STOR 566: INTRODUCTION TO DEEP LEARNING, FALL 2025

Course Information

This course is designed for senior undergraduate and Masters-level graduate students who are interested in deep learning and would like to gain some hands-on experience working with deep neural networks. Deep learning skills are valued in a variety of industries and people with such skills are in high demand. The goal of this course is to help students understand the success of deep learning by studying the foundation concepts and doing projects related to deep learning. Upon completion of this course, students will be able to:

- Understand basic machine learning and deep learning concepts and use deep learning models to solve some problems, such as classification and content generation.
- Demonstrate understanding of basic and some advanced architectures of deep neural networks and algorithms used to optimize and train the models.
- Implement certain of these architectures and algorithms using the Python programming language.
- Understand the limitations of deep neural networks.
- Identify real-world problems where deep learning models can be applied.

Lecture:	TTH 8:00am - 9:15am, Hanes 125
Optional Textbook:	*Deep Learning*, by Ian Goodfellow, Yoshua Bengio, Aaron Courville.
Course Website:	`https://liyao880.github.io/stor566/`

Instructor

Instructor:	Yao Li
Office:	Hanes 334
Email:	yaoli@email.unc.edu
Office Hours:	W 11:00am - 12:00pm.
Website:	`https://liyao880.github.io/yaoli/`

Teaching Assistant

Name:	Seong Jin Lee
Office:	Hanes B35 (Office Hours via Zoom)
Email:	slee7@unc.edu
Office Hours:	MF 2:00pm - 3:00pm.

Grader

Name:	
Email:	

Prerequisites

Basic knowledge in numerical linear algebra, optimization, and calculus.

Programming language: Python.

Topics

Deep neural networks (DNNs) have been widely used for tackling numerous machine learning problems that were once believed to be challenging. With their remarkable ability of fitting training data, DNNs have achieved revolutionary successes in many fields such as computer vision, natural language progressing, and robotics. This is an introduction course to deep learning. Topics covered by this course include but are not limited to:

- Machine Learning Overview
- Optimization
- Linear models
- Multilayer perceptron
- Convolutional neural network
- Vision-based Generative models
- Recurrent neural network
- DNN pre-training
- Transformer
- Vision transformer
- Large language models
- AI security

Grading

Homework	Final Project	Participation	Total
40%	40%	20%	100%

Homework

- Around 4 to 5 homeworks will be assigned and will be collected via Canvas.
- Late homework will receive a grade of 0.
- You are allowed to work with other students but identical solutions will receive 0.
- Questions regarding HW grade should be addressed to the grader.

Final Project

This course includes a final project in lieu of a final exam. Projects will be completed in groups of **four** and consist of:

- Project proposal (10%)
- Project presentation (30%)
- Project paper (50%)
- Peer review score (10%)

I will meet with each group to discuss the final project topic. Project topics can be:

- Solve an interesting/new problem with existing method
- Develop a new algorithm/model
- Compare state-of-the-art algorithms on some problems
- ...

Project proposal: The project proposal is limited to 2-page (excluding reference) and contains:

- Problem to solve
- Review of existing studies in this field
- Your proposed method/Methods you would like to compare
- Evaluation metric
- Reference

Please use the latex template at link for the proposal.

Project presentation: All groups will present their final projects during the last week or two weeks of classes. Every group member is expected to join the presentation. The length of the presentation depends on the number of groups (10–20min) and will be announced later.

Project paper: Each team must submit a written project report. It is recommended to include a discussion of how your research work can be further extended. It is required to use the NeurIPS Latex style files and submit the report in PDF format. The report should be less than 8 pages without references (no minimum requirement).

Peer Score: Ten points of the final project is based on an average score measuring overall contribution as seen by you and the other members of your group. Each group member should score every person in their group on a continuous scale from 0 (Bad) to 10 (Good). The due date is the same as the due date of the final paper. Your name and this information will remain private between me and you. If you fail to submit this group scoring before the deadline, 2 points penalty will be applied and I will give the other members a score of 10.

Participation

There will be approximately 5–7 in-class quizzes throughout the semester. Your final participation score will be calculated using the formula:

$$20 \times \frac{m}{n}$$

where n is the total number of quiz points available across all quizzes (after dropping the lowest quiz), and m is the total number of points you earn from the remaining quizzes.

Lowest Quiz Dropped: To account for unforeseen circumstances, your lowest quiz score will be automatically dropped from the final participation score calculation. This policy applies regardless of the reason for the missed or low-score quiz.

Make-up Quizzes: Make-up quizzes will only be granted with a valid University Approved Absence (UAA) obtained through the UAAO office. For absences that are not university-approved (e.g., job interviews or extracurricular activities), you must notify the instructor **before the class day**. Emails received after class has begun will not be considered.

Academic Integrity and AI tools

All homework and analysis assignments must be completed individually. Assistance from other students, AI tools (e.g., ChatGPT), or using previously uploaded work from other sources (e.g., CourseHero) is strictly prohibited. This policy also applies to project work; AI tools are not allowed to aid in the completion of any projects. Violations of this policy will result in a grade of 0 for the assignment or project. Additionally, any alleged violations will be reported to the University of North Carolina (UNC) for further review and potential disciplinary action.

Notes

The Instructor reserves the right to make any changes she considers academically advisable.

Attendance

Regular class attendance is a student obligation, and a student is responsible for all the work, including tests and written work, of all class meetings. No right or privilege exists that permits a student to be absent from any class meetings except for excused absences for authorized University activities or religious observances required by the student's faith. If a student misses three consecutive class meetings, or misses more classes than the course instructor deems advisable, the course instructor may report the facts to the student's academic dean. (See details at `https://catalog.unc.edu/policies-procedures/attendance-grading-examination/#text`)

Honor Code

`http://instrument.unc.edu/`

Accessibility

`https://ars.unc.edu/`

Counseling

`https://caps.unc.edu/`

Title IX

Any student who is impacted by discrimination, harassment, interpersonal (relationship) violence, sexual violence, sexual exploitation, or stalking is encouraged to seek resources on campus or in the community. Please contact the Director of Title IX Compliance (Adrienne Allison – Adrienne.allison@unc.edu), Report and Response Coordinators in the Equal Opportunity and Compliance Office (reportandresponse@unc.edu), Counseling and Psychological Services (confidential), or the Gender Violence Services Coordinators (gvsc@unc.edu; confidential) to discuss your specific needs. Additional resources are available at safe.unc.edu.