Introduction to Machine Learning Syllabus

CSCE 4205.001: Introduction to Machine Learning, Fall 2026

Time: Tuesday & Thursday 09:05 am - 10:25 am

Location: NTDP E264

Credits: 3

Dates: Aug. 17, 2026 --- Dec. 11, 2026

Instructor & TA

Name: Xinrui Cui

Office Location: Discovery Park F226

Student Hours: Thursdays 10:30-11:30 am

Email: xinrui.cui@unt.edu

TA Name: Bharath Krishnamurthy

TA Email: BharathKrishnamurthy@my.unt.edu

TA Student Hours: Thursdays 12:00-2:00 pm at F-220

Communication Expectations

Students are responsible for checking Canvas announcements, notifications, and course materials regularly and for attending class consistently. Students who miss a class should review Canvas promptly afterward for lecture slides, assignments, announcements, and other course materials.

Brief questions may be addressed before or after class or through the Canvas Inbox. For detailed assistance with course concepts, assignments, or code, students should first consult the Teaching Assistant. Questions that remain unresolved or fall beyond the Teaching Assistant's scope may be discussed during the instructor's office hours or, when appropriate, in a scheduled meeting.

Canvas Inbox messages will ordinarily receive a response within one business day. Messages sent during weekends, university holidays, or outside normal business hours may be answered on the next business day.

Course Description

This course introduces the theory and practice of designing systems that learn from data to make predictions, discover patterns, and support decision-making. Topics include supervised learning for regression and classification; model evaluation, generalization, and regularization; decision trees, nearest-neighbor methods, probabilistic models, support vector machines, and ensemble learning; unsupervised and semi-supervised learning; clustering and dimensionality reduction; neural networks and deep learning; generative models; and introductory reinforcement learning.

The course emphasizes both mathematical foundations and practical implementation. Students will learn to formulate machine learning problems, select and train appropriate models, evaluate performance using valid experimental procedures, diagnose model and data failures, and communicate conclusions supported by empirical evidence.

Learning Outcomes

By the end of the course, students will be able to:

- **Explain fundamental learning principles**, including generalization, overfitting, underfitting, the bias–variance tradeoff, model complexity, and data leakage.
- **Formulate machine learning problems** as supervised, unsupervised, semi-supervised, generative, or reinforcement learning tasks.
- **Describe and compare standard machine learning methods**, including linear and logistic regression, decision trees, nearest-neighbor methods, naïve Bayes, support vector machines, ensemble methods, clustering, dimensionality reduction, and neural networks.
- **Implement fundamental machine learning algorithms** using Python and modern computational frameworks such as NumPy, scikit-learn, and PyTorch.
- **Apply optimization methods**, including gradient descent and stochastic gradient descent, to train machine learning models.
- **Design appropriate training, validation, and testing procedures** and recognize common sources of experimental bias or data leakage.
- **Select and justify suitable evaluation metrics**, such as mean squared error, accuracy, precision, recall, F1-score, ROC-AUC, and precision–recall measures, based on the application and its error costs.
- **Analyze the mathematical and statistical assumptions** underlying machine learning methods and explain how violations of those assumptions may affect model behavior.

- **Compare candidate algorithms and justify model-selection decisions** by considering predictive performance, interpretability, robustness, computational cost, data requirements, and deployment constraints.
- **Communicate experimental findings clearly**, including the reasoning behind methodological choices, the limitations of the analysis, and the degree to which the results are reproducible and generalizable.

Course Requirements

Textbook: No textbook purchase is required for this course. However, students are strongly encouraged to consult the following references, all of which are available electronically.

-
  - Pattern Recognition and Machine Learning, by Christopher Bishop.
  - Machine Learning with PyTorch and Scikit-Learn: Develop machine learning and deep learning models with Python, by Sebastian Raschka and Vahid Mirjalili
  - Elements of Statistical Learning, by Jerome H. Friedman, Robert Tibshirani, and Trevor Hastie

Programming and software: Prior experience with Python is required. Students should be able to write, execute, and debug Python programs and work in a notebook-based environment such as Jupyter Notebook or Google Colab.

Coursework may use the following tools and libraries:

- Python 3
- NumPy
- pandas
- Matplotlib
- scikit-learn
- PyTorch
- Jupyter Notebook or Google Colab

Students may install Python 3 through the Anaconda distribution or use Google Colab. Students are responsible for confirming that their programming environment works before assignments, demonstrations, and examinations.

Laptop: A laptop computer is required for in-class examinations and may also be used for coding activities and demonstrations. The midterm and final examinations will be administered through the Canvas quiz system.

