CS4363/CS5363 Computer Vision
Spring 2021

1. General Information

Instructor:

Olac Fuentes
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Office hours: Tuesdays and Thursdays 3:00-4:30 or by appointment on MS Teams. Feel free to contact at other times if available.

Teaching Assistants (TA):

Jose Perez
Email: jperez50@miners.utep.edu
Office hours: Mondays and Wednesdays 12:30-2:30 or by appointment on MS Teams. Feel free to contact at other times if available.

Meeting times and place: M-W 3:00:4:20 p.m. on Zoom through Blackboard

Course Description:
Computer vision is concerned with the development of programs that enable computers to extract useful information from digital images. In this course we will study techniques for solving several of the most relevant problems in computer vision, including object detection, object recognition, tracking, image segmentation, and three-dimensional reconstruction. We will also study real-world applications of these techniques, including face recognition, surveillance, robot navigation, medical image analysis, and computational photography. Each student will do a research project related to a problem of his/her interest.

Outcomes:
On successful completion of this course, students will:

1. Understand the image formation process and the geometric relationship between 3D objects and their corresponding 2D projections.
2. Implement and apply algorithms for image to image transformations.
3. Implement and apply algorithms to compute meaningful features from images and image regions.
4. Implement and apply algorithms to classify images and image regions.

Graduate-level vs. Undergraduate Level Expectations:
Graduate students are given additional and more advanced assignment and exam questions. The course includes an individual project, which is optional for undergraduates and mandatory for graduate students. In the case of undergraduate students, implementation of well-known algorithms is usually sufficient; for graduate students, projects are expected to include advanced algorithms, analyses, and/or applications.

2. Course Contents (tentative)

1. Introduction
2. Brief introduction to Python

3. Image formation
4. Image processing
5. Feature detection and matching
6. Segmentation
7. Machine learning for computer vision
8. Object detection and recognition
9. Tracking
10. Stereo vision
11. 3D reconstruction
12. Applications

3. Policies and Other Information

Books:
We will use parts of the following books, which are available free online.

- Computer Vision: Algorithms and Applications, Richard Szeliski. Second Edition. Note: book is in draft form, freely available at https://szeliski.org/Book/

Prerequisites:
CS 2302 Data Structures, MATH 3323 Matrix Algebra, and STAT 3320 Probability and Statistics, or permission from instructor. Knowledge of Python is highly desirable.

Tools:
Python, including several libraries such as OpenCV and Tensorflow

Grading:
Lab assignments 20%
Quizzes, homework and exercises: 20%
Partial exams (2) 30%
Final Exam 20%
Final Project 10% -including proposal, report, and final presentation.

Late homework submission: Answers to written homework will be posted at the deadline, thus no late homework will be accepted.

Late lab submission: Lab grades will be decreased by a factor of 10% for each working day they are late. Multiple submissions for a particular assignment are allowed; only the highest grade will be considered. Each student will have one lab lateness penalty waved in the semester – use this wisely.

Collaboration: Collaboration among students is strongly encouraged.
It is OK to:

- Talk with other students about approaches and ideas.
- Get ideas and extra information from the internet, books, etc.

However, it is not OK to:

- Share code with another student (if a piece of code is submitted by two or more students, both students are guilty of cheating, regardless of who wrote the original code).
- Use code acquired from an outside source (the internet, a friend, etc.)
- Look at another student's code
- Debug another student's code

We will use software to detect plagiarized programs and take appropriate disciplinary actions if necessary.

Attendance policy: Students are expected to attend all lectures. Students arriving more than five minutes after the start of a lecture won't be allowed to enter the classroom. A student missing more than four lectures without making prior arrangements will be dropped from the class.

Disabilities: If you feel that you may have a disability that requires accommodation, contact the Center for Accommodations and Support Services (CASS) at 747-5148, go to Room 106E Union, or email cass@utep.edu

4. Lab Submission Guidelines

Lab assignments will be posted on-line. Each lab grade will be computed from the reports submitted and a 5-minute oral presentation.

You must submit a printed report of every lab that includes the following items:

- Introduction – Description of the problem you are trying to solve
- Proposed solution design and implementation – How did you solve (or attempt to solve) the problem? Provide an informal, high-level description. Description of your code (not the actual code). Explain the design choices you made, including how you broke the program into modules, your user interface, input and output, etc.
- Experimental results – Describe the experiments you performed to test your program. The experiments must be described in a way that allows anybody to replicate them using your code. Include sample runs that illustrate your results under different types of inputs.
- Conclusions – Explain what you learned from the project.
- Appendix – Source code

Reports will be graded as follows:

- Completeness
  Does your report cover all required aspects in enough detail?
- Clarity
  Are those aspects clearly explained?
- Depth
  Does the report show clear understanding of the topic covered?
- Language
  Is the report written with proper grammar and spelling?
- Presentation
  Is the formatting appropriate?

5. Standards of Conduct and Academic Dishonesty

A fundamental principle for any educational institution, academic integrity is highly valued and seriously regarded at The University of Texas at El Paso. More specifically, students are expected to maintain absolute integrity and a high standard of individual honor in scholastic work undertaken at the University. See https://www.utep.edu/student-affairs/osccr/student-conduct/academic-integrity.html for additional information.

Faculty, staff and students are expected to conduct yourself in a professional and courteous manner, as prescribed by the UTEP Standards of Conduct Guide:
https://www.utep.edu/compliance/_Files/docs/Standards_of_Conduct_Booklet_5-11-15.pdf