CS 583 Introduction to Computer Vision
Fall 2024

Instructor Information:

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Class Hours: Wednesdays 06:00 pm – 08:50 pm
Classroom: 3675 Market Street, Room 1103
Office Hours:
Office Hours Zoom Link: https://drexel.zoom.us/j/8483001631

Credit Hours:

3 Credits

Prerequisite:

Programming (Python), algorithms, data structures, probability and statistics, linear algebra, 3D calc.

Catalog Description:

Visual information processing problems; human and machine vision systems; image formation; image transforms, encoding, enhancement; edge detection; segmentation; 2D and 3D object description and recognition; scene analysis; applications

Statement of Expected Learning:

To study problems associated with image acquisition, processing, and interpretation; to learn tools for solving computer vision problems in industry and various scientific disciplines; to understand the general process of designing a practical computer vision system.

Recommended Texts, Readings and Resources:

Text: R. Szeliski. Computer Vision: Algorithms and Applications. Free copy@ http://szeliski.org/Book/;
References: D. A. Forsyth and J. Ponce. Computer Vision: A Modern Approach (2nd Edition).
Typesetting: Overleaf (LaTex compiled online, https://overleaf.com/)

Graded Assignments and Learning Activities:

Graded Homework:

Three homework assignments are planned, as shown on the course calendar. Written homework problems provide exercise on concepts and methods. Some programming may be needed to complete homework. Programming is intended to reinforce algorithms and concepts and to get correct results; it is NOT intended to be an exercise in software development (so minimum documentation and usability but careful testing). Students will often use multiple tools or programs. A report of program/algorithm behavior and results is required. Unless otherwise stated, ANY programming language or computer can be used, **while the Python language is preferred**. Students will be responsible if conversion of data or program modules is needed. Students should seriously consider using Python due to its rapid development capability. Also, students should become familiar with one or more popular image processing tools. It should be clear when basic algorithms should be implemented by the student and not obtained from an existing library or function. There are 3 total homework assignments. The first one, **Homework0, will NOT be graded**, while the other 2 will be graded.

Homework Report:

The homework report should be a single .pdf or .doc file. Handwork or hand annotated images or code is acceptable and can be scanned into electronic form. Program modules, if requested, should be in tar or zip form.

Report format is not rigid, but should include the following elements.

- The problem[s] or homework objectives.
- The approach taken / major algorithm[s], possibly mentioning what alternatives were not taken.
- Results are most important, and how to get to the results is important too.
- Provide a few cases where things look good.
- Often there will be required cases.
- Document the parameters, process, etc.
- Provide a few cases where things don't look good.
- Document the parameters, process, etc.
- Concluding comments, how things went overall, what would be good to try if the work continued.

Project:
This is an opportunity to explore a topic in depth and should involve substantial work. This is a group project, **with no more than 3 students per group**. This can be in implementation (e.g., implementing an existing algorithm), applications (e.g., applying computer vision to an existing problem), or research (e.g., trying something new in computer vision). Please start to look for partners. It will consist of:

- Proposal (1 page): The proposal should aim to explain what the problem is, why it's feasible to solve in the given timeline, and how you plan to achieve it.
- Progress report (1 page): The progress report should explain what progress you've made and be a stepping stone to the final report. That is, almost all of your work for the progress report should be usable for the final report.
- Final Project Report (4 pages): The final project report should explain what you have done.

***All written work should be in CVPR format** (.zip file here for word and latex).

Grading Matrix:

Two assignments (25% each) * 2 + One final project proposal (10%) + One final project report (20%) + One presentation (20%) = 100% (Bonus, up to 5%, for active students)

Grade Scale:

97-100 A+	92-96.99 A	90-91.99 A-	87-89.99 B+
82-86.99 B	80-81.99 B-	77-79.99 C+	72-76.99 C
70-71.99 C-	67-69.99 D+	60-66.99 D	0-59.99 F

Course Calendar:

[This schedule is tentative and may change during the course.]

Week	Topic	Suggested Reading	HW/Things Due
Week 1: Sept 25	Introduction and background; Projective Cameras I	S2.1	**HW0 Out**
Week 2: Oct 2	Projective Cameras II; Light and Shading	S2.1, S2.2, S2.3	
Week 3:	Numberical Linear Algebra	Zico Kolter Review	

Oct 9			
Week 4: Oct 16	Linear and Nonlinear filtering; Detectors and Descriptors I	S3.2, S4.1	
Week 5: Oct 23	Detectors and Descriptors II; Transformations I	S4.1, S2.1	**HW1 Out**
Week 6: Oct 30	Transformations II; Linear Models	S6, S14	
Week 7: Nov 6	Continuous Optimization; Backpropagation and Neural Nets	CS231n Backprop Examples;	**Proposal due**
Week 8: Nov 13	Convnets	CS231n Convnets	**HW2 Out; HW1 Due**
Week 9: Nov 20	Detection; Intro to 3D vision; (Sinle-View Geometry; Stereo)	S8.4, S7, S11	
Week 10: Nov 27	**No Classes**		**Progress Report due**
Week 11 Dec 4:	**Final project presentation**		**HW2 Due**
Week 12: Dec 11	**Final project report**		**Final Report due**

Course Policies:

Assignments are due Sunday at 11:59:00pm (Anywhere in the world) unless otherwise stated.
You will lose 0.5pt for every hour late (round up) on an assignment up to 60hrs (after which you will receive a zero).
Any dispute about an assignment grade must be made and resolved within 5 days of receiving your grade. After this period your grade cannot be adjusted.
Except when groups are explicitly allowed, work must be done individually. You are encouraged to discuss the problems with your classmates, but you must not share details of the solutions. If you are unsure whether you have shared too much, discuss the situation with the TA or instructor; it is your obligation to avoid even the appearance of cheating.

Academic Policies:

This course follows university, college, and department policies, including but not limited to:

- Academic Integrity, Plagiarism, Dishonesty and Cheating Policy: http://www.drexel.edu/provost/policies/academic_dishonesty.asp
- Student Life Honesty Policy from Judicial Affairs: http://www.drexel.edu/provost/policies/academic-integrity
- Students with Disability Statement: http://drexel.edu/oed/disabilityResources/students/
- Course Add/Drop Policy: http://www.drexel.edu/provost/policies/course-add-drop
- Course Withdrawal Policy: http://drexel.edu/provost/policies/course-withdrawal
- Department Academic Integrity Policy: http://drexel.edu/cci/resources/current-students/undergraduate/policies/cs-academic-integrity/
- Drexel Student Learning Priorities: http://drexel.edu/provost/assessment/outcomes/dslp/

- Office of Disability Resources: http://www.drexel.edu/ods/student_reg.html

The instructor(s) may, at his/her/their discretion, change any part of the course before or during the term, including assignments, grade breakdowns, due dates, and schedule. Such changes will be communicated to students via the course web site. This web site should be checked regularly and frequently for such changes and announcements.

Students requesting accommodations due to a disability at Drexel University need to request a current Accommodations Verification Letter (AVL) in the ClockWork database before accommodations can be made. These requests are received by Disability Resources (DR), who then issues the AVL to the appropriate contacts. For additional information, visit the DR website at drexel.edu/oed/disabilityResources/overview/, or contact DR for more information by phone at 215.895.1401, or by email at disability@drexel.edu.