

CSCI 566: Deep Learning and its Applications

Fall 2026 • Mondays • 5:00pm-8:20pm (4 units)

Section	Format	Location	Capacity
30122	Lecture, in person	SGM 124	231
30359	Lecture, DEN@Viterbi	Remote	30

Both sections meet at the same time and receive the same lecture. Where a policy differs between sections, this syllabus says so explicitly.

- Course website: <https://usc-fortis.github.io/CSCI566-F26/>
- Course Piazza: <https://piazza.com/class/msmpbcelj2p2fg>
- Course Gradescope: <https://www.gradescope.com/courses/1346598> (entry code announced on Piazza and in the first lecture)
- Course Google Drive (slides, PDF):
https://drive.google.com/drive/folders/1hiEZlttA_re8QMzZEX6mDJpDmpRsTUuc **Sign in with your USC account.** The folder is shared with USC only, so a personal Gmail account will see a request-access screen instead of the slides.

Course Description

This course offers a comprehensive introduction to the principles of machine learning (ML) and deep learning (DL), emphasizing both mathematical foundations and practical applications. You will gain insights into basic ML techniques, learn advanced DL applications in fields such as computer vision and natural language processing, and understand their impact on areas such as image recognition and autonomous systems. The course includes a hands-on assignment and a customizable final project, giving you practical experience in implementing ML and DL solutions.

Guest lectures. Industry and academic professionals join our lectures regularly, sharing their experience in ML and data science and providing career insights.

Prerequisites

- Proficiency in Python
- College calculus, linear algebra
- Probability and statistics
- Recommended: CSCI 567 (Machine Learning) or equivalent

Recommended preparation: sufficient mathematical background, good programming skills, and familiarity with concepts and methods in machine learning and AI.

Duplicate credit: CSCI 527.

Instructor and Teaching Assistants

Instructor: Yue Zhao

Office hours: During the mid-class break and after each Monday class. DEN students may join the same office hours remotely; see the course website for the link.

Office hours are for non-homework and non-project inquiries. Questions about course content and logistics are encouraged. Direct technical questions to the TAs.

Teaching assistants: Three teaching assistants support this course. Their names, office hours, and contact details are on the course website. TA sessions focus on homework, project guidance, and administrative support.

Contact: Direct all course communication through Piazza. Given the size of the course (261 students across two sections), we prioritize Piazza over email.

Required Readings and Supplementary Materials

- *Deep Learning* (MIT Press) by Ian Goodfellow, Yoshua Bengio, and Aaron Courville. Free online: <http://www.deeplearningbook.org/>
- *Mathematics for Machine Learning* (Cambridge University Press) by Marc Peter Deisenroth, A. Aldo Faisal, and Cheng Soon Ong. Free online: <https://mml-book.github.io/>

Description and Assessment of Assignments

Two in-class quizzes at announced times, one coding assignment, one midterm exam, and one course project (pre-proposal, reports, presentation).

There is no final exam. The final project poster session takes place at the last class meeting, November 30; the written final report is due one week later, on December 7. Together they serve as the final summative experience for this course.

Grading Breakdown

Deliverable	Points
In-class quizzes	10 (Quiz 1: 5, Quiz 2: 5)
Assignment	10
Midterm	35
Course project	45

Deliverable	Points
Total	100

Quiz dates are announced at least one week in advance, on the course website and Piazza.

In-Class Quizzes

Quizzes are graded on a completion basis, and answers are reviewed together during the same class session. Quizzes must be completed within the designated class period. There are no makeup quizzes.

Both sections take quizzes during the live session. DEN students complete the quiz in the same window as the in-person section.

Assignment

One individual coding task. Submissions include both code and documentation. You will be given starter code, a description of the required implementation, and unit tests that check compatibility with the grading scripts.

Midterm Exam

Format: Open book, no electronic devices. Mostly multiple-choice questions plus some computation-based questions with unambiguous single-number answers.

Date: Monday, November 2, in the regular class session.

Content: Everything covered in class up to and including the lecture on October 26, the session before the exam. **If a topic is not reached by that date, it is not on the exam.** The scope follows what was actually taught, so there is no separate module list to track.

