Yeongwoo **Song**

Ph.D. student

Complex Systems and Statistical Physics Lab, *KAIST, Daejeon 34141, Korea*

(+82) 10-5922-3269 | ywsong1025@kaist.ac.kr | ywssng.github.io

Summary

I am a Ph.D. student of physics with a keen interest in the latest advancements in the field of artificial intelligence (AI). My work focuses on the interdisciplinary field of physics and AI. Specifically, my research aims to solve the problems in physics with the help of AI, and vice versa, to understand the behavior and functions of AI through the lens of physics.

Research Interests

- Physics for AI: understanding and advancing deep neural networks through the lens of statistical physics and complex systems.
- AI for physics: automated discovery of physical laws or symmetries with the aid of artificial intelligence.
- not limited to above: phase transitions and critical phenomena of complex systems, learning dynamics and mechanistic interpretability of NNs, hyperbolic representations, GNNs, PINNs, etc.

Education

Korea Advanced Institute of Science and Technology (KAIST) — Daejeon, Korea

Integrated Ph.D. Program in Dept. of Physics — Mar. 2022 - Present

- Advisor: Prof. Hawoong Jeong

Korea Advanced Institute of Science and Technology (KAIST) — Daejeon, Korea

B.S. in Physics — Mar. 2016 - Feb. 2022

- Double major in Computer Science

Experience

DYPHI Inc. — Daejeon, Korea

Researcher (full-time) — Mar. 2021 - Feb. 2022

- Collaborated with Hyunchul Roh (CTO).
- Performed model development in human motion dataset establishment task from National Information Society Agency (NIA), Korea.

Dingbro Inc. — Daejeon, Korea

Research intern (full-time) — Dec. 2019 - Feb. 2020

- Collaborated with Jae-Young Jo (CEO).
- Participated in algorithm and dataset development for GNN-based protein-ligand binding prediction.

Publications[1]

Published

Towards Cross Domain Generalization of Hamiltonian Representation via Meta Learning

Yeongwoo Song & Hawoong Jeong, In: *The 12th International Conference on Learning Representations (ICLR 2024)* — 2024

Preprint / In progress

Stochastic Resetting Mitigates Latent Gradient Bias of SGD from Label Noise

Youngkyoung Bae[†], **Yeongwoo Song**[†], & Hawoong Jeong, In: *arXiv:2406.00396* — 2024

Presentations[2]

Towards Cross Domain Generalization of Hamiltonian Representation via Meta Learning

- The 12th International Conference on Learning Representations (ICLR 2024), Vienna, Austria, May. 2024 (poster)
- The 28th International Conference on Statistical Physics (STATPHYS28), Tokyo, Japan, Aug. 2023 (oral)
- The 2023 Korea Physical Society Spring Meeting, Daejeon, Korea, Apr. 2023 (oral)
- NeurIPS 2022 Workshop on Machine Learning and the Physical Sciences Workshop, New Orleans, USA, Dec. 2022 (poster)
- The 15th Asia Pacific Physics Conference, Online, Aug. 2022 (poster)

Stochastic Resetting Mitigates Latent Gradient Bias of SGD from Label Noise

- The 2024 Korea Physical Society Fall Meeting, Yeosu, Korea, Oct. 2024 (oral)
- ICLR 2024 Workshop on Bridging the Gap Between Practice and Theory in Deep Learning, Vienna, Austria, May. 2024 (poster)

[1] †: equal contribution

[2] categorized by publications

- The 2023 Korea Physical Society Fall Meeting, Changwon, Korea, Nov. 2023 (poster, *outstanding presentation award)*
- The 22nd Workshop for Statistical Physics 2023, Hwasun, Korea, Aug. 2023 (oral)

Teaching Experience

GPU/CPU Cluster Maintenance — Dept. of Physics, KAIST
Teaching/Maintenance Assistant — Feb. 2024 - Present

KAIST Cultural Events — KAIST Concert Hall
Graduate student manager, teaching assistant — Mar. 2022 - Feb. 2024

Special Topics in Physics ⟨Complex Systems: Science of 21st Century⟩ (PH489D) — Dept. of Physics, KAIST
Teaching Assistant — 2023 FA

Computational Physics (PH413) — Dept. of Physics, KAIST
Teaching Assistant — 2022 SP, 2023 SP

General Physics II (PH142) — Dept. of Physics, KAIST
Teaching Assistant — 2022 FA

Academic Services

Conference Reviewer

- ICLR 2025

Honors

Donghwa Industries Scholarship

Donghwa Industries Scholarship Foundation — Mar. 2024 - Present

- 10 Million KRW per year granted during KAIST Ph.D. Program.

Excellent Leadership and Volunteer Graduate Award

KAIST — Feb. 2022

- Awarded for showing exceptional leadership and participation in multiple volunteer acts, as one of 11 among all graduates (∼3000) in 2022.

KAIST Alumni Academic Scholarship

KAIST Alumni Association — Mar. 2017 - Feb. 2020

- A scholarship granted to students showing distinguished academic/extracurricular activities.
- 5 Million KRW per year granted for 3 years.

Undergraduate Humanities Scholarship

KAIST — Jul. 2019

- Awarded for devoting to academic studies and volunteer acts of the department, as one among all students (∼100) from Dept. of Physics.
- 1 Million KRW granted.

National Excellence Scholarship in Natural Science and Engineering

Korea Student Aid Foundation (KOSAF) — Mar. 2016 - Feb. 2019

- A scholorship to honor distinguished freshmens in natural science of the nation.
- 10 Million KRW per year granted.

Full Tuition Scholarship

KAIST — Mar. 2016 - Feb. 2022

- Straight for all semesters.

References

Hawoong Jeong
Professor — hjeong@kaist.edu
Department of Physics, KAIST, Daejeon 34141, Korea
Center for Complex Systems, KAIST, Daejeon 34141, Korea