CS4363/CS5363/ Computer Vision
Fall 2018

1. General Information

Instructor:
Olac Fuentes
Email: ofuentes@utep.edu
Web: www.cs.utep.edu/ofuentes
Office hours: Tuesdays and Thursdays, 10:30-12:00, or by appointment, in CCSB 3.0412 (feel free to drop by at other times if my door is open).
Chat: olacfuentes@gmail.com

Meeting Times:
MW 1:30-2:50 CCSB 1.0702

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 three-dimensional reconstruction, object detection, object recognition, and tracking. 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.

Class webpage:
http://www.cs.utep.edu/ofuentes/cs4363.html

2. Course Contents

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.
- Programming Computer Vision with Python: Tools and algorithms for analyzing images, Jan Erik Solem, O'Reilly Media, June 2012.

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

Tools:
Python
OpenCV
Keras

Grading:
3 Midterm exams 30%
Quizzes, homework and class participation 15%
Lab Assignments 20%
Final exam 20%
Course Project 15% (3 presentations, final report)

Late homework submission: Homework up to a day late will receive up to 80% of full credit; it will not be accepted after that.

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.

Cellular telephones are prohibited during lecture sessions. Students are required to turn off their cellular telephones before entering the classroom.

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 Disabled Student Services Office at 747-5184, go to Room 106E Union, or email dss@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?

Policy on late lab assignments:
Lab project grades will be reduced by a factor of 8% for each working day or fraction they are late.

Missing lab assignments:
All labs must be submitted by the end of the semester in order to pass the class. Additionally, a student who has submitted less than 75% of the labs due by the time a midterm exam is given won’t be allowed to take that exam.

5. Standards of Conduct and Academic Dishonesty

You are expected to conduct yourself in a professional and courteous manner, as prescribed by the UTEP Standards of Conduct: https://admin.utep.edu/portals/68/Standards_of_Conduct_Booklet_5-11-15.pdf

Academic dishonesty includes but is not limited to cheating, plagiarism and collusion. Cheating may involve copying from or providing information to another student, possessing unauthorized materials during a test, or falsifying data (for example program outputs) in laboratory reports. Plagiarism occurs when someone represents the work or ideas of another person as his/her own. Collusion involves collaborating with another person to commit an academically dishonest act.

Professors are required to - and will - report academic dishonesty and any other violation of the Standards of Conduct to the Dean of Students.