

CSE 4310: Introduction to Computer Vision
Summer 2018

Instructor: Chris McMurrough, Ph.D. & Shawn N. Gieser, Ph.D.

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Office Hours: McMurrough: by appointment only

Gieser: Summer 1 (June 4th – July 5th) Tuesday & Thursday 8:00AM – 9:30 AM

Summer 2 (July 9th – August 14th) Monday and Wednesday 1:30PM – 3:00PM

Section Information: CSE 4310-001

Time and Place of Class Meetings: Tuesday & Thursday 1:00 PM – 2:50 PM; ERB 130

Description of Course Content: This course introduces students to basic concepts and techniques in computer vision. The topics covered include morphological operations, connected component analysis, image filters, edge detection, feature extraction, object detection, object recognition, tracking, gesture recognition, image formation and camera models, calibration, and stereo vision. A strong programming background is assumed, as well as familiarity with linear algebra (vector and matrix operations), and knowledge of basic probability theory and statistics.

Student Learning Outcomes: Upon successful completion of this course, students will understand and have a mastery of the following topics: state of the art computer vision techniques and applications, setting up a computer vision programming environment, data acquisition and display, image thresholding, morphology, motion detection and tracking, object recognition, camera calibration and fiducial markers, depth and 3D sensing techniques and hardware, point clouds, segmentation, registration, performance considerations, parallel processing, and emerging technologies.

Required Textbooks and Other Course Materials: All required materials will be provided by the instructors through blackboard and github.

Descriptions of major assignments and examinations: The final letter grade for this course will be based on scores received on homework assignments. Homework assignments are to be submitted electronically via Blackboard. Late assignments will be accepted with a 20% penalty applied for each day late up to 2 days. Assignments submitted later than 2 days after the original deadline will not be accepted.

Attendance: Class attendance will be recorded at the beginning of lecture sessions, but will not factor into the final course grade. Students who do not regularly attend lecture sessions risk missing valuable material, such as homework solutions and demonstrations. Regular attendance of class lectures is strongly encouraged.

Grading: Final course grades will be computed as an average of all homework assignments, all weighted equally. Each homework will be 20% of the final grade.

2-Week Grade Grievance Policy: Once a grade has been posted, you will have 2 weeks to contest your grade with whoever graded that assignment. The GTA will grade the Homework and Programming Assignments, and the Instructor will grade quizzes and exams. Once a grade has been posted for 2 weeks, the grade is final and will not be changed.

Make-up Assignments: Make-up assignments will only be allowed under extraordinary circumstances and must be approved by the instructor, whose decision is final. If an assignment is missed due to unavoidable circumstances, the instructor must be notified of the situation as soon as possible. Travel will not be considered as a valid excuse for missing an assignment, unless for the purpose of representing the university or department. Any assignments that are missed due to unexcused reasons will receive an automatic grade of zero.

Drop Policy: Students may drop or swap (adding and dropping a class concurrently) classes through self-service in MyMav from the beginning of the registration period through the late registration period. After the late registration period, students must see their academic advisor to drop a class or withdraw. Undeclared students must see an advisor in the University Advising Center. Drops can continue through a point two-thirds of the way through the term or session. It is the student's responsibility to officially withdraw if they do not plan to attend after registering. **Students will not be automatically dropped for non-attendance.** Repayment of certain types of financial aid administered through the University may be required as the result of dropping classes or withdrawing. For more information, contact the Office of Financial Aid and Scholarships (<http://www.uta.edu/aao/fao/>).

Disability Accommodations: UT Arlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including *The Americans with Disabilities Act (ADA)*, *The Americans with Disabilities Amendments Act (ADAAA)*, and *Section 504 of the Rehabilitation Act*. All instructors at UT Arlington are required by law to provide "reasonable accommodations" to students with disabilities, so as not to discriminate on the basis of disability. Students are responsible for providing the instructor with official notification in the form of a **letter certified** by the Office for Students with Disabilities (OSD). Only those students who have officially documented a need for an accommodation will have their request honored. Students experiencing a range of conditions (Physical, Learning, Chronic Health, Mental Health, and Sensory) that may cause diminished academic performance or other barriers to learning may seek services and/or accommodations by contacting:

The Office for Students with Disabilities, (OSD) www.uta.edu/disability or calling 817-272-3364. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at www.uta.edu/disability.

Counseling and Psychological Services, (CAPS) www.uta.edu/caps/ or calling 817-272-3671 is also available to all students to help increase their understanding of personal issues, address mental and behavioral health problems and make positive changes in their lives.

Non-Discrimination Policy: The University of Texas at Arlington does not discriminate on the basis of race, color, national origin, religion, age, gender, sexual orientation, disabilities, genetic information, and/or veteran status in its educational programs or activities it operates. For more information, visit uta.edu/eos.

Title IX Policy: The University of Texas at Arlington ("University") is committed to maintaining a learning and working environment that is free from discrimination based on sex in accordance with Title IX of the Higher Education Amendments of 1972 (Title IX), which prohibits discrimination on the basis of sex in educational programs or activities; Title VII of the Civil Rights Act of 1964 (Title VII), which prohibits sex discrimination in employment; and the Campus Sexual Violence Elimination Act (SaVE Act). Sexual misconduct is a form of sex discrimination and will not be tolerated. For information regarding Title IX, visit www.uta.edu/titleIX or contact Ms. Jean Hood, Vice President and Title IX Coordinator at (817) 272-7091 or jmhood@uta.edu.

