

# Hanseul Cho (조한슬)

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## Personal Profile

I am a Ph.D. candidate at Kim Jaechul Graduate School of AI, Korea Advanced Institute of Science and Technology (KAIST AI). I am fortunate to be advised by Prof. Chulhee “Charlie” Yun of Optimization & Machine Learning (OptiML) Laboratory, KAIST AI. Previously, I worked at Google NYC as an intern (Student Researcher), hosted by Srdinadh Bhojanapalli. Also, I completed my M.Sc. (in AI) and B.Sc. (in Math, minor in CS, Summa Cum Laude) at KAIST.<sup>?</sup>

My primary research interests lie in optimization, machine learning (ML), and deep learning (DL). During my journey to a Ph.D., my ultimate research goal is to **rigorously understand and practically overcome** the following **three critical challenges** in ML/DL:

### Generalizability

#### Generalization capabilities of modern language models.

(e.g., length generalization and compositional generalization of Transformers)

### Adaptability

#### Training adaptable models under an evolving environment.

(e.g., continual learning, maintaining the plasticity of neural networks, sample-efficient reinforcement learning)

### Multifacetedness

#### Learning with multiple (possibly conflicting and/or orthogonal) goals.

(e.g., minimax optimization, bi-level optimization, fairness in ML)

## Publications

### International Conferences

- [C9] Chang, Hoyeon<sup>★</sup>, Jinho Park<sup>★</sup>, Hanseul Cho<sup>★</sup>, Sohee Yang, Miyoung Ko, Hyeyonbin Hwang, Seungpil Won, Dohaeng Lee, Youbin Ahn, Minjoon Seo. “Characterizing Pattern Matching and Its Limits on Compositional Task Structures.” **ICLR 2026**. [\[arXiv\]](#) [\[OpenReview\]](#)
- [C8] Cho, Hanseul<sup>★</sup>, Jaeyoung Cha<sup>★</sup>, Srinadh Bhojanapalli, Chulhee Yun. “Arithmetic Transformers Can Length-Generalize in Both Operand Length and Count.” **ICLR 2025**. [\[arXiv\]](#) [\[OpenReview\]](#)
- [C7] Jung, Hyunji<sup>★</sup>, Hanseul Cho<sup>★</sup>, Chulhee Yun. “Convergence and Implicit Bias of Gradient Descent on Continual Linear Classification.” **ICLR 2025**. [\[arXiv\]](#) [\[OpenReview\]](#)
- [C6] Cho, Hanseul<sup>★</sup>, Jaeyoung Cha<sup>★</sup>, Pranjal Awasthi, Srinadh Bhojanapalli, Anupam Gupta, Chulhee Yun. “Position Coupling: Improving Length Generalization of Arithmetic Transformers Using Task Structure.” **NeurIPS 2024** & Short version in ICML 2024 Workshop on Long-Context Foundation Models (LCFM). [\[arXiv\]](#) [\[OpenReview\]](#)
- [C5] Shin, Baekrok<sup>★</sup>, Junsoo Oh<sup>★</sup>, Hanseul Cho, Chulhee Yun. “DASH: Warm-Starting Neural Network Training in Stationary Settings without Loss of Plasticity.” **NeurIPS 2024** & Short version in ICML 2024 Workshop on Advancing Neural Network Training (WANT): Computational Efficiency, Scalability, and Resource Optimization. [\[arXiv\]](#) [\[OpenReview\]](#)
- [C4] Lee, Jaewook<sup>★</sup>, Hanseul Cho<sup>★</sup>, Chulhee Yun. “Fundamental Benefit of Alternating Updates in Minimax Optimization.” **ICML 2024** & Short version in ICLR 2024 Workshop on Bridging the Gap Between Practice and Theory in Deep Learning (BGPT). [\[arXiv\]](#) [\[OpenReview\]](#)
- **Spotlight at ICML 2024. (Top 3.5%: (144+191) of 9,473 valid submissions)**
- [C3] Lee, Junghyun<sup>★</sup>, Hanseul Cho<sup>★</sup>, Se-Young Yun, Chulhee Yun. “Fair Streaming Principal Component Analysis: Statistical and Algorithmic Viewpoint.” **NeurIPS 2023**. [\[arXiv\]](#) [\[OpenReview\]](#)
- [C2] Lee, Hojoon<sup>★</sup>, Hanseul Cho<sup>★</sup>, Hyunseung Kim<sup>★</sup>, Daehoon Gwak, Joonkee Kim, Jaegul Choo, Se-Young Yun, Chulhee Yun. “PLASTIC: Improving Input and Label Plasticity for Sample Efficient Reinforcement Learning.” **NeurIPS 2023**. [\[arXiv\]](#) [\[OpenReview\]](#)
- [C1] Cho, Hanseul<sup>★</sup> and Chulhee Yun. “SGDA with Shuffling: Faster Convergence for Nonconvex-P $\ell$  Minimax Optimization.” **ICLR 2023**. [\[arXiv\]](#) [\[OpenReview\]](#)