Students should bring a fully charged laptop and power adapter on examination days and should verify in advance that they can access Canvas using a supported web browser.

Course Evaluation

Student learning will be evaluated through individual assignments, in-class quizzes, a group project, a midterm examination, and a final examination. The assessment structure is designed to evaluate not only the correctness of a final answer or implementation, but also the student's reasoning, experimental process, reproducibility, interpretation of results, and independent understanding. CSCE 5215 students will complete graduate-level extensions involving additional theoretical analysis and derivations. These requirements will be identified clearly in each assessment.

Attendance: Attendance is mandatory. There are six in-class quizzes throughout the semester.

Assignments are generally **due at the end of the day one week after they are assigned** unless otherwise specified. Assignments should be **submitted in PDF format**. Source code and results should be **submitted in both a code notebook** (e.g., Jupyter notebook, VS Code, etc.) **and PDF format**. Coding results should be reproducible.

Group Project (topic will be released one week before the midterm): The project proposal, presentation, and final report will be used for evaluation. You are required to work in groups (**2-4 members per group**). All people in the group are expected to contribute.

Exams: Exam days are posted and considered fixed. **The midterm is class time on Oct. 6, and the Final is 8-10 am on Dec. 10.** Exams cannot be missed without prior arrangements or documented proof of extenuating circumstances.

Grading

Grades are determined by a simple points system, with a total of **100 pts**.

- Assignments: 30%
  - Four assignments in total. The first two assignments are 7% each. The last two assignments are 8% each.
- In-class quizzes: 15%
  - Six quizzes in total (Three before the midterm and three after the midterm; best five scores count).
- Group Project: 10%
  - One-page proposal: 2 pts
  - Presentation: 4 pts
  - Report: 4 pts
- Exams: 45%
  - Mid-Term Exam: 20%

- Final Exam: 25%

Letter Grade	Percentage
A	90-100%
B	80-80.99%
C	70-79.99%
D	60-69.99%
F	below 60%

Course Policies

Examination Policy

Exams will be on the computer using the **Canvas quiz system**. You need to bring a laptop on the exam days. **Exams are "closed book" - no use of materials outside the canvas exam system except for one single-sided US-letter page of notes.** Exams must be taken in the classroom unless special accommodations have been made through the Office of Disability Accommodation (ODA). Other accommodations must be given by prior arrangement with the instructor, otherwise documentation proving an extenuating circumstance will have to be provided after the missed exam. Time will be limited, and all work will be individual. You are strongly encouraged to attempt to solve the tasks iteratively and incrementally - write code that works first, but works poorly, and improve from there, rather than write perfect code top to bottom. Exams will focus on the most recent material but are expected to be cumulative in scope.

Technical Errors in Exams

In the event of technical difficulties during an online exam, immediately notify the exam proctor. The instructor will then determine appropriate accommodations to allow test completion without compromising fairness. If server outages or other technical issues prevent students from completing time-sensitive assessments, the instructor will extend submission windows and provide suitable accommodations based on the circumstances. All technical problems must be reported to the instructor without delay.

Late Policy

When assignments and project work are turned in after the due date, this places an undue burden on the instructor and TA, especially when this policy is abused. As a compromise, if the assignment or project work is turned in *prior to grading* there will be no reduction in points, however, grading can occur any time after the due date (including the following morning!). A request for late submissions may be sent at the discretion of the IA or instructor, but is not guaranteed.

Assignments and project work will still be accepted **up to two days late after the deadline**. Each day late (irrespective of how late it was received) will incur **a penalty of 10%**. **No work will be accepted two days after the stated deadline.**

Use of AI

The use of generative artificial intelligence or AI-assisted tools is **not permitted** in this course unless explicitly authorized by the instructor for a specific activity. Prohibited tools include, but are not limited to: ChatGPT, Claude, Google Gemini, Microsoft Copilot, GitHub Copilot, Cursor or other AI-assisted coding environments, AI code-generation tools, AI writing tools, AI-based homework or problem-solving services, etc.

Eagle Alert Notice

Students will be notified by Eagle Alert if there is a campus closing that will impact a class. Campus Closures Policy (https://policy.unt.edu/policy/15-006).

Student Evaluation

Student Perceptions of Teaching (SPOT) is the student evaluation system for UNT and allows students to confidentially provide constructive feedback to their instructor and department to improve the quality of student experiences in the course.

UNT Policies

Academic Integrity Policy

Academic Integrity Standards and Consequences. According to UNT Policy 06.003, Student Academic Integrity, academic dishonesty occurs when students engage in behaviors including, but not limited to cheating, fabrication, facilitating academic dishonesty, forgery, plagiarism, and sabotage. A finding of academic dishonesty may result in a range of academic penalties or sanctions ranging from admonition to expulsion from the University.

