

**San José State University**  
**Department of Computer and Software Engineering**  
**CMPE258, Deep Learning, Fall, 2023**

**Course and Contact Information**

Instructor(s): Harry Li

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Office Hours: M.W. 3:00-4:00 pm

Class Days/Time: Tuesdays and Thursdays 4:30-5:45 pm.

Classroom: Engineering Building Room 337

Prerequisites: CMPE 255 or CMPE 257 or instructor consent. Computer Engineering and Software Engineering majors only.

**Course Description**

Deep neural networks and their applications to various problems, e.g., speech recognition, image segmentation, detection and recognition of temporal and spatial patterns, and natural language processing. Covers underlying theory, the range of applications to which it has been applied, and learning from very large data sets.

**Course Format**

**Technology Intensive, Hybrid, and Online Courses (Required if applicable)**

This course is an online course. The students must have Internet connectivity and Zoom software installed on his/her machine. The students must participate in the class activities and submit all assignments, homework, exams to SJSU CANVAS. The syllabus, faculty contact information on the syllabus, homework assignment, projects, and exam papers are all available on CANVAS. See [University Policy F13-2](#) for more details.

**Faculty Web Page and MYSJSU Messaging (Delete if not applicable)**

Copies of the course materials such as the syllabus, major assignment handouts, etc. can be found on line at SJSU CANVAS, the same material is also provided online, see URL below:

<https://github.com/hualili/opencv/tree/master/deep-learning-2023s> Office hours zoom link: Join Zoom Meeting <https://us04web.zoom.us/j/9841607683?pwd=U1A3aEk1TnV4bjNLQk5CQkw0dDk4UT09> Meeting ID: 984 160 7683 Passcode: 121092

**Course Learning Outcomes (CLO)**

Upon successful completion of this course, students will be able to:

1. Understand convolution techniques and the kernel construction, as well as LoG, DoG, and Lindberg  $L(x,y;s)$  techniques, able to utilize and deploy them for video feature extractions.
2. Understand convolution neural networks CNN.
3. Understand the basic building blocks, the composition of them, and the architecture of CNN .

4. To be able to design, build, train, and test deep learning CNN for various practical applications.

## Required Texts/Readings

### Textbook

- Deep Learning with Python, 1st or 2<sup>nd</sup> Edition, by François Chollet, ISBN-13: 978-1617294433, ISBN-10: 9781617294433, <https://github.com/hualili/opencv/blob/master/IP120-AI-DL/2018F/2018F-6-DeepLearningCh02.pdf>
- Robot Vision by B.K. P. Horn, the MIT press, ISBN 0-262-08159-8, or 0-07-030349-5 (McGraw Hill).
- Reference textbook Learning OpenCV, Computer Vision with the OpenCV Library by Bradski and Kaebler, O'Reilly Publisher, ISBN 978-0-596-51613-0, 2011.

### Other Readings

1. OpenCV on line reference: <http://docs.opencv.org/index.html>
2. My lecture notes <https://github.com/hualili/opencv/tree/master/IP120-AI-DL/2018F> and <https://github.com/hualili/opencv/tree/master/deep-learning-2020S>

### Other technology requirements / equipment / material

1. Python.
2. OpenCV.
3. Tensorflow Keras API.

## Course Requirements and Assignments (Required - Delete the word “Required” in final draft)

1. All the submissions (Homework, Projects, Quiz, Exams) must be made to SJSU CANVAS, no email submission is accepted;
2. No late submission (Homework, Projects, Quiz, Exams) will be accepted. For special case of late submission, 25% mark reduction will be given;
3. Attendance to the class is required.

Explain how course requirements, reading materials, learning activities, and assignments contribute to or are aligned with course learning outcomes. Include information about general expectations, roles and responsibilities of the students, due dates and assignment weights.

SJSU classes are designed such that in order to be successful, it is expected that students will spend a minimum of forty-five hours for each unit of credit (normally three hours per unit per week), including preparing for class, participating in course activities, completing assignments, and so on. More details about student workload can be found in [University Policy S12-3](http://www.sjsu.edu/senate/docs/S12-3.pdf) at <http://www.sjsu.edu/senate/docs/S12-3.pdf>.