Detailed scope. A specific exam scope, listing which topics are and are not tested, is posted on the course website and Piazza by **October 19**, two weeks before the exam. That posted scope is always a **subset** of the material above: it can narrow what is tested, never add to it. Study from the posted scope once it is available.

A review session is held in class on **October 26**, the week before the exam.

DEN section: Students in section 30359 take the exam on the same day. The exact delivery and proctoring arrangement is confirmed with DEN@Viterbi and announced on the course website before the exam.

Makeup exams are not provided unless Viterbi approves the supporting documents.

Academic Integrity on the Midterm

Any academic integrity violation on the midterm results in a failing grade for the course. This is not a deduction on the exam and not a zero on that component. It is an F for CSCI 566, and the case is reported to the university under SCampus Section 11.

This applies to, and is not limited to: copying from another student, allowing another student to copy from you, using any electronic device during the exam, using unauthorized materials, and communicating with anyone other than course staff during the exam period.

We use multiple exam versions and assigned seating. Proctors record the seat assignment for every student.

This policy exists because the exam is worth 35 points and is taken by 261 students. A weaker penalty transfers the cost of cheating onto the students who do not cheat.

Course Project

Groups of 4 to 6 students. The topic is open, ranging from applied ML projects to rigorous ML research projects. This is an applied course, so publication-track projects are rare.

Project matching. A form collects your project preferences and potential teammates. Piazza supports this process.

Groups may mix the two sections, and doing so is encouraged. A group formed entirely of section 30359 (DEN) students is allowed only if at least one member attends the November 30 poster session in person; a DEN-only group with no member attending in person must instead join a mixed group.

By default, section 30359 (DEN) students do not attend the poster session. A mixed group presents through its in-person members, and a DEN-only group with an in-person member presents through that member. For a DEN student who does not attend in person, the share of the grade that in-person students earn at the poster session is carried by the written report instead, so that student is expected to take a correspondingly larger part in writing it. The two paths are weighted to the same total.

The project is worth 45 of the 100 course points, split as follows. Both paths total 45.

Component	Graded as	In person (30122)	DEN (30359)
Pre-proposal (1 page: team, initial thoughts, planned dataset)	Group	5	5
Midterm report (progress, literature review, initial results, updated plan)	Group	10	10
Final report	Group	15	25
Poster defense (questions answered in person)	Individual	10	—
Peer evaluation within the group	Individual	5	5
Total		45	45

Component	Graded as	In person (30122)	DEN (30359)

The ten points that in-person students earn at the poster session are carried by the final report for DEN students. Nothing else differs.

The final report should resemble a research paper: motivate the problem, present the approach, describe the experiments, and discuss the results.

Final presentation format. The last class (November 30) is a **poster and demo session**, not sequential talks. All groups present in parallel; the instructor and the TAs visit each poster for about five minutes, and **every group member who is present answers questions individually**, including about parts of the project they did not personally write. Section 30359 does not attend; see the DEN paragraph above.

The reason is arithmetic: 261 students in groups of five is roughly 53 groups, and a single 200-minute session gives under four minutes per group if presentations run one after another. A parallel session removes that limit and makes real questions possible.

Peer Evaluation Within the Group

Peer evaluation is worth 5 of the 45 project points, and it is individual: within one group, members can receive different peer scores.

How it works.

1. Every group submits a one-page **contribution statement** with the final report: who did what, agreed to by all members. This is the record the rest of this section depends on.
2. After the final report is submitted, every group member scores every other member of the same group on agreed contribution criteria.
3. Your individual peer score is the aggregate of the scores your teammates gave you.
4. **You see your own aggregate score. You do not see who gave which score.**
Individual ratings are visible only to course staff.
5. Submitting a peer evaluation is required. Failing to submit forfeits your own peer score.

Free riding. Five points is small on purpose: among members who all contribute, peer scores should differ little. It is not the whole mechanism. If every teammate independently reports that a member did not contribute, and the contribution statement and the group's commit history agree, course staff review the case and **that member's group-graded components can be reduced, to zero in a clear case**. That is up to 30 of the 45 project points, not 5. Contributing to a project and being listed on it are different things.

