

MINHAK SONG

Personal website: <http://songminhak.github.io>

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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; Sampling; Statistics

PUBLICATIONS

(* denotes equal contribution)

- [3] “Does SGD really happen in tiny subspaces?” **Minhak Song**, Kwangjun Ahn, and Chulhee Yun, Manuscript, 2024. Short version at **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, International Conference on Learning Representations (**ICLR**), 2024. Short version at **NeurIPS 2023 Workshop** on Mathematics of Modern Machine Learning (**oral presentation**). [[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
<i>Summer Cluster: Deep Learning Theory</i>	<i>Berkeley, United States</i>
· 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

SKILLS

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