NOTE that [University policy F69-24](http://www.sjsu.edu/senate/docs/F69-24.pdf) at <http://www.sjsu.edu/senate/docs/F69-24.pdf> states that “Students should attend all meetings of their classes, not only because they are responsible for material discussed therein, but because active participation is frequently essential to insure maximum benefit for all members of the class. Attendance per se shall not be used as a criterion for grading.”

The University Syllabus policy:

- [University Syllabus Policy S16-9](#)

[University Policy S16-9](#), requires that: “Success in this course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally three hours per unit per week) for instruction, preparation/studying, or course related activities, including but not limited to internships, labs, and clinical practice. Other course structures will have equivalent workload expectations as described in the syllabus.”

### Final Examination or Evaluation

Final examination is a comprehensive exam and it is close-book, close-note. Per the [University policy S17-1](#) “Faculty members are required to have a culminating activity for their courses, which can include a final examination, a final research paper or project, a final creative work or performance, a final portfolio of work, or other appropriate assignment.”

### Grading Information

Quiz, Homework, Projects	30%
Midterm Examination	30%
Final Examination	40%

- [University Attendance and Participation Policy F15-12](#)
- [University Grading System Policy F18-5](#)

### Determination of Grades

- The course grade will be determined by the accumulative scores made from quiz, homework, projects, midterm exam, final exam.
- No extra credit options.
- No late homework will be accepted.

<i>Grade</i>	<i>Points</i>	<i>Percentage</i>
<i>A plus</i>	<i>960 to 1000</i>	<i>96 to 100%</i>
<i>A</i>	<i>930 to 959</i>	<i>93 to 95%</i>
<i>A minus</i>	<i>900 to 929</i>	<i>90 to 92%</i>
<i>B plus</i>	<i>860 to 899</i>	<i>86 to 89 %</i>
<i>B</i>	<i>830 to 859</i>	<i>83 to 85%</i>
<i>B minus</i>	<i>800 to 829</i>	<i>80 to 82%</i>
<i>C plus</i>	<i>760 to 799</i>	<i>76 to 79%</i>
<i>C</i>	<i>730 to 759</i>	<i>73 to 75%</i>
<i>C minus</i>	<i>700 to 729</i>	<i>70 to 72%</i>
<i>D plus</i>	<i>660 to 699</i>	<i>66 to 69%</i>
<i>D</i>	<i>630 to 659</i>	<i>63 to 65%</i>
<i>D minus</i>	<i>600 to 629</i>	<i>60 to 62%</i>

### Classroom Protocol

Class participation and attendance are required, please arrive on time, you can bring your laptop to the class if needed. No late homework/project will be accepted. For uncontrollable exceptional situations, late penalty will apply. Exams must be completed on time and submitted to SJSU Canvas.

## University Policies

Per [University Policy S16-9](#), 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 [Syllabus Information web page](https://www.sjsu.edu/curriculum/courses/syllabus-info.php) (<https://www.sjsu.edu/curriculum/courses/syllabus-info.php>). Make sure to visit this page to review and be aware of these university policies and resources.

## General Expectations, Rights and Responsibilities of the Student

As members of the academic community, students accept both the rights and responsibilities incumbent upon all members of the institution. Students are encouraged to familiarize themselves with SJSU's policies and practices pertaining to the procedures to follow if and when questions or concerns about a class arises. See [University Policy S90-5](#) at <http://www.sjsu.edu/senate/docs/S90-5.pdf>. More detailed information on a variety of related topics is available in the [SJSU catalog](#), at <http://info.sjsu.edu/web-dbgen/narr/catalog/rec-12234.12506.html>. In general, it is recommended that students begin by seeking clarification or discussing concerns with their instructor. If such conversation is not possible, or if it does not serve to address the issue, it is recommended that the student contact the Department Chair as a next step.

## Dropping and Adding

Students are responsible for understanding the policies and procedures about add/drop, grade forgiveness, etc. Refer to the current semester's [Catalog Policies](#) section at <http://info.sjsu.edu/static/catalog/policies.html>. Add/drop deadlines can be found on the current academic year calendars document on the [Academic Calendars webpage](#) at [http://www.sjsu.edu/provost/services/academic\\_calendars/](http://www.sjsu.edu/provost/services/academic_calendars/). The [Late Drop Policy](#) is available at <http://www.sjsu.edu/aars/policies/latedrops/policy/>. Students should be aware of the current deadlines and penalties for dropping classes.

