

# MINHAK SONG

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

Contact: [minhaksong@kaist.ac.kr](mailto:minhaksong@kaist.ac.kr)

## EDUCATION

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**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  
\$10,000 funding from KAIST Presidential Fellowship

**Korea Science Academy of KAIST** Mar 2017 - Feb 2020  
Busan, South Korea  
Graduated with distinction in overall GPA GPA: 4.11/4.3

## RESEARCH INTERESTS

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Theoretical Foundations of Modern Machine Learning; Optimization; Sampling; Statistics

## PUBLICATIONS

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(\* denotes equal contribution, alphabetical order)

- [2] (**ICLR'24, NeurIPS'23 Oral**) Kwangjun Ahn\*, Xiang Cheng\*, **Minhak Song\***, Chulhee Yun, Ali Jadbabaie, Suvrit Sra (2023). "Linear attention is (maybe) all you need (to understand Transformer optimization)." In *the Twelfth International Conference on Learning Representations*. Short version at *NeurIPS 2023 Workshop on Mathematics of Modern Machine Learning (M3L)*, selected for **oral presentation**. [[arXiv: 2310.01082](https://arxiv.org/abs/2310.01082)]
- [1] (**NeurIPS'23**) **Minhak Song** and Chulhee Yun (2023). "Trajectory Alignment: Understanding the Edge of Stability Phenomenon via Bifurcation Theory." In *Advances in Neural Information Processing Systems 36*. [[arXiv: 2307.04204](https://arxiv.org/abs/2307.04204)]

## RESEARCH AND WORK EXPERIENCE

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- KAIST Optimization & Machine Learning Laboratory** Jan 2022 - Current  
*Undergraduate Researcher* *KAIST AI*
- Advisor: Prof. Chulhee Yun
  - Research topics: Deep Learning Theory, Optimization
- Upstage (AI startup)** Sep 2022 - Dec 2022  
*AI Research Engineer Intern* *Upstage AI*
- Designed real-time recommendation models using contextual bandit algorithms for e-commerce service
- KAIST Applied Artificial Intelligence Laboratory** Jun 2021 - Dec 2021  
*Undergraduate Researcher* *KAIST ISysE*
- Advisor: Prof. Il-Chul Moon
  - Research topics: Deep Generative Model, Inverse Problem

## SELECTED AWARDS AND SCHOLARSHIPS

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- NeurIPS 2023 Scholar Award** 2023  
*Travel Award, Neural Information Processing Systems Foundation*
- Korea Presidential Science Scholarship** 2020 - Current  
*Korea Student Aid Foundation*
- \$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  
*Scholarship for Outstanding Talent*
- \$15,000 financial support (20 undergraduates in KAIST were selected)
- Simon Marais Mathematics Competition, 7th place & Merit Prize** 2021  
*Asian-Pacific Undergraduate Mathematics Competition*
- 7th place prize winner (\$1,000)
  - Merit Prize winner, awarded for creative and insightful work on any problem (\$1,000)
- Department Valedictorian** 2021 Spring, 2021 Fall, 2022 Spring  
*Department of Industrial & Systems Engineering, KAIST*
- Academic scholarship awarded to the top student (ranked #1) among undergraduates
- Dean's List** 2021 Spring, 2021 Fall, 2022 Spring  
*College of Engineering, KAIST*
- Top 3% of undergraduates with outstanding academic performance
- Talent Award of Korea** 2019  
*Korean Deputy Prime Minister and Minister of Education*
- 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 in South Korea
- 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
- Conducted a scientific research to investigate open-ended real-world problems – “*Ring Oiler*” and “*Radiant Lantern*” – and presented the results in the physicists' tournament (Grand Prize, 1st place)

## TEACHING & ACTIVITIES

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- 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)
- Student Council, KAIST** 2021
- Undergraduate student representative in Department of Industrial & Systems Engineering, KAIST
- Educational Volunteering Club, SEED KAIST** 2021
- Educational volunteer for multicultural families and marginalized classes
- International Science Camp** Aug 2019  
*programmes: Renewable Energy, Laser Physics, Astrophysics* Göttingen, Germany
- Science camp with lab research experience in XLAB and University of Göttingen hosting 32 participants from 11 different countries; expense fully covered by Korea Science Academy of KAIST
- Imperial Global Summer School** Jul 2018  
*programme: Medicine and Life Science* London, United Kingdom
- Science camp with research experience in Imperial College London and cultural experience; expense fully covered by Korea Science Academy of KAIST

## SKILLS

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- **Languages:** Korean (mother tongue), English (fluent) - TOEFL 106
- **Computer Languages & Software:** Python, L<sup>A</sup>T<sub>E</sub>X, MATLAB

## REFERENCES

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**Prof. Chulhee Yun** KAIST AI

- Assistant Professor, Kim Jaechul Graduate School of Artificial Intelligence (GSAI), KAIST
- Directing the Optimization & Machine Learning (OptiML) Laboratory at KAIST AI
- Personal website: <https://chulheeyun.github.io>
- Contact: [chulhee.yun@kaist.ac.kr](mailto:chulhee.yun@kaist.ac.kr)

**Prof. Il-Chul Moon** KAIST ISysE

- Associate Professor, Department of Industrial and Systems Engineering (ISysE), KAIST
- Adjunct Professor, Kim Jaechul Graduate School of Artificial Intelligence (GSAI), KAIST
- Directing the Applied Artificial Intelligence Laboratory (AAILab) at KAIST ISysE
- Personal website: <https://aai.kaist.ac.kr>
- Contact: [icmoon@kaist.ac.kr](mailto:icmoon@kaist.ac.kr)