Optimization for Machine Learning – CSED490Y
Week 01-1: Introduction

Namhoon Lee

POSTECH

Spring 2022

Welcome everyone!!! ☺

Registration

▶ 10 students registered so far (**UG**/PG)

▶ probationary period (17 Feb – 2 Mar)

Team

Instructor:

- ▶ Namhoon Lee (namhoonlee@postech.ac.kr)
- ▶ Assistant Professor in CSE and AI
- ▶ Faculty member in the ML Lab
- ▶ PI in the Lee Optimization Group

Teaching assistant:

- ▶ Jinseok Chung (jinseokchung@postech.ac.kr)

Class assistant:

- ▶ Hiring! (will discuss more later)

    ↳ Dongyun

A quick summary

Motivation:

- ▶ Optimization lies at the very heart of machine learning and artificial intelligence.

Topics include:

- ▶ basics of convex optimization, first-order methods, stochastic methods, second-order methods, accelerated methods, and some modern approaches to large-scale optimization, and non-convex optimization

Students will:

1. learn fundamental ideas in optimization for machine learning, and
2. gain practical experience by performing a group project.

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  ▶ NO.

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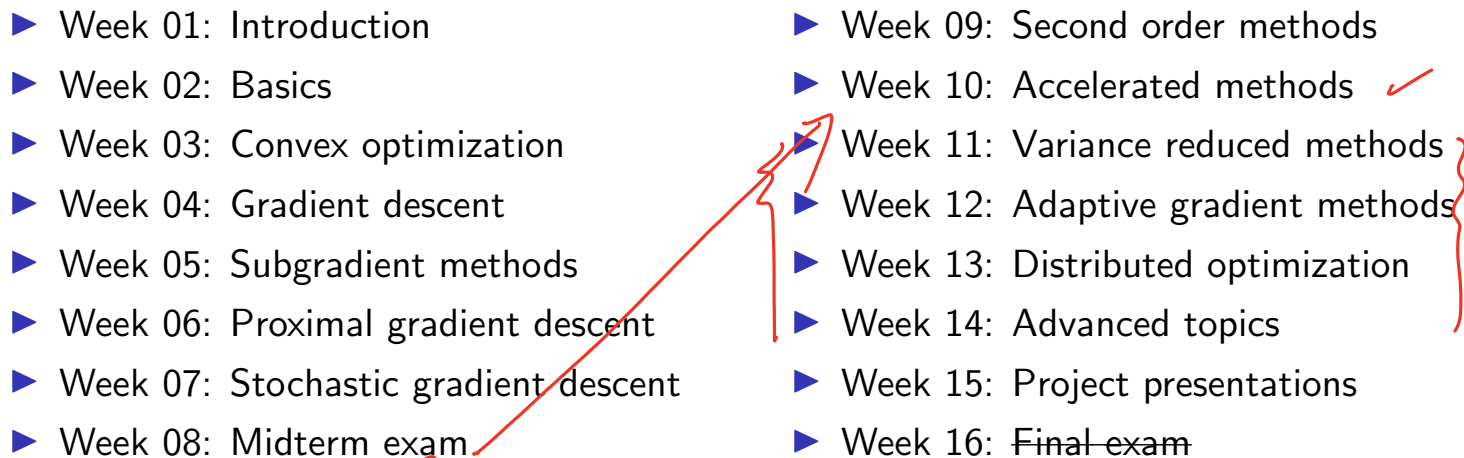My math skills are quite rusty. Can I still take this course?

- ▶ YES.

I'm an undergraduate student. Should I be worried about graduate students in the same classroom?

- ▶ NO.

I want to work alone for the project. Is it okay?

- ▶ YES.

Weekly schedule

- Week 01: Introduction
- Week 02: Basics
- Week 03: Convex optimization
- Week 04: Gradient descent
- Week 05: Subgradient methods
- Week 06: Proximal gradient descent
- Week 07: Stochastic gradient descent
- Week 08: Midterm exam

- Week 09: Second order methods
- Week 10: Accelerated methods
- Week 11: Variance reduced methods
- Week 12: Adaptive gradient methods
- Week 13: Distributed optimization
- Week 14: Advanced topics
- Week 15: Project presentations
- Week 16: ~~Final exam~~

Weekly schedule

▶ No class on holidays (Mar 9, Jun 1)
▶ No class on exam weeks (Apr 13, Jun 8) except for the exam and presentations
▶ Subject to change
  ▶ We might swap W8 with W10.
▶ Announcements will be made on PLMS.

