Syllabus: CSE 4311 / CSE 5368 Neural Networks. Spring 2026

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Instructor Information

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Office Hours: Tuesdays & Thursdays 5:00-6:30 PM

Communication Guidelines: Preferred communication method is email.

Course Information

CSE-4311-003 NEURAL NETWORKS AND DEEP LEARNING

This course offers an introduction to neural networks and deep learning. Topics include perceptrons, single-layer neural networks, multi-layer neural networks, Tensorflow and Keras, convolutional neural networks, transfer learning, deep learning methods for object recognition and object detection in images, and sequential learning models for analyzing text. Auto-encoders and generative adversarial networks will be covered to some extent. A strong programming and algorithmic background is assumed, as well as familiarity with linear algebra (vector and matrix operations). **Prerequisite:** Admitted into an Engineering Professional Program. C or better in CSE 3380 or MATH 3330, and C or better in IE 3301 or MATH 3313.

CSE-5368-001 NEURAL NETWORKS

Course Description: Theoretical principles of neurocomputing. Learning algorithms, information capacity, and mapping properties of feedforward and recurrent networks. Different neural network models will be implemented and their practical applications discussed. **Prerequisites:** CSE 5301 or consent of instructor.

Course Delivery Method

This course is designated ON-CAMPUS, which means Majority On Campus. The majority of course instruction, exams and projects delivered on-campus or at designated instructional sites, in-person.

For a full definition of the course modalities, please visit the Course Modalities page.

Time and Place of Class Meetings

WH 402, Tuesdays and Thursdays 7:00-8:20 PM

Time Zone

This course operates on Central Time. All times listed for class meeting times, exams, and assignment deadlines are in Central Time (CT).

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Classroom/Lecture Recording Policy

Faculty maintain the academic right to determine whether students are permitted to record classroom and online lectures. Recordings of classroom lectures, if permitted by the instructor or pursuant to an ADA accommodation, may only be used for academic purposes related to the specific course. They may not be used for commercial purposes or shared with non-course participants except in connection with a legal proceeding.

Recording of classroom and online lectures in this course is allowed.

Expectations for Out-of-Class Study

Beyond the time required to attend each class meeting, students enrolled in this course should expect to spend at least an additional 12 hours per week of their own time in course-related activities, including reading required materials, completing assignments, preparing for exams, etc. Be advised that this course is intended for students in computer science and engineering. It is assumed that all students are comfortable with math (calculus, linear algebra, vectors, and matrices) and are proficient in high level programming languages, particularly Python.

Student Learning Outcomes

This course focuses both on the theoretical and practical aspects of neural networks. It covers major concepts in neural networks, including but not limited to performance surfaces, optimization, multi-layer neural networks, backpropagation, convolutional neural networks, autoencoders, generative models, diffusion models, large language models, and transformers.

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

- Explain and apply core neural network architectures and algorithms.
- Understand the mathematics behind performance surfaces and optimization.
- Implement neural networks from scratch.
- Use major deep learning frameworks to solve real-world problems.
- Design and test custom architectures for research or applied projects.

Textbook Information

Primary:

- Dive into Deep Learning by Aston Zhang et al. (Free online).
- Neural Network Design by Martin T. Hagan, et al. (Free online).

Supplementary:

- Deep Learning by Ian Goodfellow, et al. (Free online).
- Neural Networks and Deep Learninr by Michael Nielson (Free online)
- Neural Networks and Learning Machinee by Simon Haykin (Free online).

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Course Schedule and Important Dates

- First day of classes: Jan. 12, 2026
- Census day: Jan. 28, 2026
- Spring Break: Mar. 9-13, 2026
- Exam 1: Mar. 24, 2026. 7:00-8:30 PM.
- Last day to drop classes: Apr. 3, 2026
- Exam 2: Apr. 28, 2026 7:00-8:30 PM.
- Last day of classes: Apr. 28, 2026

Grading Information

Grades will be calculated based on the following tables:

Percentages	
Assignments	25%
Quizzes	25%
Exam 1	25%
Exam 2	25%

Letter Grades Thresholds	
87%–100%	A
75%–87%	B
65%–75%	C
55%–65%	D
0%–55%	F

- **Grading Policy**: Grades will not be curved and will be strictly determined based on the criteria outlined in the tables above. Research indicates that curve grading can discourage effective study habits. Additionally, since curves are typically applied at the end of a semester, they create uncertainty, leading to increased stress and leaving students unsure of their standing in the course or what is required to achieve a specific grade.
- **Tracking Performance**: All grades and assignments will be posted on Canvas. Students are responsible for monitoring their progress throughout the semester and seeking guidence if their performance falls below satisfactory levels.
- **Important**: Grades will be determined **solely** by the grading criteria listed above. Requests based on personal circumstances such as GPA concerns, graduation requirements, employment needs, or program continuation will not be considered.

