University at Buffalo
The State University of New York

Introduction to Computer Vision and Image Processing

CSE 573LEC	CSE 473LR
Registration # 10770	Registration #10783

Fall 2017

COURSE INFORMATION

CSE 573 / 473 Lectures:	Monday, Wednesday, Friday	3:00PM - 3:50PM	121 Cooke Hall
CSE 473 Recitation:	Wednesday	4:00PM – 4:50PM	115 Baldy Hall
	Thursday	3:00PM – 3:50PM	106 Baldy Hall
Number of credits:	CSE 573 (3 lectures per week)		3 credits
	CSE 473 (3 lectures + 1 recitation per week)		4 credits

Instructor:	Kevin R. Keane, PhD	krkeane@buffalo.edu	Wed 1:30-2:30pm	303 Davis Hall
TAs:	Radhakrishna Dasari	radhakri@buffalo.edu	Tuesday 2-3pm	301A Davis Hall
	Yuhao Du	yuhaodu@buffalo.edu	Friday 10-11am	300 Davis Hall
	Niyazi Sorkunlu	niyaziso@buffalo.edu	Monday 4-5pm	300 Davis Hall

This term we will be using UB*learns* Discussion Board. The system is catered to getting you help fast and efficiently from classmates, the TAs, and myself. Rather than emailing questions to the teaching staff, I encourage you to post your questions on the appropriate forum on the Discussion Board.

COURSE DESCRIPTION

This course introduces the fundamental techniques used in computer vision, that is, the analysis of patterns in visual images to reconstruct and understand the objects and scenes that generated them. Topics covered include image formation and representation, camera geometry and calibration, multi-view geometry, stereo, 3D reconstruction from images, motion analysis, image segmentation, object recognition. The material is based on graduate-level texts augmented with research papers, as appropriate. Evaluation is based on homework and a final project. The homework involves considerable MATLAB programming exercises.

***CSE 573 prerequisites*:** Knowledge of linear algebra, vector calculus, and basic probability are required. MATLAB programming experience and previous exposure to image processing are desirable, but not required.

***CSE 473 prerequisites*:** linear algebra MTH309; vector calculus MTH 241 OR MTH 251; basic probability MTH411 OR STA301 OR EAS305; and, data structures CSE 250. MATLAB programming experience and previous exposure to image processing are desirable. Approved CS, CEN, Bioinformatics/CS majors only.

STUDENT LEARNING OUTCOMES

Students completing this course will be well prepared to comprehend current research in computer vision or apply state-of-the-art techniques to problems of interest in their own field.

TEXTBOOKS:

Computer Vision: A Modern Approach (2nd Edition) by David A. Forsyth and Jean Ponce. (required)
Computer vision: algorithms and applications by Richard Szeliski. (online)
Computer Vision by Dana H. Ballard and Christopher M. Brown. (On reserve: book / pdf)
Image processing, analysis and computer vision by Milan Sonka, Vaclav Hlavac and Roger Boyle. (On reserve: book / pdf)
Robot Vision by Berthold Horn. (On reserve: book)

COURSE REQUIREMENTS / GRADING POLICY

Your final grade will be determined by five homework assignments (with considerable MATLAB implementation) worth 17% each, a class project worth 12%, and class participation (measured by UB*learns* Discussion Board answers following our guidelines) worth 3%. Homework must be submitted on UB*learns* by 11:59 pm on the given due date. You will be allowed a total of 3 late days throughout the semester - use them wisely! Each additional day late will result in a penalty of 50% of the homework grade, and no homework will be accepted after 3 days past its due date.

COURSE OUTLINE:

I. Image formation
- Camera models
- Light and shading
- Color

II. Early vision
- Linear filters
- Local image features
- Texture
- Stereopsis
- Structure from motion

III. Mid-level vision
- Segmentation by Clustering
- Grouping and Model Fitting
- Tracking

IV. High-level vision
- Registration
- Learning to Classify
- Classifying Images

V. Applications and topics
- Looking at people
- Image search and retrieval
- Deep learning

ACADEMIC INTEGRITY

Academic integrity is a fundamental university value. Through the honest completion of academic work, students sustain the integrity of the university while facilitating the university's imperative for the transmission of knowledge and culture based upon the generation of new and innovative ideas. Homework may be discussed, but each student must independently write up their own solutions. In particular, no sharing of code. Please see the university policies below on academic honesty. It is fine to use reference materials found online, but do not search for homework solutions. Rather, students are strongly encouraged to ask questions at both office hours and on the class discussion group.

- CSE 573 http://grad.buffalo.edu/study/progress/policylibrary.html
- CSE 473 https://catalog.buffalo.edu/policies/integrity.html

ACCESSIBILITY RESOURCES

If you have any disability which requires reasonable accommodations to enable you to participate in this course, please contact the Office of Accessibility Resources, 25 Capen Hall, 645-2608, and also the instructor of this course. The office will provide you with information and review appropriate arrangements for reasonable accommodations.
http://www.buffalo.edu/studentlife/who-we-are/departments/accessibility.html