CSCE 5218 – Deep Learning

Course Information & Syllabus (Spring 2026)

https://oluwatosin-oluwadare.github.io/Teaching/CSCE5218–DeepLearning/index.htm

Basic Course Information

•	**Instructor:**	Dr. Oluwatosin Oluwadare
•	**E-mail:**	Oluwatosin.oluwadare@unt.edu
•	**Office:**	F209
•	**Phone:**	Microsoft Teams or Zoom
•	**Office Hours (Zoom):**	Tuesday 10:00 am-12:00 pm or by email appointment
•	**TA:**	Minghao Li (E-mail: minghaoli@my.unt.edu)
	Office Hours:	F219, 3:00 pm or by Appointment

Textbooks

We will have required readings from the following textbook:

- **Understanding Deep Learning**, by Simon J.D. Prince, 2025. Online Textbook

Besides, the following textbooks are useful as additional references:

- **Deep Learning**, by Ian Goodfellow, Yoshua Bengio, and Aaron Courville, 2016. online version
- **Dive into Deep Learning**, by Aston Zhang, Zack C. Lipton, Mu Li, and Alex J. Smola, 2019. online version
- **Neural Networks and Deep Learning**, by Michael Nielsen, 2019. online version
- **Introduction to Deep Learning**, by Eugene Charniak, 2019. link

In addition to the textbooks, extra reading materials will be provided as we cover relevant topics. Check out the course website regularly for updated reading materials.

Prerequisites

The students are required to master basic knowledge about calculus, linear algebra, (Python) programming, and algorithm implementation. Machine learning background is beneficial for this course.

Programming language/framework:

We will use Python, NumPy/SciPy, and PyTorch for this course.

Course Description

This course aims to cover the basics of modern deep neural networks. In specific, the first part will introduce the fundamental concepts in deep neural networks including network architecture, activation function, loss, optimization, gradient and initializations etc. Then, the second part will describe specific types of deep neural networks such as convolutional neural networks (CNNs), recurrent neural networks (RNNs) and attention-based Transformer, as well as their applications in computer vision and natural language processing. In the final part we will briefly discuss some recent advanced topics in deep learning such as graph neural networks, unsupervised representation learning, deep reinforcement learning, generative adversarial networks (GANs), etc. In this course, hands-on practice of implementing deep learning algorithms (in Python) will be provided.

Tentative topics of this course include:

- Review of machine learning
- Basic concepts in neural networks
- Shallow Neural networks

- Gradient and Initializations
- Loss, optimization, and training of deep neural networks
- Convolutional neural networks (CNNs)
- Recurrent neural networks (RNNs)
- Transformer
- Applications of deep neural networks
- Graph neural networks
- Unsupervised representation learning
- Deep reinforcement learning
- Reinforcement Learning
- Generative adversarial networks (GANs)

Detailed class schedule of this course can be found on the course website.

Learning outcomes: Students in this course will learn basic concepts in deep neural network and different neural network types such as convolutional neural networks (CNNs), recurrent neural network (RNNs), and Transformer. The goals including the following:

- Learn the basic concepts and tools that underlie all modern deep neural networks
- Be able to select a suitable model architecture to process different types of data
- Grow hands-on experience implementing deep neural network models for computer vision, natural language processing, robotic applications, etc.
- Team up and implement an existing research paper or algorithm

Grading (tentative)

- Discussion 5%
- Paper review 35%
- Course project 50%
  - Project proposal: 15%
  - Final report: 35%
- Final exam 10%

Paper review: Up to 18 papers (three papers every two weeks) will be provided for review throughout the semester, and a review example will be provided on the course website.

Discussions: During certain weeks, a discussion prompt will be posted on Canvas. Students are required to contribute one original post and respond to at least two classmates. Please note that points are not awarded automatically for simply posting. Discussion contributions are graded based on relevance, substance, and critical engagement. Responses such as *"I agree," "Yes, that's true,"* or other minimal comments **do not** count as substantive participation and will not earn credit. The quality and depth of your contributions will be evaluated at the discretion of the grader.

Course project: After a few weeks into the course, you will select among several collaborative projects (the project must be related to deep learning) suggested by the instructor, but the students are free to suggest, especially if they are related to their current research. The project is important to improve the hands-on skill of implementing the deep models. A small team of at most two members can work on a project together (each team member will receive the same grade for the project; it is up to the team members to divide the work fairly). For the project, each team requires to include:

- *Project proposal*: On the indicated due date, each team needs to submit the proposal that consists of abstract, introduction, related work, potential solution, datasets and metrics for experiments, and reference.

- *Final report*: On the indicated due date, each team needs to submit a final report which is similar to a research paper. Besides all the components in the proposal, the details of the proposed approach, implementation, and experimental analysis and results should be included in the final report.

The project proposal and final report need to be submitted on Canvas on the indicated due date. More details of the project will be announced during the semester.

Final exam: There will be a final exam for this course. Since our class is online, it will be online on canvas too. More details will be provided during the semester.

Attendance: Since this class is 100% online, attendance is not required. However, the instructor will hold an optional weekly class session to lecture on the topic of the week. Recorded videos of the sessions will also be provided on canvas. See Canvas for details.

Grading / Late Assignments: The TA does all grading - any grade questions should be directed to the TA. Due to the large number of students, we are unable to accept late work. There will be no exceptions to this - you can do the assignments early. There is no make-up for missed assignments.

Late submission: Again, Late submissions will **not** be accepted. It is your responsibility to submit any required submission on time and plan ahead even for unplanned sicknesses and internet connectivity loss. **There will be no exceptions made**.

Grading Scale (based on 100 points**)**
90-100 = A
80-89 = B
70-79 = C
60-69 = D
below 60 = F

Generative AI (GenAI) Use Policy. You may use Generative AI tools (ChatGPT, Claude, Gemini, Copilot, etc.) to support your learning in this course. These tools can help you explore ideas, review concepts, debug code, and improve your writing. However, GenAI should assist, not replace, your own understanding. You are responsible for ensuring that any work you submit reflects your own thinking and that you can explain it if asked. GenAI-generated responses may be inaccurate, so always verify results and use these tools thoughtfully. Use GenAI to learn, not to bypass the learning process. You are responsible for every submission made.

UNT Policies

Academic Integrity 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.

Most lectures in class will have homework assignments. Students may discuss the homework problems and approaches with each other but must work on their solutions individually unless otherwise stated in the assignment. Students must not copy homework from any source, including other students or the internet. No collaboration is allowed in quizzes and exams.

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 Center for Student Rights and Responsibilities 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.

Americans with Disabilities Act: We cooperate with the Office of Disability Accommodation to make reasonable accommodations for qualified students (cf. Americans with Disabilities Act and Section 504, Rehabilitation Act) with disabilities. If you have not registered with ODA, we encourage you to do so. If you have a disability for which you require accommodation, please discuss your needs with the instructor or submit a written Accommodation Request on or before the fourth-class day.

Disclaimer

Note, this syllabus is to serve as a guide and may be subject to changes. For up-to-date information, assignments, and class material, students are recommended to check out course website or Canvas regularly. This syllabus may be updated in the future to reflect changes. The updated version will be available in the course website and on Canvas.