Quizzes, and Exams

This course includes face-to-face lectures, programming assignments, in-class quizzes and two exams.

- The lowest quiz score will be dropped.
- Quizzes and exams will include both theoretical and programming questions.
- Quizzes and exams will be comprehensive, covering material from pre-readings, textbook chapters, and class lectures.
- Quizzes may be administered at any time during a class period and will only be given to students who are present at the start time of the quiz.

- Only non-programmable calculators are permitted during quizzes and exams, unless explicitly specified otherwise. The use of all other electronic devices, including laptops, cellphones, smartwatches, and tablets, is prohibited.
- There will be no make-up quizzes or exams, except in cases of approved official medical or university documentation. In such cases, the average of other quizzes or exams will replace the grade of the missed quiz or exam. **No other exceptions will be granted.**

Incomplete Grades and Make-Up Exams

No incomplete shall be given in this course and there will be no make-up quizzes or exams. The only exceptions are for absences with approved official written medical or university documentation. In such cases, the average of your other quizzes or exams will replace the grade of the missed quiz or exam. No other exceptions will be granted.

Assignments

- **Assignment Availability and Deadlines:** All assignments will be announced well in advance of their due dates. Unless otherwise specified, assignments are due by 11:59 PM on the stated deadline.
- **Grace Period Policy:** A 24-hour grace period is provided after the due date with no penalty. This grace period is intended to accommodate unforeseen circumstances such as network, system, or server issues. Submissions will not be accepted after the grace period expires, and a missed assignment will receive a grade of zero.
- **Submission Method:** All assignments must be submitted electronically through Canvas. Submissions via email or other means will not be accepted.
- **Programming Language:** The required programming language for this course is Python. All lectures, examples, and demonstrations will also be conducted using Python.
- **Submission Requirements:** Each assignment must be self-contained, unless explicitly stated otherwise, and must include all required files and components. The teaching assistant will evaluate only the files submitted through Canvas; no external, supplemental, or later-provided materials will be considered.
- **Program Execution:** Programs that do not execute successfully will receive no credit. Partial credit may be awarded for programs that meet some requirements, provided the submitted code runs without errors.
- **Student Responsibility:** Students are responsible for thoroughly testing their programs both before and after submission to ensure error-free execution. After submitting an assignment, students are strongly encouraged to download and test the submitted files to verify that the correct version was uploaded.
- **Grading as Submitted:** Assignments are graded exactly as submitted. Once the submission deadline has passed, no revisions, corrections, or file replacements will be permitted.
- **Multiple Submissions:** Students may submit assignments multiple times prior to the deadline. Only the last submission before the deadline (or grace period, if used) will be graded.

General Policies

- **Your opinion matters.** Constructive suggestions are welcome and will be carefully considered. I am open to ideas that enhance the overall learning objectives of the course and benefit the class as a whole. Suggestions should be broadly applicable and focused on improving the learning experience for all students, rather than addressing individual

preferences or personal circumstances. To maintain fairness and consistency, requests or appeals based on individual reasons will not be considered. My goal is to foster an inclusive, equitable, and unbiased learning environment.. **Please DO NOT ask for any exception.**

- **Be present.** Multiple research studies indicate that the use of electronic devices in class can lead to a distracting learning environment. **You learn better when you are mentally present.** Cell phones, laptops, I-Pads, Kindles, and other electronic devices must be turned off during class (unless explicitly specified otherwise for particular in-class activity).
- **DO NOT enter the classroom if you are late**. Your late arrival will disturb the continuity of the subject and may break other student's concentration.
- **Responsibility for Missed Material**: Students are responsible for all material covered during any class session they miss, regardless of the reason for the absence.
- **Communication**: All course announcements will be sent via email. Students are responsible for regularly checking their university email account.