Course website

Optimization for Machine Learning

Optimization lies at the very heart of machine learning driving the success of modern artificial intelligence. This course offers introductory lectures on the fundamental ideas in mathematical optimization for machine learning. Students will also gain practical experience by performing a mini group project throughout the course.

General

Code   CSED490Y
Term   Spring 2022
Audience   UG and PG students at POSTECH

Meet

Lectures   Mondays and Wednesdays 11am-12:15pm (on Zoom)
Office hours   Thursdays 5-6pm (by appointment)
Online   PLMS

Staff

Instructor   Namhoon Lee (namhoonlee@postech.ac.kr)
TA   Jinseok Chung (jinseokchung@postech.ac.kr)
CA   t.b.a.

✓ https://namhoonlee.github.io/courses/optml

Lectures

- ▶ Monday and Wednesday from 11am to 12:15pm
  - ▶ Access Zoom meeting via PLMS
  - ▶ Have your camera and microphone ready at all time.

---

[1]except that the university rule requires to attend at least 75% lectures to receive credits.

Lectures

- Monday and Wednesday from 11am to 12:15pm
  - Access Zoom meeting via PLMS
  - Have your camera and microphone ready at all time.
- Attendance is *not* mandatory [1], but
  - be ready for pop quizzes, and
  - there wil be no video recording.
  - You can also get Participation scores by engaging in live discussion.

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Office hours

- Thursday 5–6pm (by appointment)
- Offline (Engineering bldg 2, Room 227) or online (Zoom)
- We could discuss pretty much anything:
    - Course materials (*e.g.*, project)
    - Research advising (*e.g.*, internship)
    - General advising (*e.g.*, academic, career)

Communication

Method	For
Lecture	course delivery, live discussion
PLMS	announcement, peer-discussion
Office hours	offline meeting, advising
Email	other inquiries
OptML	reference

We will be speaking in English at all time.

Group project

1. Create a team of up to three members.
2. Pick a topic of your interest.
   - ▶ Empirical study of *any* optimization and machine learning method.
3. Work on it throughout the course.
4. Submit results:
   - ▶ Submit a 1-page proposal report (by the beginning of W8).
   - ▶ Submit a 3-page final report and code (by the beginning of W15).
   - ▶ Do a final presentation (during W15-W16).

Grading – Overview

Participation	Quizzes	Midterm exam	Project	Total
5	15	40	40	100

Grading – Participation

Total scores: 5 (out of 100)

- ▶ To encourage active discussion in and out the classroom.
    - ▶ To receive the full scores, you must engage in discussions at least 5 times.
    - ▶ 3 and 2 points for asking 3 and addressing 2 questions, respectively.

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- ▶ CA will assess/record/track your activities.

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Participation scores can have a critical impact on your final grade.

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Main duty:

- ▶ Check and record student particiation.
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To apply:
- ▶ Email me today including some description of your previous experience.

Grading – Quizzes

Total scores: 15 (out of 100)

- ▶ There will be 3 quizzes throughout the course.
    - ▶ 5 scores each time
- ▶ It will take place during lecture without notice.
- ▶ If you miss it by being late or absent, expect to receive 0 score.

Total scores: 40 (out of 100)

- ▶ Date: Monday of the exam week *(W 8 or W 10)*
- ✓ ▶ Location: on campus
    - ▶ If you don't turn up, expect to receive 0 score.
- ▶ Based on all the stuff delivered during classes till then

Grading – Project

Total scores: 40 (out of 100)

▶ Proposal report: 5
▶ Presentation: 10
▶ Final report: 25

We will discuss more later about the evaluation criteria.

Grading – Others

▶ Letter grading (A, B, C, with +/0/-, or F) *or* S/U
  ▶ Relative evaluation
  ▶ Percentages to be decided based on the final distribution (and number of students).
▶ Grading will be generous ☺, but
  ▶ no soliciting please (*e.g.*, "This is my last semester", "I need to graduate", ...).
▶ No cheating or plagiarism

Academic integrity

If you get caught cheating, you will

- ▶ have to leave the course effective immediately, and
- ▶ be reported to the department for further regulations.

Some examples – let's have a look

- ▶ POSTECH regulations (S01-6-2)
- ▶ Any standard rules by other places (*e.g.*, CMU Computer Science)

Please don't cheat.

Remarks

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Any questions?