CS 6476 Computer Vision			
Georgia Tech			
I. General Information			
Course Number:	CS 6476-O01		
Course Name:	Computer Vision		
Description:	This course provides an introduction to computer vision including fundamentals of image formation, camera imaging geometry, feature detection, and matching, stereo, motion estimation and tracking, image classification, and scene understanding. We'll develop basic methods for applications that include finding known models in images, depth recovery from stereo, camera calibration, image stabilization, automated alignment, tracking, and recognition. The focus of the course is to develop the intuitions and mathematics of the methods in lecture, and then to learn about the difference between theory and practice in the problem sets.		
Program:	Georgia Tech's Online MS in Computer Science		
II. Team/People			
Instructor	Irfan Essa & Humphery Shi		
Instructional Designers	Arpan Chakraborty		
Video Production	Megan Smith		
III. Important Websites			
Canvas	https://gatech.instructure.com/	Grading, Schedule, Syllabus, and Final Exam.	
Google Doc (Syllabus / Info / Schedule)	This Document.	This document PUBLISHED!	
Ed (for Discussions)	https://edstem.org/	Exclusively used for discussions and contacting Instrcutors!	
Notes:			
1	All students are required to participate, attend to above websites. No EXCEPTIONS		
2	No information will be shared via any other sites (G+, FB, etc.) or services (slack, twitter, reddit, etc.). Students are welcome to create their own social media sites, but none of the instructors are required to be on those sites and will not participate there regularly. Do note, that students should not share any of thw work product (assignments, projects, etc) to a public site.		
IV. Assignments & Grading			
A.	Assignments Type 1: There will be 1 assignments of this type	5.0%	
B.	Assignments Type 2: There will be 5 assignments of this type	65.0%	
C.	Project: Topics to choose from will be given near the release date	15.0%	
D.	Exam: Cumulative, timed, and online	15.0%	
	Total	100.0	

V. Books / Readings			
1	Szeliski (2010), "Computer Vision: Algorithms and Applications", Springer, 2010	SZ	http://szeliski.org/Book/
2	Forsyth & Ponce (2011), "Computer Vision: A modern approach", 2nd Ed., Pearson 2011	FP	Publishers Site
	Other readings maybe added		
VI. Policies			
A. Communications			
1	*WITH the Professor and TAs should be exclusively through Ed Discussion. No emails! Professor and TAs **will do their best to respond to questions within 2 days** of posted question.*		
2	*Ed Discussion will serve as the primary and ONLY source of communication and sharing announcements with the students.*		
3	*All communications should be professional and courteous. TA/Graders and Students are all required to maintain high standards of interaction on Ed Discussion.*		
4	*The online forum (Ed Discussion) is for course-related discussion. Not a forum to publically raise issues about the class. If you have some issues, please raise them PRIVATELY via Ed Discussion just with the INSTRUCTORS!*		
B. Assignments			
1	We will be using the class autograder for submitting the homework. Dates and Deadlines are counted by the final submission timestamp.		
2	Homework Assignments will be graded both with an autograder portion and a TA-graded portion, with a list of criteria (specified on the assignment) such as quality of work, completeness, insight into technical issues, insight into other relevant issues, etc.		
3	Each assignment will be fully graded and returned USUALLY within two weeks of submission. Please allow two weeks to pass to ask about the current grading status. If there is delay for some reason, it will be announced.		
4	Over the course of the semester, you'll have 6 “free” late days to submit assignments PS1 through PS6. Late days do not apply to the Late Submission Policy Quiz, the Plagiarism Policy Quiz, the Final Project or the Final Exam; none of these assignments will be accepted late for any reason. Additionally, PS1 through PS6 will not be accepted more than 2 weeks past their respective due date. Our intention is to give you some flexibility around your work commitments, family obligations, vacations, and the like. Additional rules: - For every extra late day (past the 6 “free” late days) used, you'll incur a penalty of 1% from your final grade. For instance, if at the end of the course you used 8 late days in total, and your final grade was 91%, your score will be 89% and Grade B after the penalty is applied. (In this example the penalty is 2% because 8 late days in total were used - 6 late days = 2) - Up to the first 6 days, your late submissions will be considered in hours (so you have 144 hours, that can be used over 6 assignments). However, a penalty is applied per day. ie. If your total late time is 6 days 1 hour or 6 days 23 hours, you'll still incur a 1% penalty. - Gradescope displays by how many hours your submission is late. - If you submit the report late by an hour, and the code by 2, you would have used up to 3 hours of your late submission quota. If you have a medical or family emergency, please contact the Dean of Students who may grant an exception to the late policy if your circumstances warrant it. We must receive approval from the Dean to grant an exception.		
5	See collaboration policy below for more details on how to collaborate		