ODA Policy

UNT makes reasonable academic accommodation for students with disabilities. Students seeking accommodation must first register with the Office of Disability Accommodation (ODA) to verify their eligibility. If a disability is verified, the ODA will provide a student with an accommodation letter to be delivered to faculty to begin a private discussion regarding one's specific course needs. Students may request accommodations at any time, however, ODA notices of accommodation should be provided as early as possible in the semester to avoid any delay in

implementation. Note that students must obtain a new letter of accommodation for every semester and must meet with each faculty member prior to implementation in each class. For additional information see the ODA website (https://disability.unt.edu/).

Emergency Notification & Procedures

UNT uses a system called Eagle Alert to quickly notify students with critical information in the event of an emergency (i.e., severe weather, campus closing, and health and public safety emergencies like chemical spills, fires, or violence). In the event of a university closure, please refer to Blackboard for contingency plans for covering course materials.

Retention of Student Records

Student records pertaining to this course are maintained in a secure location by the instructor of record. All records such as exams, answer sheets (with keys), and written papers submitted during the duration of the course are kept for at least one calendar year after course completion. Course work completed via the Blackboard online system, including grading information and comments, is also stored in a safe electronic environment for one year. Students have the right to view their individual record; however, information about student's records will not be divulged to other individuals without proper written consent. Students are encouraged to review the Public Information Policy and the Family Educational Rights and Privacy Act (FERPA) laws and the University's policy. See UNT Policy 10.10, Records Management and Retention for additional information.

Acceptable Student Behavior

Student behavior that interferes with an instructor's ability to conduct a class or other students' opportunity to learn is unacceptable and disruptive and will not be tolerated in any instructional forum at UNT. Students engaging in unacceptable behavior will be directed to leave the classroom and the instructor may refer the student to the Dean of Students to consider whether the student's conduct violated the Code of Student Conduct. The University's expectations for student conduct apply to all instructional forums, including University and electronic classroom, labs, discussion groups, field trips, etc. Visit UNT's Code of Student Conduct (https://deanofstudents.unt.edu/conduct) to learn more.

Access to Information - Eagle Connect

Students' access point for business and academic services at UNT is located at: my.unt.edu. All official communication from the University will be delivered to a student's Eagle Connect account. For more information, please visit the website that explains Eagle Connect and how to forward e-mail Eagle Connect (https://it.unt.edu/eagleconnect).

Student Evaluation Administration Dates

Student feedback is important and an essential part of participation in this course. The student evaluation of instruction is a requirement for all organized classes at UNT. The survey will be

made available during weeks 13, 14 and 15 of the long semesters to provide students with an opportunity to evaluate how this course is taught. Students will receive an email from "UNT SPOT Course Evaluations via IASystem Notification" (no-reply@iasystem.org) with the survey link. Students should look for the email in their UNT email inbox. Simply click on the link and complete the survey. Once students complete the survey they will receive a confirmation email that the survey has been submitted. For additional information, please visit the SPOT website (http://spot.unt.edu/) or email spot@unt.edu.

Getting Help

Technical Assistance

UNT Help Desk (http://www.unt.edu/helpdesk/index.htm)

Email: helpdesk@unt.edu

Phone: 940-565-2324

In Person: Sage Hall, Room 130

Walk-In Availability: 8am-9pm

Telephone Availability:

- Sunday: noon-midnight
- Monday-Thursday: 8am-midnight
- Friday: 8am-8pm
- Saturday: 9am-5pm

Laptop Checkout: 8am-7pm

Student Support Services

- Registrar (https://registrar.unt.edu/registration)
- Financial Aid (https://financialaid.unt.edu/)
- Student Legal Services (https://studentaffairs.unt.edu/student-legal-services)
- Career Center (https://studentaffairs.unt.edu/career-center)
- Multicultural Center (https://edo.unt.edu/multicultural-center)
- Counseling and Testing Services (https://studentaffairs.unt.edu/counseling-and-testing-services)
- Student Affairs Care Team (https://studentaffairs.unt.edu/care)
- Student Health and Wellness Center (https://studentaffairs.unt.edu/student-health-and-wellness-center)
- Pride Alliance (https://edo.unt.edu/pridealliance)

Academic Support Services

- Academic Resource Center (https://clear.unt.edu/canvas/student-resources)
- Academic Success Center (https://success.unt.edu/asc)
- UNT Libraries (https://library.unt.edu/)
- Writing Lab (http://writingcenter.unt.edu/)
- MathLab (https://math.unt.edu/mathlab)