Information about the latest changes and news is available at the [Advising Hub](#) at <http://www.sjsu.edu/advising/>.

## Consent for Recording of Class and Public Sharing of Instructor Material

[University Policy S12-7](#), <http://www.sjsu.edu/senate/docs/S12-7.pdf>, requires students to obtain instructor's permission to record the course and the following items to be included in the syllabus:

- “Common courtesy and professional behavior dictate that you notify someone when you are recording him/her. You must obtain the instructor's permission to make audio or video recordings in this class. Such permission allows the recordings to be used for your private, study purposes only. The recordings are the intellectual property of the instructor; you have not been given any rights to reproduce or distribute the material.”
  - It is suggested that the greensheet include the instructor's process for granting permission, whether in writing or orally and whether for the whole semester or on a class by class basis.
  - In classes where active participation of students or guests may be on the recording, permission of those students or guests should be obtained as well.
- “Course material developed by the instructor is the intellectual property of the instructor and cannot be shared publicly without his/her approval. You may not publicly share or upload instructor generated material for this course such as exam questions, lecture notes, or homework solutions without instructor consent.”

## **Academic integrity**

Your commitment, as a student, to learning is evidenced by your enrollment at San Jose State University. The [University Academic Integrity Policy S07-2](http://www.sjsu.edu/senate/docs/S07-2.pdf) at <http://www.sjsu.edu/senate/docs/S07-2.pdf> requires you to be honest in all your academic course work. Faculty members are required to report all infractions to the office of Student Conduct and Ethical Development. The [Student Conduct and Ethical Development website](http://www.sjsu.edu/studentconduct/) is available at <http://www.sjsu.edu/studentconduct/>.

## **Campus Policy in Compliance with the American Disabilities Act**

If you need course adaptations or accommodations because of a disability, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. [Presidential Directive 97-03](http://www.sjsu.edu/president/docs/directives/PD_1997-03.pdf) at [http://www.sjsu.edu/president/docs/directives/PD\\_1997-03.pdf](http://www.sjsu.edu/president/docs/directives/PD_1997-03.pdf) requires that students with disabilities requesting accommodations must register with the [Accessible Education Center](http://www.sjsu.edu/aec) (AEC) at <http://www.sjsu.edu/aec> to establish a record of their disability.

## **Accommodation to Students' Religious Holidays**

San José State University shall provide accommodation on any graded class work or activities for students wishing to observe religious holidays when such observances require students to be absent from class. It is the responsibility of the student to inform the instructor, in writing, about such holidays before the add deadline at the start of each semester. If such holidays occur before the add deadline, the student must notify the instructor, in writing, at least three days before the date that he/she will be absent. It is the responsibility of the instructor to make every reasonable effort to honor the student request without penalty, and of the student to make up the work missed. See [University Policy S14-7](http://www.sjsu.edu/senate/docs/S14-7.pdf) at <http://www.sjsu.edu/senate/docs/S14-7.pdf>.

## **Student Technology Resources**

Computer labs for student use are available in the [Academic Success Center](http://www.sjsu.edu/at/asc/) at <http://www.sjsu.edu/at/asc/> located on the 1st floor of Clark Hall and in the Associated Students Lab on the 2nd floor of the Student Union. Additional computer labs may be available in your department/college. Computers are also available in the Martin Luther King Library. A wide variety of audio-visual equipment is available for student checkout from Media Services located in IRC 112. These items include DV and HD digital camcorders; digital still cameras; video, slide and overhead projectors; DVD, CD, and audiotape players; sound systems, wireless microphones, projection screens and monitors.

## **SJSU Peer Connections**

Peer Connections, a campus-wide resource for mentoring and tutoring, strives to inspire students to develop their potential as independent learners while they learn to successfully navigate through their university experience. You are encouraged to take advantage of their services which include course-content based tutoring, enhanced study and time management skills, more effective critical thinking strategies, decision making and problem-solving abilities, and campus resource referrals.

In addition to offering small group, individual, and drop-in tutoring for a number of undergraduate courses, consultation with mentors is available on a drop-in or by appointment basis. Workshops are offered on a wide variety of topics including preparing for the Writing Skills Test (WST), improving your learning and memory, alleviating procrastination, surviving your first semester at SJSU, and other related topics. A computer lab and study space are also available for student use in Room 600 of Student Services Center (SSC).

