

Introduction to Machine Learning

CS 171

Fall 2026 Section 05 In Person 3 Unit(s) 08/19/2026 to 12/07/2026 Modified 08/18/2026

Contact Information

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Office Hours

Tuesday and Thursday, 12 PM to 1 PM, In person at MH 411

Course Information

Instructor: Dr. Amith Kamath Belman

Tuesday, Thursday, 9:00 AM to 10:15 AM, MH 422

Course Description and Requisites

Covers a selection of classic machine learning techniques including backpropagation and several currently popular neural networking and deep learning architectures. Hands-on lab exercises are a significant part of the course. A major project is required.

Prerequisite(s): CS 146 (with a grade of "C-" or better). Computer Science or Software Engineering majors only.

Letter Graded

Classroom Protocols

Regular attendance is an integral part of the learning process. Please arrive to class on time and make sure your cell phones are silent during the lecture.

Class time will be spent in interactive lecture. You are required to bring your wireless laptop to class. Your laptop must remain closed except for designated activities.

In this educational environment, we uphold a strict policy of integrity and respect. Cheating is absolutely unacceptable and will not be tolerated under any circumstances. It is expected by every student to be respectful towards both the instructor and their fellow students, fostering an atmosphere of mutual understanding and cooperation. Lastly, for security and identification purposes, students are required to carry a valid picture ID at all times.

Recording and Privacy

Students are prohibited from recording class activities, distributing class recordings, or posting class recordings. Materials created by the instructor for the course (syllabi, lectures and lecture notes, presentations, etc.) are copyrighted by the instructor. This university policy (S12-7) is in place to protect the privacy of students in the course, as well as to maintain academic integrity through reducing the instances of cheating. Students who record, distribute, or post these materials will be referred to the Student Conduct and Ethical Development office. Unauthorized recording may violate university and state law. It is the responsibility of students that require special accommodations or assistive technology due to a disability to notify the instructor.

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)

The focus of this course will be machine learning, with examples from various domains of applications.

After completing this course students will be able to:

(CLO1) Understand, explain, and implement a variety of machine learning techniques

(CLO2) Apply the appropriate models to specific tasks and application domains

(CLO3) Analyze results, assess model performance, and mitigate issues

(CLO4) Present the results using common ML performance indicators and charts

Course Materials

Other Readings:

Machine Learning: An Algorithmic Perspective, Second Edition, 2014, Chapman and Hall/CRC
Authors: Stephen Marsland
ISBN-13 : 978-1-4665-8333-7 (eBook - PDF)

Machine Learning with Applications in Information Security, by Mark Stamp, published by
ChapmanHall/CRC in 2017. ISBN-10 : 1138626783, ISBN-13 : 978-1138626782

Deep Learning (Adaptive Computation and Machine Learning series)
Authors: Ian Goodfellow, Yoshua Bengio, Aaron Courville
ISBN-13: 9780262035613, ISBN-10: 0262035618

Software

Python 3

PyCharm Professional or Community Edition - recommended IDE

Course Requirements and Assignments

Homework

Homework assignments will be posted and submitted on Canvas. For full credit, they must be submitted by the posted due date and time.

You may not share or copy code or answers from fellow students or from the web. Infractions will be detected and will lead to an automatic 0. All students involved in academic integrity violations will be held responsible.

Use of AI is not permitted, unless clearly stated and permitted by the instructor, for each assignment question. If a question requires AI assistant usage in any capacity, the instructor will specify it. All other cases of usage will be considered academic integrity violations.

Questions of the Week (QOW)

We will have a single question every week to check your understanding of the previous week's material. I will count the 10 best scores out of the 11 total QOWs in the semester. You must be in the classroom and must use the LockDown browser to access and answer the question on Canvas.

Missed QOWs cannot be made up.

Class Participation

You are expected to attend all class meetings as you are responsible for all the material discussed. If you are absent from class, it is your responsibility to check the materials and announcements made while you were absent.

Midterm Exams

There are two midterm exams. Midterm 1 takes place in the classroom during class time on Tuesday, October 13 and covers weeks 1 to 7. Midterm 2 takes place in the classroom during class time on Tuesday, November 24 and covers weeks 8 to 14.

Project

The course project is a team project (teams of 3). Each team picks a problem and dataset, poses a clear question that can be answered with machine learning within the semester, builds and evaluates models, and presents the results.

Final Culminating Activity

The culminating activity for this course is the final project deliverable: the final project report, the code repository due on Canvas by Thursday, December 10 at 9:00 AM. No late submissions are accepted for the culminating activity.

✓ Grading Information

The final grade in the course will be calculated based on the homework assignments, questions of the week, midterms and project.

Makeup exams, QOWs will only be given in cases of illness (documented by a physician) or in documentable, extreme emergency cases.

No other extra credit options will be given.

Late Work

No submissions will be accepted more than 1 day late.

Late assignments will be evaluated with a 25% penalty. Late days include weekend days.

For example, Assignment due on Tuesday by 5 PM:

- will incur a penalty of 25% if submitted anytime between 5:01 PM on Tuesday to 5:00PM on Wednesday.
- will not be graded if submitted after 5:01PM on Wednesday.