Academic Integrity: Students enrolled all UT Arlington courses are expected to adhere to the UT Arlington Honor Code:

I pledge, on my honor, to uphold UT Arlington's tradition of academic integrity, a tradition that values hard work and honest effort in the pursuit of academic excellence.

I promise that I will submit only work that I personally create or contribute to group collaborations, and I will appropriately reference any work from other sources. I will follow the highest standards of integrity and uphold the spirit of the Honor Code.

UT Arlington faculty members may employ the Honor Code in their courses by having students acknowledge the honor code as part of an examination or requiring students to incorporate the honor code into any work submitted. Per UT System *Regents' Rule* 50101, §2.2, suspected violations of university's standards for academic integrity (including the Honor Code) will be referred to the Office of Student Conduct. Violators will be disciplined in accordance with University policy, which may result in the student's suspension or expulsion from the University. Additional information is available at <https://www.uta.edu/conduct/>.

Electronic Communication: UT Arlington has adopted MavMail as its official means to communicate with students about important deadlines and events, as well as to transact university-related business regarding financial aid, tuition, grades, graduation, etc. All students are assigned a MavMail account and are responsible for checking the inbox regularly. There is no additional charge to students for using this account, which remains active even after graduation. Information about activating and using MavMail is available at <http://www.uta.edu/oit/cs/email/mavmail.php>.

Campus Carry: Effective August 1, 2016, the Campus Carry law (Senate Bill 11) allows those licensed individuals to carry a concealed handgun in buildings on public university campuses, except in locations the University establishes as prohibited. Under the new law, openly carrying handguns is not allowed on college campuses. For more information, visit <http://www.uta.edu/news/info/campus-carry/>

Student Feedback Survey: At the end of each term, students enrolled in classes categorized as "lecture," "seminar," or "laboratory" shall be directed to complete an online Student Feedback Survey (SFS). Instructions on how to access the SFS for this course will be sent directly to each student through MavMail approximately 10 days before the end of the term. Each student's feedback enters the SFS database anonymously and is aggregated with that of other students enrolled in the course. UT Arlington's effort to solicit, gather, tabulate, and publish student feedback is required by state law; students are strongly urged to participate. For more information, visit <http://www.uta.edu/sfs>.

Final Review Week: A period of five class days prior to the first day of final examinations in the long sessions shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled activities such as required field trips or performances; and no instructor shall assign any themes, research problems or exercises of similar scope that have a completion date during or following this week *unless specified in the class syllabus*. During Final Review Week, an instructor shall not give any examinations constituting 10% or more of the final grade, except makeup tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week. During this week, classes are held as scheduled. In addition, instructors are not required to limit content to topics that have been previously covered; they may introduce new concepts as appropriate.

Emergency Exit Procedures: Should we experience an emergency event that requires us to vacate the building, students should exit the room and move toward the nearest exit. When exiting the building during an emergency, one should never take an elevator but should use the stairwells. Faculty members and instructional staff will assist students in selecting the safest route for evacuation and will make arrangements to assist individuals with disabilities.

Student Support Services: UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include tutoring, major-based learning centers, developmental education, advising and mentoring, personal counseling, and federally funded programs. For individualized referrals, students may visit the reception desk at University College (Ransom Hall), call the Maverick Resource Hotline at 817-272-6107, send a message to resources@uta.edu, or view the information at <http://www.uta.edu/universitycollege/resources/index.php>.

Course Schedule: An outline of the course schedule and individual topics covered is included in the course syllabus. As the instructor for this course, I reserve the right to adjust this schedule in any way that serves the educational needs of the students enrolled in this course.

Day	Topic	Homework
5-Jun	Course Intro, Outline	
7-Jun	Environment Walkthrough, OpenCV Compilation	
12-Jun	Image Containers, File IO, Pixel Access, Region of Interest	
14-Jun	Data Acquisition, Annotation	HW1 Assigned
19-Jun	Normalize, Equalize, Threshold, Color Detection	
21-Jun	Blob, Centroid, Bounding Box, Image Mask, Morphology	HW1 Due, HW2 Assigned
26-Jun	Edge Detection, Hough Lines	
28-Jun	Model Fitting	
3-Jul	Background Subtracking, PMOG, Basic Tracking	
5-Jul	Advanced Tracking, TLD Tracker	HW2 Due, HW3 Assigned
10-Jul	Features, Template Matching, SIFT, SURF	
12-Jul	Registration, Object Recognition	
17-Jul	Camera Calibration, Stereo Cameras	
19-Jul	Homography, Augmented Reality, Aruco Markers	HW3 Due, HW4 Assigned
24-Jul	Depth Cameras, Point Cloud Library	
26-Jul	Segmentation	HW4 Due, HW5 Assigned
31-Jul	Registration	
2-Aug	Octrees, Clustering, KDTrees	
7-Aug	Performance	
9-Aug	Emerging Technology	HW5 Due
14-Aug	No Final Exam	

Important Dates:

First day of Class – June 4th
 Census Date – June 21st
 4th of July Holiday – July 4th
 Drop Date – July 19th
 Last Day of Classes – August 9th
 Finals – August 13th – August 14th

<p>Emergency Phone Numbers: In case of an on-campus emergency, call the UT Arlington Police Department at 817-272-3003 (non-campus phone), 2-3003 (campus phone). You may also dial 911.</p>