### Notable Domestic Journals/Conferences

- Cho, Hanseul<sup>★</sup>, Baekrok Shin<sup>★</sup>, Chaewon Moon<sup>★</sup>, Sang-Geun Hong, U-Ju Byeon, Jin-Yong Sung, Chulhee Yun. “Deep Model-Based Optimization of Jamming Effectiveness under Aircraft AESA Radar Operational Environments.” *The Journal of Korean Institute of Communications and Information Sciences (J-KICS)*, vol. 50, no. 11, pp. 1647-1659, 2025. DOI: 10.7840/kics.2025.50.11.1647. [\[Info\]](#)
- Jung, Hyunji<sup>★</sup>, Hanseul Cho<sup>★</sup>, Chulhee Yun. “Convergence and Implicit Bias of Gradient Descent on Continual Linear Classification.” *Short version in the 11th Joint Conference of Korean Artificial Intelligence Association (JKAIA 2024)*.
  - **Best Paper Award (Top 3) & Oral presentation.**
- Cho, Hanseul<sup>★</sup> and Chulhee Yun. “SGDA with Shuffling: Faster Convergence for Nonconvex-P $\ell$  Minimax Optimization.” *Short version in the 7th Joint Conference of Korean Artificial Intelligence Association (JKAIA 2022)*.
  - **NAVER Outstanding Theory Paper Award (Top 3) & Oral presentation.**

? You can find the source code of this CV [here](#).

★ Co-first authors: These authors contributed equally.

★ Sole first authors.

## Education

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### Korea Advanced Institute of Science and Technology (KAIST)

Ph.D. in Artificial Intelligence

- Advisor: Prof. Chulhee Yun (Optimization & Machine Learning (**OptiML**) Laboratory, Kim Jaechul Graduate School of AI (GSAI), KAIST)
- Anticipated Graduation Date: Aug. 2027

Seoul, Republic of Korea

Sep. 2023 – Current

### KAIST

M.Sc. in Artificial Intelligence

- Advisor: Prof. Chulhee Yun (Optimization & Machine Learning (**OptiML**) Laboratory, Kim Jaechul Graduate School of AI (GSAI), KAIST)
- Thesis: "Improved Convergence Rate of SGDA by Shuffling: Focusing on the Nonconvex-P $\ell$  Minimax Problems" (Approved by Chulhee Yun, Se-Young Yun, & Donghwan Kim)
- GPA: 4.22/4.3

Seoul, Republic of Korea

Mar. 2022 – Aug. 2023

### KAIST

B.Sc. in Mathematical Sciences

- Minor in Computing Sciences
- Summa Cum Laude (GPA: 4.05/4.3)

Daejeon, Republic of Korea

Mar. 2017 – Feb. 2022

### University of Twente

Exchange Student Program

- Major in Applied Mathematics

Enschede, Netherlands

Feb. 2020 – Jul. 2020

### Incheon Science High School (ISHS)

High School

- Early graduation by one year (i.e., two-year course)

Incheon, Republic of Korea

Mar. 2015 – Feb. 2017

## Experiences

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### Google G

Internship: Student Researcher Program (On-Site), Engineering

New York, NY, United States

May 5th 2025 – Aug. 22nd 2025

- Host: Srinadh Bhojanapalli (Staff Research Scientist at Google DeepMind)
- Notable Co-workers: Hrayr Harutyunyan & Amir Keivan Mohtashami (Research Scientists at Google DeepMind)
- Office: Google NYC, 9th Building (111 8th Ave, New York, NY)
- Research Topic: Advanced attention mechanisms of Transformers for long contexts

### KAIST 2021 Post-AI Research Project

Daejeon, Republic of Korea

May 2021 – Dec. 2021

Undergraduate Researcher

- Jointly advised by Prof. Sangyoon Yi (DS Lab, GSFS, KAIST) & Prof. Jinkyoo Park (Sys. Int. Lab, ISysE, KAIST)
- Project: Research on 'AI-augmented Organizations' of Collaborative Decision Making and Learning. Below, I list my contribution:
  1. *Algorithm Design*: Devised a model-based randomized algorithm for a single-player finite-horizon NK landscape optimization game
  2. *Experiment Assistance*: Conducted experiments on human-AI cooperation based on the algorithm that I devised

### Individual Study: Optimization for Deep Learning

Daejeon, Republic of Korea

Mar. 2021 – Jun. 2021

Undergraduate Student @ KAIST

- Advised by Prof. Jinwoo Shin (ALIN Lab, GSAI, KAIST)
- (1) Gradient-based optimizers for large-batch setting (e.g., LARS & LAMB); (2) Theoretical analysis on gradient clipping (paper reading)

