

00137130/00101755: Deep Learning: Algorithms and Applications Spring 2020

Lectures: Tuesdays 1:00–2:50 pm and even Thursdays 10:10 am–noon, 307 Classroom Building 2

Instructor: Wei Lin (weilin@math.pku.edu.cn)

Office hours: Thursdays 2:00–4:00 pm, 1547 Science Building 1

Teaching Assistants: Ruotai Li (liruotai@pku.edu.cn), Xinyi Shen (ssxy00@pku.edu.cn)

Office hours: TBD

Course Description:

Deep learning plays a key role in modern AI. This course introduces the theory, algorithms, and applications of deep learning. Prerequisite: an introductory course in machine learning or statistical learning.

References:

1. Goodfellow, I., Bengio, Y. and Courville, A. (2016). *Deep Learning*. MIT Press.
2. Stevens, E., Antiga, L. and Viehmann, T. (2020). *Deep Learning with PyTorch*. Manning.

Lecture Schedule:

Part I: Deep Learning (DL) Basics

1. Feedforward networks (3 hours)
2. Regularization for DL (3)
3. Optimization for DL (3)
4. Convolutional networks (3)
5. Recurrent networks (3)
6. Generative adversarial networks (3)

Part II: Practice of DL

7. PyTorch basics (2)
8. DL with PyTorch (2)
9. Large-scale DL (2)
10. Applications to computer vision (3)
11. Applications to natural language processing (3)

Part III: Advanced Topics

12. Generalization bounds for DL (3)
13. Analysis of stochastic gradient descent (3)
14. The double-descent phenomenon and interpolators (2)

Homework:

About four homework sets will be assigned during the semester. Homework will be collected in class; however, if you missed the class, contact the TAs to turn in your homework, possibly via email, by the end of the due date. No late homework after the due date will be accepted.

Exams and Projects:

There will be a 2-hour, closed-book midterm exam on Tuesday, April 28. There will be no final exam, but students need to work in groups of two to four on a final project. Proposals of project topics (1–2 pages) are due by Tuesday, May 12. Oral presentations of projects are scheduled on Tuesday, June 2 and Thursday, June 4. Written reports of projects are due Tuesday, June 9.

Grading:

The course grade breaks down as follows: homework 30%, midterm exam 30%, and project 40%.

Websites:

Course materials and homework assignments will be posted on the course website at www.math.pku.edu.cn/teachers/linw/37130s20.html or course.pku.edu.cn.