Everyone gets two free 'late days' for the semester, separately. Cannot be used on the same assignment. Any assignment submitted after 1 day late is not graded. The two free late days, are only used to refund the 25% penalty that was applied to a late submission, not to extend the deadline or the late day.

Late days apply to homework only, not to QOWs, exams or project milestones.

Academic Dishonesty

Students who are suspected of cheating will be referred to the Student Conduct and Ethical Development office and depending on the severity of the conduct, will receive a zero on the assignment or a grade of F in the course. Grade Forgiveness does not apply to courses for which the original grade was the result of a finding of academic dishonesty.

Criteria

Type	Weight	Topic	Notes
Homework Assignments	25%		5 assignments
Questions of the week	15%		Best 10 of 11
Midterm Exam 1	15%		Tue Oct 13, weeks 1 to 7
Midterm Exam 2	15%		Tue Nov 24, weeks 8 to 14
Project	30%		Teams of 3: proposal: 3%, checkpoint: 7%, presentation: 10%, final report and code repo: 10%

Breakdown

Grade	Range	Notes
A +	98 to 100%	
A	93 to 97.99%	
A -	90 to 92.99%	
B +	87 to 89.99%	
B	83 to 86.99%	
B -	80 to 82.99%	
C +	77 to 79.99%	
C	73 to 76.99%	
C -	70 to 72.99%	
D	60 to 69.99%	
F	below 60%	

Per [University Policy S16-9 \(PDF\)](http://www.sjsu.edu/senate/docs/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) (<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

Tentative Course Schedule.

NOTE: The course schedule is subject to change with fair notice. Changes will be announced on Canvas.

Week	Date	Day	Topics	QOW, exams, assignments, project
1	Aug 20	Thu	Course logistics, syllabus review and course overview	Pre-course survey Take-home syllabus quiz (due Mon Aug 24)
2	Aug 25	Tue	What is machine learning; the ML workflow; supervised vs unsupervised vs reinforcement learning; train, validation and test splits; data leakage	No QOW this week
2	Aug 27	Thu	Data preprocessing (scaling, encoding, missing values); first model: k-nearest neighbors	HW1 out (due Sep 10)
3	Sep 1	Tue	Linear regression, loss functions, gradient descent	QOW 1
3	Sep 3	Thu	Logistic regression; batch, mini-batch and stochastic gradient descent; learning rate	Project team formation announcement. (due Sept 15) Project proposal assignment out (due Sep 29)
4	Sep 8	Tue	Overfitting, the bias-variance tradeoff, regularization (L1, L2), cross-validation	QOW 2
4	Sep 10	Thu	Evaluation: confusion matrix, accuracy, precision, recall, F1	HW1 due HW2 out (due Sep 24)

Week	Date	Day	Topics	QOW, exams, assignments, project
5	Sep 15	Tue	ROC and AUC, threshold choice; introduction to imbalanced data	QOW 3 Project team formation due (teams of 3, on Canvas)
5	Sep 17	Thu	Imbalanced data: over- and under-sampling, SMOTE; evaluation wrap-up	
6	Sep 22	Tue	Decision trees	QOW 4
6	Sep 24	Thu	Ensembles: bagging, boosting, random forests	HW2 due HW3 out (due Oct 8)
7	Sep 29	Tue	Support vector machines and kernels	QOW 5 Project proposal due
7	Oct 1	Thu	Feature engineering	
8	Oct 6	Tue	Neural networks: the perceptron, the multilayer perceptron (examined on Midterm 2, not Midterm 1)	Note: this week's QOW is on Thursday, at the review
8	Oct 8	Thu	Midterm 1 review	QOW 6 HW3 due
9	Oct 13	Tue	Midterm 1 (weeks 1 to 7)	Midterm 1
9	Oct 15	Thu	Backpropagation	HW4 out (due Oct 29) Project checkpoint assignment out (due Nov 5)
10	Oct 20	Tue	Deep learning: activations, initialization, optimization (momentum, Adam)	QOW 7
10	Oct 22	Thu	Dropout, batch normalization, training at scale on GPUs	
11	Oct 27	Tue	Convolutional neural networks	QOW 8
11	Oct 29	Thu	Computer vision; transfer learning; synthetic data and domain randomization	HW4 due HW5 out (due Nov 12)
12	Nov 3	Tue	Natural language processing I: word embeddings	QOW 9

Week	Date	Day	Topics	QOW, exams, assignments, project
12	Nov 5	Thu	Recurrent networks, long short-term memory	Project checkpoint due Final project assignment out (due Dec 10 at 9AM)
13	Nov 10	Tue	Natural language processing II: attention and transformers	QOW 10
13	Nov 12	Thu	Large language models and foundation models, fine-tuning, reinforcement learning and RLHF	HW5 due (last homework)
14	Nov 17	Tue	Unsupervised learning	Note: this week's QOW is on Thursday, at the review
14	Nov 19	Thu	Midterm 2 review	QOW 11
15	Nov 24	Tue	Midterm 2 (weeks 8 to 14: neural networks onward)	Midterm 2
15	Nov 26	Thu	Thanksgiving holiday, no class (campus closed)	
16	Dec 1	Tue	Project presentations (day 1)	
16	Dec 3	Thu	Project presentations (day 2)	
	Dec 10	Thu	Culminating activity: final project report, code repository due 9 AM on Canvas. No late submissions.	Culminating activity