6	Instruction included with the assignment and in the code provided MUST be explicitly followed, especially any and all directions like how to submit and the file naming conventions specified
7	Regrade requests can be made via gradescope. Please provide clear details as to why you are requesting a regrade. All regrade requests must be made within ONE (1) week of the grade release. For grades released in the last week of the term, the regrade request must be made by the last day of the final exams week.
8	There will be no peer feedback this semester. We tried it, it did not work, so we are not using it.
9	All DUE dates will be on Canvas, and the timezone will be Anywhere on Earth Time (AoE) time. Please plan accordingly.
10	As we have a 6 assignments, there may be overlap on assignments. We expect students to manage their schedule to meet the deadlines for each of the assignments
11	Students are welcome to work and submit assignments before their due date. The lectures will all be available from week 1. TAs will try to answer questions related to the assignments as much as they can, but most conversations maybe most active as per the schedule planned for the class
12	All submissions will be checked for plagarism. Students should do their own work and submit their own work. Any suspicion of copying will be reported to the Office of Student Integrity for further analysis.
13	If the assignment does not follow the specific requirements, like using the REQUIRED template, the asssignemnt will be returned UNGRADED with a score of ZERO
C. Discussions (via Ed Discussion)	All class discussions will be on the Ed Discussion site listed above. Here are some very specific guidelines for these discussions, which MUST be adhered to:
1	All posts must be professional and cordial and about/related to the course material at hand.
2	Students WILL not post specific answers to any of the assignments to Ed Discussion before the due date of said assignments. In some instances, TAs will start a special discussion for students to share and discuss their assignments after the DUE date.
3	Before asking a question on the Forum, students should search for an answer to their question. It most probably has been discussed already
4	Instructor team will start weekly discussion threads about relevant topics. Before posting a new thread, please see these threads and these official threads will be actively monitored by the Instructor team
5	Instructor team will attempt to answer all questions, as possible. But, please do NOT expect answers within hours. TAs are instructed let students answer each others questions too, as that support more interactive learning.
6	Students can post annonymously to the class, but their IDENTITIES will be known by the instructor team
7	Instructor team is required to maintian privacy of all students, so please ensure that you communicate with them privately (using the private channels via Ed Discussion) to communicate with them.
8	If there is a complaint about the class, please DO not post a public note to Ed Discussion. Please communicate directly with the instructor team. We will do our best to address it. If it is NOT addressed, please use OMS Assistance (Point G. below).
D. Websites	Following are the websites we will OFFICIALLY use for this class:
1	Canvas: Grading and Final Exam.
2	Ed Discussion: For Official Announcements, and Forums for discussion.
3	Gradescope: Assignment Submission.
4	Google Docs: (This site) for syllabus/schedule and general information.
5	No information will be shared via any other site (G+, FB, etc.). Students are welcome to create their own social media sites, but none of the instructors are required to be on those sites and will not participate there regularly.

E. Grading	*Grading Scale (for each assignment/unit and for the entire class).*	
1	Above 90%	
2	80%-89.99%	
3	70%-79.99%	
4	60%-69.99%	
5	Below 60%	
F. Honor Code		
1	All assigned work is expected to be individual, except where explicitly written otherwise. You are encouraged to discuss the assignments with your classmates; however, what you hand in should be your own work. If any work product was produced based on discussions with someone else (in the class OR outside), please specify clearly in the final turn-in.	GT Honor Code
G. Academic and Research Honesty/Integrity Statement		
1	Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. Review Student Code of Conduct Academic Honor Code Appendix A: Graduate Addendum to the Academic Honor Code	
2	Allegations of scientific or scholarly misconduct are handled in accordance with the procedures outlined by the Policy for Responding to Allegations of Scientific or Other Scholarly Misconduct	
G. Collaboration Policy		
1	As stated above with the Honor Code, but worth making explicit here. Collaboration between students on work assigned in class is fine. You are encouraged to discuss your work with each other. But each individual students MUST submit their own work, done solely by themselves. In some cases, you may have had a fellow student or a non-student friend, help you with an assignment or work (say to take a picture!). You are REQUIRED to acknowledge any help you may have received in completing the work assigned, even as small as holding the light, or suggesting a possible path to a solution. Please be explicit and provide details. We will be checking for code plagiarism in our assessment, so please NO copying code from the Web/Internet.	
2	**Any code snippets must be cited and limited to a maximum of 5 lines.** We understand you may not be familiar with some libraries and APIs presented in this class and you will likely look up usage examples for individual functions. You may study these examples but the code used in your assignment must be your own. As part of this course's grading process, any suspicion of copying will be reported to the Office of Student Integrity for further analysis.	
3	All students must also ensure that they DO NOT make any of the code for problem sets publicly available and are required to take steps to prevent future students from having access to it. Consequently, if you're using any version control systems such as git, please make sure that you mark your repositories as private.	
4	You may not collaborate at all on the final exam. Students are not to discuss any questions or answers from the actual exam with classmates or anyone else until after the testing period is complete.	

