CS 678, Computer Vision, Spring 2018

Instructor
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Course Format and Credit hours
3 hr Lecture / Presentations
3 hr Credit

Prerequisites
Proficiency in Calculus, Linear Algebra, Matlab, and C/C++

Schedule
W 5:00pm – 7:20 pm

Location
ESB 215

Office Hours
Thursday 4:00 to 6:00 p.m. or by appointment

Course Objectives
This course will provide an introduction to Computer Vision at the graduate level. First, we will give an introduction to low-level image analysis methods, including image formation, edge detection, feature detection, and image segmentation. Second, image transformations are introduced, including warping, morphing, and mosaics for image synthesis. Third, methods for reconstructing three-dimensional scene information using techniques such as stereo, structure from motion, and shape from shading. Fourth, algorithms for motion and video analysis will be introduced. Finally approaches to object recognition will be described.

Expected Learning Outcomes

1. Identify and define basic concepts in computer vision, including camera parameters, camera calibration, edge detection, line detection, stereo algorithms, motion detection, structure from motion, image mosaic, face detection, and object recognition

2. Design and implement an algorithm for a given practical problem in computer vision

3. Evaluate the correctness and generality of a computer vision method using a variety of test images

3. Justify a given computer vision algorithm mathematically

Tentative topics and Schedule

- Week 1: Human vision
- Week 2: Image formation: Geometry, Radiometry, and Digitization
- Week 3: Camera calibration
- Week 4: Image segmentation: Region-based and edge-based
- Week 5: Image processing for feature: Edge detection, line and curve detection
- Week 6: Image filtering
- Week 7: Shape from X: Shape from shading, photometric stereo
- Week 8: Image-based modeling and rendering
- Week 9: Motion analysis: Motion detection and optical flow, structure from motion
- Week 10: Object recognition: Model-based, appearance-based
- Week 11: Object recognition: Invariant features
- Week 12: Face detection and recognition
- Week 13: Epipolar geometry
- Week 14: Stereo
- Week 15: Recent advances and research topics in Computer Vision

Grading

Homework and Programming Assignments (40%)
Exam (40%)
Final Project (20%), due date: April 10, 2018
Extra (1~10%, for creative ideas, paper submission based on this course, etc.)

Textbook

Computer Vision: Algorithms and Applications, Richard Szeliski, http://szeliski.org/Book/
ISBN: 978-1-84882-934-3 (Print), 978-1-84882-935-0 (Online)

Optional Books

Computer Vision: A Modern Approach by D. A. Forsyth and J. Ponce, Prentice Hall, 2003. ISBN-10: 0-13-085198-1
Introductory Techniques for 3-D Computer Vision, E. Trucco and A. Verri, Prentice Hall, 1998. ISBN 0-13-261108-2

Grading Policy

No make-up exams except by prior arrangement with instructor
Late assignment = no assignment
Exam grading appeals in writing on the day the exam is returned.

Attendance Policy

Consistent with WVU guidelines, students absent from regularly scheduled examinations because of authorized University activities will have the opportunity to take them at an alternate time. Make-up exams for absences due to any other reason will be at the discretion of the instructor.

Inclusivity Statement

The West Virginia University community is committed to creating and fostering a positive learning and working environment based on open communication, mutual respect, and inclusion.
If you are a person with a disability and anticipate needing any type of accommodation in order to participate in this class, please advise me and make appropriate arrangements with the Office of Accessibility Services (304-293-6700). For more information on West Virginia University's Diversity, Equity, and Inclusion initiatives, please see http://diversity.wvu.edu.

Integrity Statement

The integrity of the classes offered by any academic institution solidifies the foundation of its mission and cannot be sacrificed to expediency, ignorance, or blatant fraud. Therefore, I will enforce rigorous standards of academic integrity in all aspects and assignments of this course. For the detailed policy of West Virginia University regarding the definitions of acts considered to fall under academic dishonesty and possible ensuing sanctions, please see the West Virginia University Academic Catalog at
http://catalog.wvu.edu/undergraduate/coursecreditstermsclassification/#academicintegritytext.
Should you have any questions about possibly improper research citations or references, or any other activity that may be interpreted as an attempt at academic dishonesty, please see me before the assignment is due to discuss the matter.

Adverse Weather Commitment Statement

In the event of inclement or threatening weather, everyone should use his or her best judgment regarding travel to and from campus. Safety should be the main concern. If you cannot get to class because of adverse weather conditions, you should contact me as soon as possible. Similarly, if I am unable to reach our class location, I will notify you of any cancellation or change as soon as possible (by 11 o'clock/3 hours before class starts), using (MIX/Gmail/eCampus/Twitter/Facebook/text message) to prevent you from embarking on any unnecessary travel. If you cannot get to class because of weather conditions, I will make allowances relative to required attendance policies, as well as any scheduled tests, quizzes, or other assessments.