### Individual Study: Deep Learning in Computer Vision

Daejeon, Republic of Korea

Sep. 2020 – Feb. 2021

Undergraduate Student @ KAIST

- Advised by Prof. Jong-chul Ye (BISPL, BBE, KAIST)
- Assignment: Semantic segmentation of kidney tumor with U-Net (with KiTS19 challenge dataset)
- Self-taught PyTorch coding on Linux Ubuntu

### Individual Study: Statistical Learning Theory

Daejeon, Republic of Korea

Jun. 2020 – Aug. 2021

Undergraduate Student @ KAIST

- Advised by Prof. Yeonseung Chung (MAS, KAIST)
- Resource: Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani. "An Introduction to Statistical Learning: with Applications in R." Springer, 2013. [[link](#)]

## Seminars

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### SNU-KAIST AI/ML Theory Workshop

Organizer

- Homepage: [nick-jhlee.github.io/snu-kaist-workshop](http://nick-jhlee.github.io/snu-kaist-workshop)
- Jointly organized by three research groups of Prof. Ernest K. Ryu, Prof. Min-hwan Oh, and Prof. Chulhee Yun.

Gangneung, Republic of Korea

Aug. 12th–14th, 2024

### Machine/Deep Learning Theory + Physics (MDLTP) Seminar

Organizer

- Homepage: [sites.google.com/view/mdltp-p](https://sites.google.com/view/mdltp-p)
- Jointly organized by OSI Lab, OptiML, and CSSPL
- Topics: Learning theory, loss landscape, trajectory analysis, (stochastic) optimization, high-dimensional statistics, statistical/mathematical physics, scientific machine learning, and more.

Seoul, Republic of Korea

Jul. 2022 – Feb. 2023

### Geometric Deep Learning Seminar

Participant

- A seminar organized by OptiML and OSI Lab
- Resources: [\[Homepage\]](#) [\[Lecture Videos\]](#) [\[Book\]](#)

Seoul, Republic of Korea

2022

## Awards

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2025	<b>Top Reviewer (Top 1.88%: 206 of 10,943 reviewers)</b> , ICML 2025	Vancouver, Canada
2024	<b>Best Paper Award (Top 3)</b> , JKAIA 2024	Republic of Korea
2024	<b>Top Reviewer (Top 8.60%: 1,304 of 15,160 reviewers)</b> , NeurIPS 2024	Vancouver, Canada
2022	<b>NAVER Outstanding Theory Paper Award (Top 3)</b> , JKAIA 2022	Republic of Korea
2022	<b>Summa Cum Laude</b> , Bachelor's, KAIST	Republic of Korea
2017 – 2020	<b>The National Scholarship for Science and Engineering</b> , Korea Student Aid Foundation	Republic of Korea
2017 Fall	<b>Dean's List</b> , The School of Freshman, KAIST	Republic of Korea

## Services

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### Top-tier ML Conference/Journal Reviewer (24 papers)

From time to time

- NeurIPS: 2023 (), 2024\* ( ), 2025 ()
  - NeurIPS 2024: awarded Top Reviewer (Top 8.60%: 1,304 of 15,160 reviewers).
- ICML: 2025\* ( )
  - ICLR 2025: awarded Top Reviewer (Top 1.88%: 206 of 10,943 reviewers).
- ICLR: 2024 ( ), 2025 ( ), 2026 ( ).
- TMLR ( ).

### 1st GPU server manager of OptiML lab

June 2022 – Feb 2024

- Being involved in installing OptiML lab's very first 5 GPU servers and a storage server
- Allocating GPU nodes to lab members
- Managing errors occurred in the servers

### Tutoring Basic Courses for Freshmen at KAIST

Mar 2018 – Dec 2021

- Calculus II (2018–2019; 3 times), Introduction to Programming (Fall 2021)
- Allocating GPU nodes to lab members
- Managing errors occurred in the servers

## Languages

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**English** Professional Proficiency (i.e., sufficient for academic activities)

**Korean** Native proficiency

**Others** Had some introductory courses on French, German, Classical Latin, & Chinese.

# Skills

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**Programming** Familiar: Python  (PyTorch, NumPy, Scikit-learn, Jupyter, Pandas, JAX, etc.), MATLAB.

Novice: C, C++, R, HTML/CSS, Scala

**Computer Misc.** Familiar:  (Overleaf/VSCode/MacTex), Git , Microsoft Office, Keynote

Novice: Adobe (Lightroom, Premiere Pro, After Effects, Photoshop)

**Music & Hobby** Playing the drums  and percussion. Begun to learn in 2009. Joined music bands listed below:

- ISHS: *Cha-rang* (2015–2016)
- KAIST: *Muse KAIST* (2017–2019), *Carpe Diem* (2019)
- Club “Music Space”: Team *Woodstone* (2024–2025)
- Team “*Kira-Kira Yoon(tentative name)*” (2025–current)

I'm a huge music fan, especially for jazz, funk, K-indie, rock, blues, Latin, house, and many more.