H. OMS Assistance	If after contacting your TA and the instructor you do not feel your issue has been resolved, you may escalate the issue by emailing oms-advising@cc.gatech.edu and asking that your ticket to be assigned to Jay Summet.

Week	Lectures				Assignments		Readings
#	Module #	Title	Lesson	Topic	PS #	Title	Text
1	1A	Introduction	1A-L1	Introduction	1	Images as Functions	SZ: 1.1, 1.2
	2A	Linear image processing	2A-L1	Images as functions			
			2A-L2	Filtering			FP: 4
			2A-L3	Linearity and convolution			
			2A-L4	Filters as templates			
			2A-L5	Edge detection: Gradients			FP: 5.1, 5.2
			2A-L6	Edge detection: 2D operators			
2	2B	Hough Transforms	2B-L1	Hough transform: Lines			FP: 10.1
			2B-L2	Hough transform: Circles			
			2B-L3	Generalized Hough transform			
	2C	Frequency domain analysis	2C-L1	Fourier transform			FP: 4
			2C-L2	Convolution in frequency domain			
			2C-L3	Aliasing			
3	3A	Camera models	3A-L1	Cameras and images	2	Traffic Lights and Signs	FP: 1, 2.1-2.2
			3A-L2	Perspective imaging			
	3B	Stereo geometry	3B-L1	Stereo geometry			FP: 7
			3B-L2	Epipolar geometry			
			3B-L3	Stereo correspondence			
4	3C	Camera calibration	3C-L1	Extrinsic camera calibration			FP: 8
			3C-L2	Instrinsic camera calibration			
			3C-L3	Calibrating cameras			
5	3D	Multiple views	3D-L1	Image to image projections	3	Adventures in AR	
			3D-L2	Homographies and mosaics			
			3D-L3	Projective geometry			
			3D-L4	Essential matrix			
			3D-L5	Fundamental matrix			
6	4A	Feature detection	4A-L1	Introduction to "features"			FP: 5.3-5.4; SZ: 4
			4A-L2	Finding corners			
			4A-L3	Scale invariance			
	4B	Feature descriptors	4B-L1	SIFT descriptor			FP: 5.4; SZ: 4.1
			4B-L2	Matching feature points (a little)			
	4C	Feature robustness	4C-L1	Robust error functions			
			4C-L2	RANSAC			FP: 10.2-10.4
7	5A	Photometry	5A-L1	Photometry	4	Motion Detection	FP: 2.1-2.2
	5B	Lightness	5B-L1	Lightness			
	5C	Shape from shading	5C-L1	Shape from shading			
8	6A	Motion	6A-L1	Introduction to motion			FP: 9, 10.6
	6B	Optical flow	6B-L1	Dense flow: Brightness constraint			
			6B-L2	Dense flow: Lucas and Kanade			
			6B-L3	Hierarchical LK			
			6B-L4	Motion models			FP: 11.3

Week	Lectures				Assignments		Readings
#	Module #	Title	Lesson	Topic	PS #	Title	Text
9	7A	Tracking	7A-L1	Introduction to tracking	5	Object Tracking and Pedestrian Detection	
	7B	Parametric models	7B-L1	Tracking as inference			
			7B-L2	The Kalman filter			
10	7C	Non-parametric models	7C-L1	Bayes filters			
			7C-L2	Particle filters			FP: 11.5
			7C-L3	Particle filters for localization			
			7C-L4	Particle filters for real			
11	7D	Tracking considerations	7D-L1	Tracking considerations	6	Classification	
	8A	Recognition / Classification	8A-L1	Introduction to recognition		Final Project Topic release	FP: 16
	8B	Classification: Generative models	8B-L1	Classification: Generative models			FP: 15.1-15.2
			8B-L2	Principle Component Analysis			FP: 16.1.5
			8B-L3	Appearance-based tracking			
12	8C	Classification: Discriminative models	8C-L1	Classification: Discriminative models			
			8C-L2	Boosting and face detection			
			8C-L3	Support Vector Machines			
			8C-L4	Bag of visual words			FP: 20.1
13	8D	Action recognition	8D-L1	Introduction to video analysis	7	Final Project	
			8D-L2	Activity recognition			
			8D-L3	Hidden Markov Models			
14	9A	Color spaces and segmentation	9A-L1	Color spaces			
			9A-L2	Segmentation			
			9A-L3	Mean shift segmentation			
			9A-L4	Segmentation by graph partitioning			
15	9B	Binary morphology	9B-L1	Binary morphology			
	9C	3D perception	9C-L1	3D perception			
	10A	The retina	10A-L1	The retina			
	10B	Vision in the brain	10B-L1	Vision in the brain			
16		Last Week				FINAL EXAM	