Why this exists. In previous offerings, every group member received the same project grade regardless of contribution, and course evaluations reported that this left groups with no mechanism

to address uneven participation. Peer evaluation gives that mechanism while keeping most of the grade collective, so the group still has a shared incentive to produce good work.

Course staff review peer scores before they are applied. If the pattern within a group suggests retaliation or collusion rather than a contribution difference, staff may adjust or discard the peer component for that group.

Assignment Submission Policy

All assignments and project reports are due in electronic form by 11:59pm Pacific on the due date. There are no late days.

Grading Scale

Grade	Range	Grade	Range
A	93-100	C+	77-79
A-	90-92	C	73-76
B+	87-89	C-	70-72
B	83-86	D+	67-69
B-	80-82	D	63-66
		D-	60-62
		F	59 and below

Letter grades are decided by rounding floating-point grades up to the nearest whole number (for example 92.2 becomes A, and 59.8 becomes D-).

Schedule

The course meets on 14 Mondays. September 7 is Labor Day and the university is closed. The last class is November 30; December 7 falls in the study and examination period. The most current schedule is on the course website.

#	Date	Topic	Assessment
1	Aug 24	Course intro; ML and DL framing; agent security and trustworthy AI; linear models	
2	Aug 31	Classical ML: decision trees, kNN, clustering; model metrics (recorded lecture, no live session, no meeting in SGM)	

#	Date	Topic	Assessment
		124)	
—	Sep 7	Labor Day, no class	
3	Sep 14	Neural network basics: perceptron, gradient descent, forward propagation	
4	Sep 21	Backpropagation; vanishing gradients; activation functions; NVIDIA guest lecture	Assignment out
5	Sep 28	Convolutional neural networks	Quiz 1
6	Oct 5	RNN and LSTM; graph neural networks	Pre-proposal due
7	Oct 12	Training dynamics; transfer learning	
8	Oct 19	Generative AI: GAN and VAE	Assignment due; exam scope posted
9	Oct 26	Attention, decoding, mixture of experts; midterm review	
10	Nov 2	Midterm	Midterm
11	Nov 9	Self-supervised learning and LLMs; out-of-distribution and anomaly detection	Project midterm report due
12	Nov 16	Scaling laws; reinforcement learning	Quiz 2
13	Nov 23	Automated ML; project clinic	
14	Nov 30	Project poster session	
—	Dec 7	No final exam	Final report due

The schedule is subject to change. The most current version is on the course website.

Statement on Academic Conduct and Support Systems

Academic Conduct

Plagiarism, presenting someone else's ideas as your own either verbatim or recast in your own words, is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus Section 11, Behavior Violating University Standards, in the USC Student Handbook: <https://policy.usc.edu/studenthandbook/>

Other forms of academic dishonesty are equally unacceptable. See additional information in university policies on research and scholarship misconduct: <https://policy.usc.edu/research-and-scholarship-misconduct/>

The midterm integrity policy stated above is in addition to, not in place of, these university policies.

Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the Office of Equity and Diversity <http://equity.usc.edu> or to the Department of Public Safety <https://dps.usc.edu/contact/>. This is important for the safety of the whole USC community. Another member of the university community, such as a friend, classmate, advisor, or faculty member, can help initiate the report or can initiate it on behalf of another person. USC Relationship and Sexual Violence Prevention Services (the current CARE-SC entry point, successor to the former Center for Women and Men and sexual assault resource center pages) provides 24/7 confidential support and describes reporting options and other resources: <https://sites.usc.edu/clientservices/>.

Support Systems

A number of USC's schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the American Language Institute <http://dornsife.usc.edu/ali>, which sponsors courses and workshops specifically for international graduate students. The Office of Student Accessibility Services (OSAS, formerly the Office of Disability Services and Programs), <https://osas.usc.edu/>, provides certification for students with disabilities and helps arrange the relevant accommodations. If an officially declared emergency makes travel to campus infeasible, USC Emergency Information <http://emergency.usc.edu> will provide safety and other updates, including ways in which instruction will be continued.