SYLLABUS
College of Computing and Software Engineering
Department of Computer Science
CS 4277: Deep Learning
Spring 2025

Course Information

Class meeting times: Mondays and Wednesdays, 15:30-16:45

Modality: Traditional; Location: Engineering Technology Center Room 310

Syllabus and detailed schedule is posted on course web site: https://drcs.codes/databases/ksu/cs4277/schedule.html.

Instructor Information

Name: Christopher Simpkins

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Office Location: Norton Hall Room 330

Office phone: N/A

Office Hours: Thursdays, 15:30-17:30 in R2-330 (during January in Room J123)

Preferred method of communication: E-mail

Course Description

This course covers the foundations of Deep Learning; how to build neural networks and how to design successful deep learning projects. The course topics include convolutional networks, sequence modeling such as recurrent and recursive neural networks (RNNs), long short-term memory (LSTM), Adam, Dropout, BatchNorm, Xavier/He initialization, state-of-the-art technologies, and research topics leveraging Deep Learning. The course includes programming assignments in a modern deep learning framework.

Prerequisites:

- CS 3642 Artificial Intelligence

Corequisites:

- CS 4267 Machine Learning

Credit Hours: 3-0-3

Course Materials

Required Texts:

- UDL: Understanding Deep Learning, by Simon J.D. Prince, https://udlbook.github.io/udlbook/

Recommended Texts:

- DLFC: Deep Learning Foundations and Concepts, by Bishop and Bishop, https://www.bishopbook.com
- DDL: Dive into Deep Learning, by Ashton Zhang, et. al., https://d2l.ai
- DL: Deep Learning, by Goodfellow, Bengio and Courville,

https://www.deeplearningbook.org

- LDL: Learning Deep Learning, by Ekman, https://ldlbook.com
- NND: Neural Network Design, by Hagan, et. al., https://hagan.okstate.edu/nnd.html
- DLI: Deep Learning Illustrated, by Jon Krohn: https://www.deeplearningillustrated.com
- ITLA: Information Theory, Inference and Learning Algorithms, by David MacKay, http://www.inference.org.uk/mackay/itila/book.html

Course Learning Outcomes

At the end of the course, students should be able to:

1. understand the state-of-the-art technologies and their trends driving Deep Learning
2. build, train, and apply fully connected deep neural networks
3. understand how to implement efficient neural networks
4. understand key parameters in Deep Learning architecture
5. explain how Deep Learning works
6. demonstrate the capability of communication with peers for research ideas in Deep Learning related fields

Course Requirements and Assignments

- 4-5 Problem sets (PS)

- 3-4 Programming assignments (PA)
- Research project
- Midterm Exam
- Final Exam

Evaluation and Grading Policies

- Problem sets: 20%
- Programming assignments: 20%
- Research project: 20%
- Exams: 40%

Each assignment will be graded on a 100 point scale which you may consider a percentage with respect to the grading scale below. Some assignments may have more than 100 points, in which case the points in excess of 100 are "extra credit."

In general, every attempt will be made to provide grades and feedback within two weeks of the submission deadline of an assignment. All grades to date will be posted before midterm so that students may make informed decisions about course withdrawals, and before finals week so that students may budget their final exam study time appropriately.

GRADING SCALE:

- $\geq$ 90: A
- $\geq$ 80: B
- $\geq$ 70: C
- $\geq$ 60: D
- $<$ 60: F

Midterm Grades: A midterm grade will be assigned by the

midterm grade due date identified on the academic calendar. This midterm grade is for assessing mid-semester performance at least one week prior to the last day to withdraw without academic penalty. You may view your midterm grade in Owl Express. Note that only your final grade will be officially recorded on your academic transcript.

Course Policies

Assignment Submission and Make-up Policies

Assignments are due at 23:59 local time on the due date. Late submissions are not accepted except in exceptional, documented cases beyond the student's control such as illness, death in the family, or natural disasters.

In the case of missed exams, make-ups will be given accoring to the same policy regarding exceptional cases for assignments.

Academic Honesty

Academic dishonesty cannot be tolerated. You may discuss any of the assignments with your classmates (or anyone else) but all work for all assignments must be entirely your own. Any sharing or copying of assignments will be considered cheating. By the rules of the College of Computing and Sofwate Engineering (CCSE), the instructor is obligated to report any incidents of cheating to the department. The first incident of cheating will result in the student getting a final grade of F for the course. The second incident, by CCSE rules, will result in a semester suspension from the College.

Attendance Policy

Class attendance is required and very important for successful completion of the course. Students are expected to attend every class and participate in the discussion of ideas developed

by others in the class. Peer feedback is essential and is part of the grade assigned to each of the course assignments stated above. Excused absences must be planned for, when possible, and justified with documentation. The student is responsible for making up missed class sessions. Late arrival that causes disruption, early departure that causes disruption, excessive conversation among students (a disruption in its own right), inappropriate use of electronic devices that cause disruptions and other actions that disrupt the classroom are unacceptable.

