

Introduction to AI602: Recent Advances in Deep Learning

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KAIST AI

Course Information

- Goal: Cover a very partial subset of recent advances in deep learning
- Course homepage: https://alinlab.kaist.ac.kr/ai602_2024.html
 - Slides are made by students in Algorithmic Intelligence Laboratory
 - Reference papers will be uploaded for each class (we have no textbook)
- Zoom link for the class (throughout the semester)
 - <https://kaist.zoom.us/j/84475287117>
- Office hours: Every Tuesday, 10:15am-11am, after the class (on demand)

Instructor and TAs

- Instructor: Jinwoo Shin
 - Professor, KAIST AI and EE
 - Email: jinwoos@kaist.ac.kr

- TA
 - Kyungmin Lee, kyungmnlee@kaist.ac.kr

Prerequisites

- How much backgrounds do I need?
 - This course is not an introductory course to deep learning
 - I will cover some backgrounds quickly, but not spend too much time
 - For example, I will not teach how to use TensorFlow or PyTorch
 - Very sorry, but if you worry about this, please drop the class
- For example, I assume all students know the following concepts
 - Supervised, unsupervised and reinforcement learning
 - Popular neural architectures (e.g., RNN, CNN, LSTM, GNN, ResNet, Transformers)
 - Stochastic gradient descent
 - Batch normalization
 - Overfitting, underfitting and regularization
 - Reparameterization tricks
 - Popular generative models (e.g., Diffusion models, GAN, VAE)

(Tentative) Schedule

- Each Lecture X ($X > 0$) would take a day (or often two or more days)
 - Between lectures, there would be paper presentations by students
- Lecture 0: Introduction to AI602
- Lecture 1: Recent neural architectures for vision I: Discriminative models
- Lecture 2: Recent neural architectures for vision II: Generative models
- Lecture 3: Recent neural architectures for language
- Lecture 4: Foundation models for language
- Lecture 5: Foundation models for vision
- Lecture 6: ML Safety and out-of-distribution detection
- Lecture 7: Neural fields and high-dimensional vision

Assignments: 1 Presentation + 1 Report

- We will provide a list of papers in a Google Sheet by **03/04 (4th March)**.
 - You have to choose a paper
 - **The chosen paper is used for your presentation and report**
 - You cannot choose a paper chosen by another student (first-come-first-serve)
 - If you do not choose your paper until **03/07 (7th March)**, you will be assigned to a random paper.

- Presentation (free format)
 - Present the paper's contents, e.g., motivation, problem, contribution, method, experiments, etc.
 - Your talk would be around 10-15 minutes, i.e., 10-20 slides.
 - You do not need to include your own experimental results
 - Presentation schedules will be announced on **03/08 (8th March)**.

Assignments: 1 Presentation + 1 Report

- Report (free format, e.g., use NeurIPS or CVPR format)
 - Try to reproduce some results of the paper
 - Try to criticize the weakness of the paper.
 - Try to improve the results of the paper
 - Due is on **6/16 (16th June)** (send your pdf to TA via email)
- How to criticize the paper?
 - You can criticize the paper upon your reproduced results
 - You can criticize the method fails in a different setup/problem, e.g., if some assumption does not hold
 - You can criticize the method in a way that it is suboptimal, i.e., there is a better method for the same problem
- How to improve the paper?
 - Try to resolve one of criticisms you found by your own idea, with supporting experimental results
 - At least, you can find better hyper-parameters to improve the results

Grading Policy

- Presentation 20% + Report 60% + Attendance 20%
 - You will be graded by the absolute scores, and not by the relative rankings. You will not compete with anybody.
 - You should attend at least 70% of classes (otherwise, 0 credit for attendance).
 - The attendance score will be calculated as follows:
$$\text{Attendance Score} = 20 * x \text{ if } x > 0.7 \text{ else } 0$$
$$x = (\# \text{ of attended classes} / \# \text{ of total classes})$$
 - For the attendance criteria, one is considered as "attended" if his/her zoom access log is more than 50 minutes and **your video is on (for showing your face)**. Otherwise, it is considered as "absent".
 - Please make sure your face is on your camera
 - TAs will record the video to check the attendance
- When you enter in Zoom session, please set your Zoom-name as "[student ID] [Name]" (e.g., 20217018 Junsu Kim)
 - Please check your student ID and write your name in English
 - If you are using more than two IDs (e.g., for camera), please identify them with identifier ,e.g., (camera) 20217018 Junsu Kim