# MINHAK SONG

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## EDUCATION

**Korea Advanced Institute of Science and Technology** Mar 2020 – Current
*Daejeon, South Korea* (Expected graduation: Aug 2026)
B.S. in Industrial & Systems Engineering and Mathematical Sciences (double major) GPA: 4.19/4.3
Admitted as KAIST Presidential Fellow (KPF, top 3%)
2 years leave of absence for mandatory military service (Feb 2023 – Nov 2024)

**University of California, Berkeley** Jun 2022 – Oct 2022
*Berkeley, United States*
Exchange Student, $10,000 funding from KAIST Presidential Fellowship

**Korea Science Academy of KAIST** Mar 2017 – Feb 2020
*Busan, South Korea*

## RESEARCH INTERESTS

Theoretical Foundations of Modern Machine Learning; Optimization; Online learning; Statistics

## PUBLICATIONS

(* denotes equal contribution)

[3] "Does SGD really happen in tiny subspaces?" **Minhak Song**, Kwangjun Ahn, and Chulhee Yun, ***ICML 2024 Workshop*** *on High-dimensional Learning Dynamics: The Emergence of Structure and Reasoning.* [arXiv:2405.16002]

[2] "Linear attention is (maybe) all you need (to understand Transformer optimization)." Kwangjun Ahn*, Xiang Cheng*, **Minhak Song***, Chulhee Yun, Ali Jadbabaie, and Suvrit Sra, *Internation Conference on Learning Representations (**ICLR**), 2024.* [Paper] [arXiv:2310.01082]

[1] "Trajectory Alignment: Understanding the Edge of Stability Phenomenon via Bifurcation Theory." **Minhak Song** and Chulhee Yun, *Neural Information Processing Systems (**NeurIPS**), 2023.* [Paper] [arXiv:2307.04204]

## RESEARCH AND WORK EXPERIENCE

**KAIST Optimization & Machine Learning Laboratory** Jan 2022 – Current
*Undergraduate Researcher* *Seoul, South Korea*

- Advisor: Prof. Chulhee Yun
- Research Topics: Deep Learning Theory, Optimization

**Upstage AI** Sep 2022 – Dec 2022
*AI Research Engineer Intern* *Seoul, South Korea*

- Designed real-time recommendation models using contextual bandit algorithms for e-commerce service

**KAIST Applied Artificial Intelligence Laboratory** Jun 2021 – Dec 2021
*Undergraduate Researcher* *Daejeon, South Korea*

- Advisor: Prof. Il-Chul Moon
- Research Topics: Deep Generative Model, Inverse Problem

## SELECTED AWARDS AND SCHOLARSHIPS

**ICLR 2024 Travel Award** 2024

**NeurIPS 2023 Travel Award** 2023

**Korea Presidential Science Scholarship** 2020 – Current

· $45,000 financial support for honorable undergraduates from Korean government

**KAIST Presidential Fellowship** 2020 – Current

· Honor Society of KAIST (Advisor: Prof. Jaeyoung Byeon)
· $30,000 financial support and matching mentor professor
· 28 undergraduates were selected in around 800 freshmen in KAIST

**KAIST Alumni Academic Scholarship** 2021 – Current

· $15,000 financial support (20 undergraduates in KAIST were selected)

**Simon Marais Mathematics Competition, 7th place & Merit Prize** 2021

· Merit Prize winner, awarded for creative and insightful work on any problem

**Department Valedictorian** 2021 Spring, 2021 Fall, 2022 Spring

· Academic scholarship awarded to the top student (ranked #1) among undergraduates

**Dean's List** 2021 Spring, 2021 Fall, 2022 Spring

· Top 3% of undergraduates with outstanding academic performance

**Talent Award of Korea** 2019

· Recognizes those individuals who are likely to become Korea's future leaders and have performed exemplary talents or outstanding meritorious service
· 50 high school students, 40 college students, and 10 adults are selected by Korean government

**Han Sung Son Jae Han Scholarship for Gifted Students** 2018 – 2019

· $10,000 financial support for honorable high school students in South Korea

**Korean Young Physicists' Tournament, Grand Prize** 2018

## TEACHING & ACADEMIC ACTIVITIES

**Deep Learning Theory Workshop and Summer School** Aug 2022
*Summer Cluster: Deep Learning Theory* *Berkeley, United States*

· Participant, Simons Institute for the Theory of Computing Workshop

**Academic Tutor, KAIST** 2021

· Calculus I (2021 Spring), Calculus II (2021 Fall)

## PROFESSIONAL SERVICES

- **Conference Reviewer:** NeurIPS 2024, ICLR 2025

## SKILLS

- **Languages:** Korean (mother tongue), English (fluent)
- **Computer Languages & Software:** Python, LaTeX, MATLAB