SJSU SAN JOSÉ STATE UNIVERSITY

College of Science · Computer Science

Introduction to Computer Vision Section 01

CS 136

Fall 2023 3 Unit(s) 08/21/2023 to 12/06/2023 Modified 08/23/2023

Contact Information

Instructor: Nada Attar

Email: nada.attar@sjsu.edu

Office Hours

Monday, Wednesday, 1:15 PM to 2:15 PM, Zoom

https://sjsu.zoom.us/j/81811913727?pwd=STcvV3lkSU1yRGgvUlJvNzVvZEh3dz09 (https://sjsu.zoom.us/j/81811913727?pwd=STcvV3lkSU1yRGgvUlJvNzVvZEh3dz09)

Course Description and Requisites

Fundamental and advanced Computer Vision algorithms. Basic image processing techniques (image convolution, and region and edge detection). Complex vision algorithms for contour detection, depth perception, dynamic vision, and object recognition. Core topics (color processing, texture analysis, and visual geometry).

Prerequisite(s): CS 146, MATH 39, and CS 49C or equivalent (with a grade of "C-" or better in each). Computer Science and Software Engineering majors only.

Letter Graded

Classroom Protocols

Classroom Protocol

Please avoid disturbing the class: turn off cell phones (or put them on vibrate mode), no text messaging in the class or the exams, no taking pictures and video, avoid coming late. You may not publicly share or upload material for this course such as exam questions, lecture notes, or solutions without the instructor's consent.

Program Information

Diversity Statement - At SJSU, it is important to create a safe learning environment where we can explore, learn, and grow together. We strive to build a diverse, equitable, inclusive culture that values, encourages, and supports students from all backgrounds and experiences.

Course Learning Outcomes (CLOs)

1. Understand the human visual system and how to use its techniques in computer vision
2. Use various algorithms to build computer vision applications
3. Learn advanced concepts leading to object and scene categorization from images
4. Become familiar with the major technical approaches involved in computer vision

5. Be able to program various methods used for processing images, detecting edges, recognizing objects, and segmenting images
6. Embrace ethical adoption of computer vision technolog

Course Materials

Image Processing, Analysis, and Machine Vision

Author: Sonka, Hlavac, and Boyle
Publisher: Thomson Learning
Edition: 4
ISBN: ISBN 10: 1133593607, ISBN 13: 9781133593607

Hands-On Computer Vision

Author: Marc Pomplun
Edition: 1

Notes, and research papers giving by the instructor

Course Requirements and Assignments

Canvas Learning Management System and Messaging

Course materials such as syllabus, handouts, notes, hands-on exercises, project instructions, etc. can be found on the Canvas Leaning Management System course login website at http://sjsu.instructure.com. You responsible for regularly checking with the Canvas messaging system to learn of any updates.

Late homework/projects

All assignments and projects will be due at 6:00pm for the certain due date. The assignment will be posted at least a week before the due date to give enough time to work and ask for help during my virtual office hours. Please do not email me few hours before the deadline asking me to help you understand concepts. If I feel that you just start working on your assignment at the due date, I will ignore your emails because I know you won't be able to finish understanding the problem, coding, testing, compiling, and debugging in a few hours. So, please start early and manage your time wisely.

Late Submission:

- 0-6hr -> no penalty
- +6hr -> 50% penalty
- +12hr -> 100% penalty

If you believe an error was made in the grading of your assignments, quizzes, or final exam, you can request a re-grade from the instructor. A request must be sent to the instructor no more than one week after the grades are posted.

Grading Information

Breakdown

Percentage	Grade
97 and above	A+

94-96	A
90 - 93	A-
87 - 89	B+
84 - 86	B
80 - 83	B-
77 - 79	C+
74 - 76	C
70 - 73	C-
67 - 69	D+
64-66	D
60-63	D-
59 and below	F

Criteria

Type	Weight	Topic	Notes
Mid Term Exams	15%		Exams are closed book. No extra point options. No make-ups exams except in case of verifiable emergency circumstances
End of Semester Exams	15%		Exams are closed book; final exam is comprehensive and cumulative . No extra point options. No make-ups exams except in case of verifiable emergency circumstances
Programming Assignments	40%		
Final Project	10%		Final project includes solving problems in Computer Vision and highlight the importance of adopting ethics in the implementation process of the computer vision applications.
Quizzes/Homework	20%		

University Policies

Per University Policy S16-9 (PDF) (http://www.sjsu.edu/senate/docs/S16-9.pdf), relevant university policy concerning all courses, such as student responsibilities, academic integrity, accommodations, dropping and adding, consent for recording of class, etc. and available student services (e.g. learning assistance, counseling, and other resources) are listed on the Syllabus Information (https://www.sjsu.edu/curriculum/courses/syllabus-info.php) web page. Make sure to visit this page to review and be aware of these university policies and resources.