Email Guidelines

- **Subject Line**: Begin the subject line of your email with “CSE-4311” or “CSE-5368”. Follow this prefix with a concise description of the topic you’re addressing. For example, "CSE-5368: Question about an old test."
- **Opening Line**: In the first line of your email, clearly state the main point or purpose of your message. This helps the recipient quickly understand the nature of your inquiry or request. For example, "I have a question about old test number 2 in Fall 2023". Follow this initial statement with any necessary details or justification in the subsequent paragraphs to provide context and support for your question or request.
- **Email Address**: Always use your official university email address.
- **Signature**: Conclude your email with your full name formatted as (Last, First). This practice helps to clearly identify who is sending the message and ensures proper attribution. For example, "Smith, John."

Grade Grievance & Re-Grading Policy

I am committed to ensuring that all grading is fair, consistent, and transparent. If you believe that a grading error has occurred, Submit your request for regrading **in writing via email** within **72 Hours** of the grade being posted.

- Your email must:
  - Begin the subject line with: CSE-4311 / CSE-5368: Re-Grading Request.
  - Specify exactly which question(s) or section(s) you believe were graded incorrectly.
  - Provide a clear, concise explanation supported by evidence from course materials or instructions.
  - Be sent from your official university email account.
  - Conclude with your full name in the format: (Last, First).
- The entire submission, quiz, or exam may be regraded, which can result in an **increase, decrease, or no change** to your score.
- Grades will be determined **only** by the published grading criteria. Requests based on personal circumstances—such as the need to improve GPA, remain in the program, secure a job offer, or graduate—will not be considered.
- Requests without a clear academic justification, or those seeking exceptions, may result in a **reduction** of the original grade.

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Attendance Policy

The University of Texas at Arlington does not recognize a single attendance policy but encourages faculty to establish class-specific policies on attendance. As the instructor of this section, At The University of Texas at Arlington, taking attendance is not required but attendance is a critical indicator in student success. Each faculty member is free to develop his or her own methods of evaluating students' academic performance, which includes establishing course-specific policies on attendance. As the instructor of this section, **I will NOT** take attendance. However, while UT Arlington does not require instructors to take attendance in their courses, the U.S. Department of Education requires that UT Arlington have a mechanism in place to verify Federal Student Aid recipients' attendance in courses. UT Arlington instructors are expected to report the last date of attendance when submitting students' final course grades; specifically, when a student earns a course grade of F, instructors must report the last date a student attended their class. For on-campus classes, last date of attendance can be based on attendance rosters or on academic engagements—a test, participation in a class project or presentation, or Canvas-based activity. Online or distance education courses require regular and substantive online interaction and participation. Students must participate in online course activities in Canvas to demonstrate attendance; logging into an online class is not sufficient by itself to demonstrate attendance. The last date of attendance is reported to the U.S. Department of Education for federal financial aid recipients.

Generative AI Use in This Course

The use of Generative AI (GenAI) in course assignments and assessments must align with the guidelines established by the instructor. Unauthorized use of GenAI could result in breaches of academic integrity. Instructors are responsible for clearly delineating the permissible uses of GenAI in their courses, underscoring the importance of responsible and ethical application of these tools.

Community Standards within the Office of the Dean of Students articulate the university's stance on academic integrity and scholastic dishonesty. These standards extend to the use of GenAI. Unauthorized or unapproved use of GenAI in academic work falls within the scope of these policies and will be subject to the same disciplinary procedures.

As the instructor for this course, I have adopted the following policy:

Generative AI tools (e.g., ChatGPT, Copilot) may be used **in a limited way**:

1. **Understanding Requirement**

- You must fully understand any AI-assisted code or content you submit.
- You may be **quizzed individually** on your work at any time. If you cannot explain how your code works or why you wrote it that way, it will be considered a violation of course policy.

2. **Originality Requirement**

- AI output must be **substantially modified** and adapted to your own style and problem-solving approach.

- If your code appears **substantially similar** to another student's submission due to AI use, it will be treated as **collusion or plagiarism** under University academic integrity rules.

3. **Attribution Requirement**

- When AI tools are used, you must **disclose**:
- The tool's name (e.g., ChatGPT, GitHub Copilot)
- The prompt(s) you used or a summary of the assistance received
- Failure to disclose AI use will be treated as an integrity violation.

