CS584: Deep Learning
Spring 2020

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Office hours: Tuesdays, 1:30pm–3:00pm; Thursdays, 9:30am–11:00am; or by appointment
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Webpage
`https://reynalab.github.io/courses/cs584_spring2020`

Lectures
Location: Woodruff Memorial Research Building 4004
Time: Mondays and Wednesdays, 4:00pm–5:15pm

Textbook
Deep Learning. Goodfellow, Bengio, and Courville. MIT Press, First Edition
`http://www.deeplearningbook.org`

Learning Objectives
This course will introduce students to the theory and practice of deep learning through lectures, homework, quizzes, presentations and discussions of papers, and a project. By the end of this course, students should:

1. Understand the mathematical foundations of deep learning.
2. Be able to implement deep learning models and choose different model architectures for different kinds of data and tasks.
3. Be familiar with many of the seminal papers for deep learning and be able to read, understand, present, and critique work that develops or applies deep learning.
4. Be able to design, complete, and present a project that uses deep learning to solve a substantive problem.
5. Consider the societal impacts of deep learning and related work.

Prerequisites
Previous coursework in multivariate, linear algebra, probability theory or statistics, and machine learning (CS534 or equivalent). Proficiency with numerical computing in Python and mathematical typesetting in LaTeX.

[1]Please include `CS584` in the subject line of your email.

Course Outline
This table provides a loose outline of what we will cover in this course. Please consult the course website, email, and announcements in class for details and updates.

Dates	Topics	Chapters
1/13, 1/15	Introduction, linear algebra, probability, numerical computing, basics of machine learning	1, 2, 3, 4, 5
1/22, 1/27, 1/29	Deep feedforward networks, regularization, optimization	6, 7, 8
2/3, 2/5, 2/10, 2/12	Convolutional neural networks, recurrent neural networks	9, 10
2/17, 2/19, 2/24, 2/26	Practical issues, applications, projects	11, 12
3/2, 3/4, 3/16	Markov models and reinforcement learning	N.A.
3/18, 3/23, 3/25	Linear factor models, autoencoders, graphical models	13, 14, 16
3/30, 4/1, 4/6	Sampling methods, the partition function, approximate inference	17, 18, 19
4/8, 4/13, 4/15	Boltzmann machines	20
4/20, 4/22, 4/27	Project presentations and assorted topics, e.g., generative adversarial networks, adversarial examples, differential privacy, deepfakes	N.A.

Grading
You will be evaluated on periodic homework and quizzes, presentations and discussions of papers, and a semester project. Requests for regrades must be submitted in writing within one week after grades are made available to students.

1. **Homework (30%)** will help students develop technical skills and learn about deep learning techniques. A homework assignment given on the first day of class will test prerequisite material for this course, and a passing grade on this assignment is required to pass. Late homework will not be accepted, but the lowest homework grade will be dropped.

2. **Quizzes (10%)** check for comprehension of key concepts, often about the reading. Late quizzes will not be accepted, but the lowest quiz grade will be dropped.

3. **Presentations and discussions of papers (30%)** will provide students with experience with reading, understanding, presenting, and critiquing work about deep learning. Given a paper, presenters should deliver a presentation that clearly and effectively explains the paper to other students in the class and address questions about the paper. The audience should understand the paper well enough to ask questions and discuss the paper. If you are unsure about how to give a good presentation, then please ask.

4. **A semester project (30%)** will help students further develop technical skills and provide practical experience with preparing data, designing and implementing algorithms, performing rigorous comparisons, and describing and presenting your work.

A weighted average of your homework, quizzes, presentations and discussions of paper, and semester project grades determines your course letter grade.

Attendance
You should attend lectures.

Accommodations
Emory University complies with the Americans with Disabilities Act of 1990 and provides reasonable accommodations to students with disabilities. If you are registered with the Office of Accessibility Services and would like to receive accommodations for this course, then please inform me as soon as possible. Any information about disabilities or accommodations will be kept as confidential as possible.

Safety and Inclusion
My goal is to create a safe and inclusive environment. If I mispronounce your name, use an incorrect pronoun, etc., then please correct me. If you do not feel safe in a classroom environment, then please inform me. Like many Emory faculty and staff, I am a mandatory Title IX reporter.

Support
I want you to do well in this course and in life. If you are struggling with emotional, psychological, or other issues that threaten your success, then please contact Emory's Counseling and Psychological Services (CAPS):
`http://counseling.emory.edu/index.html`

CAPS services are **free** to Emory students. Emory provides a variety of support services, including 24/7-assistance through Student Intervention Services at (404)-430-1120.

Academic Integrity
All students are expected to be familiar with and abide by the Laney Graduate School Honor Code. All suspected violations of the Honor Code will be referred to the Dean of the Laney Graduate School:
`http://gs.emory.edu/handbook/honor-conduct-grievance/honor/index.html`

In particular, all work should be your original work and reflect your understanding of the material. Any assistance must be approved by the instructor beforehand and appropriately acknowledged in your work upon submission. All homework, quizzes, and paper presentations must be completed independently, and the paper discussions and semester projects may be completed with others. You must cite any reused text, tables, and figures in your assignments, and you may not copy code, including from websites or open-source libraries. Other actions may also constitute academic misconduct; if in doubt, then consult the Laney Graduate School Honor Code and your instructor beforehand.