd/rave-guardian/)

c. Learn what you can do to prepare yourself in the event of an active threat (http://www.clemson.edu/cusafety/EmergencyManagement/)

ACADEMIC INTEGRITY: As members of the Clemson University community, we have inherited Thomas Green Clemson's vision of this institution as a 'high seminary of learning.' Fundamental to this vision is a mutual commitment to truthfulness, honor, and responsibility, without which we cannot earn the trust and respect of others. Furthermore, we recognize that academic dishonesty detracts from the value of a Clemson degree. Therefore, we shall not tolerate lying, cheating, or stealing in any form. In instances where academic standards may have been compromised, Clemson University has a responsibility to respond appropriately to charges of violations of academic integrity. Further information on Academic Integrity can be found in the *Undergraduate Announcements* and in the *Graduate School Policy Handbook*.

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MODIFICATION STATEMENT: The instructor reserves the right to modify any aspect of the syllabus at any time during the semester for reasons including but not limited to COVID-related situations.