4. **Responsibility for Accuracy**

- AI tools can produce incorrect or inefficient solutions. You are solely responsible for testing, debugging, and verifying your submission.

Summary: You may use AI for inspiration, guidance, and partial code generation—but you must (1) understand your work, (2) make it your own, and (3) follow all disclosure and originality rules. Violations will be reported as academic misconduct.

Institutional Policies

UTA students should review the University Catalog and the Syllabus Institutional Policies page for institutional policies and contact the specific office with any questions. The institutional information includes the following policies, among others:

- Drop Policy
- Disability Accommodations
- Academic Integrity
- Electronic Communication

UTA Honor Code

UTA students are expected to adhere to and observe standards of conduct compatible with the University's functions as an educational institution and live by the University of Texas at Arlington's Honor Code. It is the policy of The University of Texas at Arlington to uphold and support standards of personal honesty and integrity for all students consistent with the goals of a community of scholars and students seeking knowledge and responsibility.

UT Arlington faculty members may employ the Honor Code in their courses by having students acknowledge the honor code as part of an examination or requiring students to incorporate the honor code into any work submitted. Per UT System *Regents' Rule* 50101, §2.2, suspected violations of university's standards for academic integrity (including the Honor Code) will be referred to the Office of Student Conduct. Violators will be disciplined in accordance with University policy, which may result in the student's suspension or expulsion from the University. Additional information is available at https://www.uta.edu/conduct/.

All students are expected to pursue their academic careers with honesty and integrity. "Scholastic dishonesty includes, but is not limited to, cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another

person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts" (Regents' Rules and Regulations, Part One, Chapter VI, Section 3, Subsection 3.2, Subdivision 3.22.). Students found guilty of dishonesty in their academic pursuits are subject to penalties that may include suspension from the university.

Any suspicious activity of academic dishonesty will be reported to the Office of Student Conduct.

For any student found guilty of academic dishonesty the instructor reserves the right to impose any grading penalties, including failing the course regardless of any other aspects of student performance, in addition to any other penalties assessed by the Office of Student Conduct (suspension, expulsion, probation).

These and other applying UTA rules, will be strictly enforced. Any case of academic dishonesty will be treated in accordance with the UTA Handbook of Operating Procedures or the Judicial Affairs. If you do not understand this policy, it is your responsibility to obtain clarification or any additional information you may require. Students are not allowed to:

- Collaborate with others on the code they write or on assignment solutions.
- Copy any part of someone else's program, even with permission or modifications.
- Share or give their code, or any subset of it, to another student.
- Review another student's solution, including solutions from past semesters.
- Hire an individual or company to complete assignments or exams.
- Use generative AI tools beyond the adopted policy.

Student Conduct

Students are expected to maintain professionalism and civility in their language and behavior:

- During lectures.
- During office hours.
- In any oral, written, or electronic communication with the instructor and TAs.
- In assignment submissions.

For any student violating this policy, the instructor reserves the right to impose appropriate grading penalties, including a failing grade for the course, regardless of other aspects of student performance. Violations include using vulgar, insulting, disrespectful, or threatening language, making noise or talking during lectures, disrupting lectures, or otherwise making it difficult for other students to follow the lecture.

Academic Success Center

The Academic Success Center (ASC) offers a range of resources and services designed to help you maximize your learning and achieve academic success as a student at the University of Texas at Arlington. ASC services include supplemental instruction, peer-led team learning, tutoring, mentoring, and TRIO SSS. Academic Success Center services are provided at no additional cost to UTA students. For additional information, visit the ASC website or submit a tutoring request form.

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The English Writing Center (411LIBR)

The Writing Center offers FREE tutoring in 15-, 30-, 45-, and 60-minute face-to-face and online sessions to all UTA students on any phase of their UTA coursework. Register and make appointments online at the Writing Center. Classroom visits, workshops, and specialized services for graduate students and faculty are also available. Please see Writing Center: OWL for detailed information on all our programs and services.

Academic Plaza

The Library's 2nd floor Academic Plaza offers students a central hub of support services, including IDEAS Center, University Advising Services, Transfer UTA, and various college/school advising hours. Services are available during the library's hours of operation.

