CS 1678 Introduction to Deep Learning

Department of Computer Science, SCUPI

Spring 2025

Instructor

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Office Hours: Friday 12:00-17:00 or by appointment

Lectures

Friday 8:15-11:00
Location: SCUPI Building N212

Description

This undergraduate course will cover the basics of modern deep neural networks. The first part of the course will introduce neural network architectures, activation functions, and operations. It will present different loss functions and describe how training is performed via backpropagation. In the second part, the course will describe specific types of neural networks, e.g. convolutional, recurrent, and graph networks, as well as their applications in computer vision and natural language processing. The course will also briefly discuss reinforcement learning and unsupervised learning, in the context of neural networks. In addition to attending lectures and completing bi-weekly homework assignments, students will also carry out and present a project.

Prerequisites

- MATH 0220 Analytic Geometry and Calculus 1
- MATH 0280 Matrices and Linear Algebra

Course Objectives

The course objectives are (1) to understand the principles of deep learning and its capabilities and (2) to acquire practical skills to design, implement, and train practical deep learning systems. At the end of the course, students will have knowledge of the fundamentals of neural networks and modern deep learning. With this knowledge, the student will be able to use deep learning models or develop new architectures to solve practical real-world problems such as computer vision and natural language processing. In particular, students will become familiar with one of the most popular deep learning programming frameworks based on Python. The exposure to some research topics in the latter part of the course will also encourage students' interest in research of this topic. Thus, students will be prepared to have a relevant experience for their next career either in industry or academia.

Applicable ABET Outcomes

- Analyze a complex computing problem and apply principles of computing and other relevant disciplines to identify solutions.

- Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
- Communicate effectively in a variety of professional contexts.
- Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
- Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.
- Apply computer science theory and software development fundamentals to produce computing-based solutions.

Textbook

Ian Goodfellow, Yoshua Bengio, Aaron Courville. *Deep Learning*. MIT Press, 2016. Available at https://www.deeplearningbook.org/.

Grading

Participation	5%
Homework	30%
Project	15%
Mid-Term Exam	20%
Final Exam	30%

Conversion from Numerical Score to Letter Grade

100~90	89~85	84~80	79~76	75~73	72~70	69~66	65~63	62~61	60	<60
A	A–	B+	B	B–	C+	C	C–	D+	D	F

Communication

All lecture notes, assignments, projects, and announcements will be published on Blackboard (https://pibb.scu.edu.cn/). Announcements and notifications for update on Blackboard will be sent to QQ / email group. It is the student's responsibility to regularly check Blackboard in a timely manner.

Class Policy

Participation

Class participation is expected and takes a share in your final grade. If a student has a valid reason to be absent from a class session, please notify the instructor beforehand.

Homework Assignment

The homework assignments of this course are semester-long project-like homework. Students are required to schedule weekly online meeting with the TAs to report their progress on the homework assignments. The TAs have the responsibility to supervise and provide guidance to the students.

Exam

There will be one mid-term exam and one final exam. The final exam will be cumulative. The

exams will be OPEN BOOK, OPEN NOTES and CLOSED COMPUTER.

Academic Integrity

The principles of academic integrity requires that a student to make sure that all work submitted is the student's own and created without the aid of impermissible technologies, materials, or collaborations. Academic integrity policy will be strictly followed.

Classroom Recording

To ensure the free and open discussion of ideas, students may not record classroom lectures, discussion and/or activities without the advance written permission of the instructor, and any such recording properly approved in advance can be used solely for the student's own private use.

Tentative Course Schedule

Week	Date	Topic
1	Feb 24	Introduction
2	Mar 3	Neural Network Basics
3	Mar 10	Convolutional Neural Networks
4	Mar 17	Convolutional Neural Networks
5	Mar 24	Recurrent Neural Networks
6	Mar 31	No Class
7	Apr 7	Recurrent Neural Networks
8	Apr 14	Mid-term Project Presentation
9	Apr 21	Mid-term Exam
10	Apr 28	Transformers
11	May 5	Transformers
12	May 12	Self-Supervised Learning
13	May 19	Self-Supervised Learning
14	May 26	Reinforcement Learning
15	Jun 2	Reinforcement Learning
16	Jun 9	Final Project Presentation
17	Jun 16	Final Exam