San José State University
College of Engineering

Computer Engineering Department
CMPE258-Section 1 Deep Learning

S2021

Course and Contact Information

Instructor:	Hua Harry Li, Ph.D.
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Office Hours:	MW 4:30 -5:30 PM;
Class Days/Time:	Thursday 3:00 – 5:45 PM
Classroom:	Zoom (link to be shared in the email)

Faculty Web Page and MYSJSU Messaging (Optional)

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 at the following yahoo group, see URL below:
https://github.com/hualili/CMPE297

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

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 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. OpenGL on line reference (OpenGL programming guide): ftp://ftp.sgi.com/opengl/contrib/kschwarz/OPEN_GL/REFERENCE/OGL_PG/oglPG.pdf
3. 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 equipment / material requirements

1. C++ compiler, such as gcc compiler.
2. Python.
3. OpenCV.
4. Tensorflow Keras API
5. Optional: Maixpy board: Sipeed M1 dock suit (M1 dock + 2.4 inch LCD + OV2640) K210 Dev. Board 1st RV64 AI board for Edge Computing, https://www.seeedstudio.com/Sipeed-M1-dock-suit-M1-dock-2-4-inch-LCD-OV2640-K210-Dev-Board-1st-RV64-AI-board-for-Edge-Computing.html

Course Requirements and Assignments

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 at http://www.sjsu.edu/senate/docs/S12-3.pdf.

NOTE that University policy F69-24 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."

Grading Policy

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

0-59	F
60-69	D
70-79	C
80-89	B
90-100	A

Classroom Protocol

Class participation and attendance are required, please arrive on time, you can bring your laptop to the class if needed.

University Policies

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/. 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."
    - o 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.
    - o 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 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 10th 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 7th 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** at http://www.sjsu.edu/counseling.

CMPE 258 Deep Learning Course Schedule

Course Schedule

Week	Date	Topics, Readings, Assignments, Deadlines
1	Class 1	Introduction to deep learning and the development environment. Introduction to digital image and video formation, techniques for images and videos manipulations with OpenCV tools. Enabling OpenCV GPU computation platform.
2	Class 2	Introduction to Alex Net Architecture, e.g., deep Convolutional Neural Networks. 2D convolution technique. Introduction to development environment, e.g., Sipeed M1 dock suit (M1 dock + 2.4 inch LCD + OV2640) K210 Dev. Board 1st RV64 AI board for Edge Computing, techniques to bring up the board. Universal workflow of machine learning.
3	Class 3	Tensorflow Keras for simple Handwritten digits recognition. Techniques for ROI (region of interests) definition, binary image processing, Canny edge detection, floodfill algorithm, moments computations, Hough transform, and contour analysis feature selections.
4	Class 4	In class homework submission for the simple Handwritten digits recognition. Fundamentals of machine learning
5	Class 5	yolo CNN. Evaluating Machine Learning Models. Perceptron neural networks., Learning by back propagation technique.
6	Class 6	yolo CNN for people and object recognition. Data Processing, Over-fitting and under-fitting. Inspecting and monitoring deep-learning. Stereo Vision. Point Cloud, and Point Net Technique, and applications, such as self driving navigation or active assistance driving systems.
7	Class 7	Midterm and Function approximation based on Bayes theory.
8		yolo CNN homework in class submission, pointNet object detections and recognition, Behavior analysis technique, stick diagrams analysis.
9		Behavior analysis and Fast RCNN. Image segmentation techniques.
10		Behavior analysis and Fast RCNN. Image segmentation techniques.
11		RCNN, Motion estimation and semantic segmentation. Perceptron neural networks.
12		Deep learning for text and sequences.
13		Case study on CNN, behavior analsys and PointNets. Steepest gradient descent technique.
14		Case study on CNN, behavior analysis and PointNets,
15		Comparative study.
16		Final comprehensive exam.