UTA Health and Wellbeing Resources

UT Arlington is committed to the safety, success, and well-being of our students. To support our community, UTA has established a Community Advocacy, Response, and Engagement (CARE) Team, a dedicated group of campus professionals responsible for helping students who could benefit from academic, emotional, or psychological support, as well as those presenting risks to the health or safety of the community. If you know of someone experiencing challenges, appearing distressed, needing resources, or causing a significant disruption to the UTA community, please submit a CARE Referral by visiting the CARE Team page. You may also submit a referral for yourself if you would like additional support.

UTA students also have access to virtual, on-demand emotional support, appointment-based counseling, advanced psychiatric care, and more. For more information, visit TimelyCare.

NOTE: If a person's behavior poses an immediate threat to you or someone else, contact UTA Police at 817-272-3003 or dial 911. If you or someone you know needs to speak with a crisis counselor, please reach out to the MAVS TALK 24-hour Crisis Line at 817-272-8255 or the National Suicide and Crisis Lifeline at 988.

Student Services Page

The Student Services page provides links to many resources available to UTA students, including:

- Academic Success
- Counseling and Psychological Services (CAPS)
- Health Services
- Students with Disabilities
- Veteran Services

Students are also encouraged to check out Career Center resources to enhance their career-readiness, find student employment, search for internships, and more. We encourage Major Exploration and the use of Experiential Major Maps to keep students on track for graduation. Refer to the Graduation Help Desk for more details.

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Accessibility of Course Materials

If you experience any accessibility barriers with course materials, please know that accommodations are available. You can get assistance through the Student Access and Resource (SAR) Center or by contacting your instructor directly. Please don't hesitate to reach out if you need help.

Online Academic Success Guide

Visit the Online Academic Success Guide to explore a list of helpful tips and resources to help you succeed in your online journey.

MavAlert System

The MavAlert system sends information to cell phones or email accounts of subscribed users in case of an emergency. Anyone can subscribe to MavAlerts at Emergency Communication System.

Emergency Phone Numbers

In case of an on-campus emergency, call the UT Arlington Police Department at **817-272-3003** (non-campus phone) or **2-3003** (campus phone). You may also dial 911. The non-emergency number is 817-272-3381.

Course Schedule

Course Schedule

Introduction • Introduction to Python, Numpy, Matplotlib, pytorch • Definitions • Historical background • Theoretical background (probability) • Matrix operations • Relationship to biological networks • Anatomy of a single neuron	Week 1
Neuron Model and Network Architectures • Artificial Neural Networks • Single neuron and single layer of neurons. • Inside an artificial neuron • Transfer functions • Multiple neurons • Topology of neural network architectures	Week 2
Regression (Linear & Logistic) • Definition • Training • Error functions • Applications	Week 3

Computational Graphs, Performance Surface and Optimization
• Backpropagation
• Tyler series
• Steepest descent and directional derivatives
• Performance measures / Cost functions
• Quadratic functions (Eigensystem, Hessian)
• MSE, SVM, CrossEntropy, Softmax, …
• Optimization Techniques:
  ○ Batch vs. mini-batch training
  ○ Learning rate schedules
  ○ Momentum and Nesterov acceleration
  ○ Adaptive methods:
  ▪ AdaGrad
  ▪ RMSProp
  ▪ Adam
• Vanishing and exploding gradients
• Regularization
	Week 4-6

Convolution Neural Networks (CNN)
• Convolution operation and intuition
• Padding, stride, pooling
• CNN architectures:
  ○ LeNet
  ○ AlexNet
  ○ VGG
  ○ ResNet
	Week 7-8

Autoencoders • Variational Autoencoders (VAEs) • Probabilistic modeling • Latent variables • Reparameterization • KL divergence derivation and variational inference • ELBO derivation	Week 9-10
Recurrent Neural Networks • Sequential data representation • RNNs • LSTM and GRU	Week 11
Transformers • Embeddings • Attention Mechanisms • Transformer architecture • Positional encoding	Week 12-13

Generative Neural Networks and Diffusion Models
• GANs:
  ○ Generator vs. discriminator
  ○ Training instability
• Diffusion models:
• Forward and reverse processes
• Score matching intuition
• Stable Diffusion
	Week 13-..

As the instructor for this course, I reserve the right to adjust this schedule in any way that serves the educational needs of the students enrolled in this course.
–Farhad Kamangar