Course Schedule

When	Topic	Notes
Week 1 08/21/2023 10:30 AM - 11:45 AM MH222	Course Mechanic & Introduction	
Week 1 08/23/2023 10:30 AM - 11:45 AM MH222	The Human Visual System, Eye Movements and Visual Attention	
Week 2 08/28/2023 10:30 AM - 11:45 AM MH222	Vision in Technical Systems	(Ch.1)
Week 2 08/30/2023 10:30 AM - 11:45 AM MH222	Digital Images, Data imbalance	(Ch.2) + Notes
Week 3 09/04/2023 10:30 AM - 11:45 AM MH222	Labor Day - Campus Closed	No Class
Week 3 09/06/2023 10:30 AM - 11:45 AM MH222	Representation of Color	(Ch.2)
Week 4 09/11/2023 10:30 AM - 11:45 AM MH222	Basic Image Transformations	(Ch.3)
Week 4 09/13/2023 10:30 AM - 11:45 AM MH222	Data structures for image, Reduce Human Errors	(Ch.4) + Notes
Week 5 09/18/2023 10:30 AM - 11:45 AM MH222	Image Processing, Correcting the datasets	(Ch.5)+ Notes
Week 5 09/20/2023 10:30 AM - 11:45 AM MH222	Image Processing	(Ch.5)

When	Topic	Notes
Week 6 09/25/2023 10:30 AM - 11:45 AM MH222	Image Segmentation I	(Ch.6)
Week 6 09/27/2023 10:30 AM - 11:45 AM MH222	Image Segmentation II	(Ch.6)
Week 7 10/02/2023 10:30 AM - 11:45 AM MH222	Midterm Exam I	
Week 7 10/04/2023 10:30 AM - 11:45 AM MH222	Image Segmentation II	(Ch.7)
Week 8 10/09/2023 10:30 AM - 11:45 AM MH222	Image Segmentation and Bias Detection and Correction	Notes
Week 8 10/11/2023 10:30 AM - 11:45 AM MH222	Shape representation and description	(Ch.8)
Week 9 10/16/2023 10:30 AM - 11:45 AM MH222	Texture	(Ch.15)
Week 9 10/18/2023 10:30 AM - 11:45 AM MH222	Stereo Vision and Depth	(Ch.10)
Week 10 10/23/2023 10:30 AM - 11:45 AM MH222	3D Vision	(Ch.12)
Week 10 10/25/2023 10:30 AM - 11:45 AM MH222	Stereo Vision and Depth	(Ch.10)

When	Topic	Notes
Week 11 10/30/2023 10:30 AM - 11:45 AM MH222	Motion Analysis: differential motion analysis method	(Ch.16)
Week 11 11/01/2023 10:30 AM - 11:45 AM MH222	Motion Analysis: optical flow	(Ch.16)
Week 12 11/06/2023 10:30 AM - 11:45 AM MH222	Midterm Exam II	
Week 12 11/08/2023 10:30 AM - 11:45 AM MH222	Image Understanding and Scene Classifications (biases that can be embedded in image representations)	(Ch.10) + Notes
Week 13 11/13/2023 10:30 AM - 11:45 AM MH222	Faces Classification Techniques, Emotion Detection from Facial Expressions, (discuss bias in face classification and unfair Outcomes for people of color, women, and disabled people)	(Ch.10) + Notes
Week 13 11/15/2023 10:30 AM - 11:45 AM MH222	Image Data Compression	(Ch.14)
Week 14 11/20/2023 10:30 AM - 11:45 AM MH222	Object Recognition	(Ch.9)
Week 14 11/22/2023 10:30 AM - 11:45 AM MH222	Non-Instructional Day	
Week 15 11/27/2023 10:30 AM - 11:45 AM MH222	Deep Learning: Convolutional Neural Networks	(Notes)
Week 15 11/29/2023 10:30 AM - 11:45 AM MH222	Guest Speaker (Topics in computer vision and algorithmic bias and the ethical implications underlying projects, Cognitive AI Bias)	

When	Topic	Notes
Week 16 12/04/2023 10:30 AM - 11:45 AM MH222	Review	
Week 16 12/06/2023 10:30 AM - 11:45 AM MH222	Final Exam	
12/12/2023 9:45 AM - 12:00 PM MH222	Final Project	