Email Policy

Students must use their official KSU email address and put the course number, CS 4277, in the subject line of the email when sending email pertaining to the course.

Classroom Behavior

All students are reminded to conduct themselves in accordance with the Student Code of Conduct, as published in the University Catalog. Every KSU student is responsible for upholding the provision. Students who are in violation of KSU policy will be asked to leave the classroom and may be subject to disciplinary action by the University.

Instructional Continuity Plan

Kennesaw State University (KSU) may decide to close campuses, operate on a delayed schedule, or transition to remote instruction for inclement weather or in case of emergency.

The University will announce campus closures, delayed schedules, or remote instruction through KSU Alerts sent to your cell number on file and to your university email account. In addition, announcements will be posted on KSUâ€™s home page: www.kennesaw.edu.

Our class continuity plan includes:

1. Communication: Please check D2l Brightspace or e-mail for necessary instructions.
2. Virtual Classes: If in-person classes are not possible, we may transition to virtual classes using MS Teams.
3. Assignments and Assessments: Deadlines for assignments and assessments may be adjusted to accommodate the emergency situation.

We understand that emergencies create unique challenges. If you need additional support during an emergency, reach out via Brightspace or e-mail. The university also offers resources such as counseling and academic support, which can be accessed remotely.

Policy on the Usage of Artificial Intelligence

AI Use Allowed, but Not Required:

In this class, you are welcome to use AI for any purpose. However, you should note that all AI generative tools still tend to make up incorrect facts and fake citations, code generation models tend to produce inaccurate outputs, and image/art generation tools can produce copied work or offensive products. You will be responsible for any inaccurate, biased, offensive, or otherwise unethical content you submit regardless of whether it originally comes from you or an AI tool. If you use an AI tool, its contribution must be credited in your submission. The use of an AI tool without acknowledgement is cheating and constitutes a violation of the KSU Code of Academic Integrity.

Department or College Policies

Students are expected to be aware that the Computer Science department has certain policies in place that govern practices within the department including:

1. "B" or better grade is required for CS 1321/L and CSE

1322/L and their equivalent transfers. All courses used toward any undergraduate degree in the computer science must be completed with an assessed performance grade of "C" or better. This means that all prerequisite courses from the CS Department must have been completed with a "C" or better in order for a student to enter the next course in a sequence.

2. All requests for course overloads must be made through the College advising office and with the approval of the Program coordinator and department chair. The instructor of any course is not permitted to authorize course overloads.

3. All requests for prerequisite bypasses must be made through the College advising office and with the approval of the Program coordinator and department chair. The instructor of any course is not permitted to authorize course overwrites.

4. All students are encouraged to register their current choice of major using the department major change process. Students who are not recorded under their intended major may find that they may be limited from registering for courses they require to complete their intended program of study.

Institutional Syllabus Policies, Procedures, and Resources

Federal, BOR, & KSU Required Syllabus Policies and Student Resources: https://www.kennesaw.edu/curriculum-instruction-assessment/academic-program-planning-development/resources/student-syllabus-resources.php

Course Schedule

Detailed course schedule: https://drcs.codes/databases/ksu/cs4277/schedule.html.

Weekly Summary:

Week	Content Covered	Assignments	Exams
Week 1: 01-06,01-08	Course Introduction,Machine Learning		
Week 2: 01-13,01-15	Shallow Networks,Deep Networks	Assigned: PS1,Assigned: Project	
Week 3: 01-20,01-22	MLK Jr Day - No Class,Deep Networks	Assigned: PA1	
Week 4: 01-27,01-29	Probability,Loss Functions	Due: PS1,Assigned: PS2	
Week 5: 02-03,02-05	Fitting Models,Gradients and Initialization	Due: Project Proposal	
Week 6: 02-10,02-12	Measuring Performance,Regularization	Due: PA1	
Week 7: 02-17,02-19	Midterm Review	Due: PS2	Midterm Exam
Week 8: 02-24,02-26	Convolutional Networks	Assigned: PS3,Assigned: PA2	
Week 9: 03-03,03-05	Residual Networks,Transformers		
Week 10: 03-10,03-12	Spring Break - No Class		
Week 11: 03-17,03-	Transformers,Graph Neural	Due: Project	

19	Networks	Results	
Week 12: 03-24,03-26	Generative Adversarial Networks	Due: PS3,Assigned: PS4	
Week 13: 03-31,04-02	Normalizing Flows,Variational Autoencoders	Due: PA2,Assigned: PA3	
Week 14: 04-07,04-09	Diffusion Models,Reinforcement Learning		
Week 15: 04-14,04-16	Deep Learning Philosophy,Deep Learning Ethics	Due: PA3	
Week 16: 04-21,04-23	Project Presentations	Due: Final Project Paper	
Week 17: 04-28	Final Exam Review	Due: PS4	