Peer Connections is located in three locations: SSC, Room 600 (10th Street Garage on the corner of 10<sup>th</sup> and San Fernando Street), at the 1st floor entrance of Clark Hall, and in the Living Learning Center (LLC) in

Campus Village Housing Building B. Visit [Peer Connections website](http://peerconnections.sjsu.edu) at <http://peerconnections.sjsu.edu> for more information.

## **SJSU Writing Center**

The SJSU Writing Center is located in Clark Hall, Suite 126. All Writing Specialists have gone through a rigorous hiring process, and they are well trained to assist all students at all levels within all disciplines to become better writers. In addition to one-on-one tutoring services, the Writing Center also offers workshops every semester on a variety of writing topics. To make an appointment or to refer to the numerous online resources offered through the Writing Center, visit the [Writing Center website](http://www.sjsu.edu/writingcenter) at <http://www.sjsu.edu/writingcenter>. For additional resources and updated information, follow the Writing Center on Twitter and become a fan of the SJSU Writing Center on Facebook. (Note: You need to have a QR Reader to



scan this code.)

## **SJSU Counseling Services**

The SJSU Counseling Services is located on the corner of 7<sup>th</sup> Street and San Fernando Street, in Room 201, Administration Building. Professional psychologists, social workers, and counselors are available to provide consultations on issues of student mental health, campus climate or psychological and academic issues on an individual, couple, or group basis. To schedule an appointment or learn more information, visit [Counseling Services website](http://www.sjsu.edu/counseling) at <http://www.sjsu.edu/counseling>.

# CMPE258 Deep Learning, Spring 2023, Course Schedule

The final exam will be held on line, the schedule of the final exam can be found here:

<https://www.sjsu.edu/classes/final-exam-schedule/> The schedule is subject to change with fair notice and the notice will be made available to the class via email.

## Course Schedule

Week/ Lesson/ Module (Delete if not applicable)	Date	Topics, Readings, Assignments, Deadlines (If appropriate, add extra column(s) to meet your needs.)	Learning Outcomes (Delete if not applicable)
1	8/21	Introduction to deep learning and the development environment. Introduction to neural networks, basic building blocks and mathematical formulation;	
2	8/28	Introduction to digital images and video formation, techniques for images and videos manipulations with OpenCV tools. Enabling OpenCV GPU computation platform.	
3	8/28	Introduction to CNN Architecture. Theory of NN basic building blocks. Fundamentals of CNN.	
4	9/4	Activation Functions, Loss Functions, Objective Functions. Tensorflow Keras for simple Handwritten digits recognition.	
5	9/11	Supervised Learning and Training. Handwritten digits recognition.	
6	9/18	Deep Convolutional Neural Networks. Yolo CNN. Back propagation technique.	
7	9/25	Techniques for ROI (region of interests) definition, binary image processing, Canny edge detection, 2D convolution technique. Steepest gradient descent technique.	
8	10/2	Design and deployment of CNN.	
9	10/9	Midterm	
10	10/16	Enhancement of CNN performance. Yolo CNN for people and object recognition.	
11	10/23	Preprocessing, moments computations, and contour analysis feature selections.	
12	10/30	Data Processing, Over-fitting and under-fitting. Inspecting and monitoring deep-learning.	
13	11/6	Data Processing, Over-fitting and under-fitting. Inspecting and monitoring deep-learning.	
14	11/13	Semantic segmentation techniques.	

<b>Week/ Lesson/ Module</b> (Delete if not applicable)	<b>Date</b>	<b>Topics, Readings, Assignments, Deadlines</b> (If appropriate, add extra column(s) to meet your needs.)	<b>Learning Outcomes</b> (Delete if not applicable)
15	11/20	Yolact for semantic segmentation. Team project Presentation.	
16	11/27	Project presentation.	
17	12/4	Project Presentation.	
Final Exam		<i>The final exam will be in person, the schedule of the final exam can be found here: <a href="https://www.sjsu.edu/classes/final-exam-schedule/">https://www.sjsu.edu/classes/final-exam-schedule/</a> The schedule is subject to change with fair notice and the notice will be made available to the class via email.</i>	