Hae Seong Lee | Curriculum Vitae

Statistical Physics of Eco-Evolutionary Dynamics (SPEED) Lab, Department of Physics
Inha University
✉ haesung0125@gmail.com

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Research Interests

- Emergent phenomena in complex systems
- Dynamics in complex networks
- Synchronization
- Neuroscience
- Spreading Phenomena
- Language

Research Experiences

Inha University
Postdoctoral Researcher, *Mar.2025-Present*

Education

Sungkyunkwan University
Ph.D. candidate in Physics *2019–2025*
Supervisor: Prof. Beom Jun Kim

Sungkyunkwan University
B.S. in Physics, *2013–2017*

Publications

[4] *(in preparation)* **Hae Seong Lee** and Beom Jun Kim, "The effect of prior knowledge on vocabulary learning"

[3] Jae Hyung Woo, **Hae Seong Lee**, Tae-Wook Ko and Joon-Young Moon, "Hysteresis in a generalized Kuramoto model with a simplified realistic coupling function and inhomogeneous coupling strengths", Chaos, Solitons and Fractals 190, 115770 (2025).

[2] **Hae Seong Lee**, Beom Jun Kim, and Hye Jin Park "Stability of twisted states in power-law-coupled Kuramoto oscillators on a circle with and without time-delay", Phys. Rev. E 109, 064203 (2024).

[1] **Hae Seong Lee**, Jong Il Park, and Beom Jun Kim, "Modified Kuramoto model with inverse-square law coupling and spatial time delay", Physica A 582, 126263 (2021).

Skills

Programming languages: C, C++, Python, SQL, Matlab, Javascript

Computer skills: Monte-carlo simulation, CUDA programming, Agent-based simulation, MPI programming, Networkx, Latex

Honors & Awards

SKKU scholarship innovation **Sungkyunkwan University**
2022

SKKU innovative research fellowship **Sungkyunkwan University**
2022

Excellence project award **19th KIAS-APCTP Winter School on Statistical Physics**
2022

Outstanding oral presentation award **2021 Korean Physical Society Spring Meeting**
2021

Graduate merit scholarship **Sungkyunkwan University**
2019–2021

Services

Organizer of the joint journal club of statistical physicists
Sungkyunkwan U., Hanyang U., Catholic U. of Korea, and Inha U. *Aug. 2024 - Jan. 2025*

Experiences

Teaching Assistant

Thermal and Statistical Mechanics II: Spring 2020, Spring 2021

Thermal and Statistical Mechanics I: Fall 2020, Fall 2021

Analytical Mechanics II Exercise: Fall 2019

Analytical Mechanics II: Fall 2019

Analytical Mechanics I: Spring 2019

Military service

Technical Research Personnel: 2022-present

Attended schools

International schools

XII GEFENOL Summer School on Statistical Physics of Complex Systems
Madrid, Spain, *2024*
Topic: Selected topics in statistical physics

Complexity72h
Madrid, Spain, *2024*
Topic: Unraveling cancer dynamics: From multiscale stochastic models to tissue morphology

Complex Networks: Theory, Methods, and Applications
Como, Italy, *2024*
Topic: Selected topics in complex networks

CSH Winter School 2023
Obergurgl, Austria, *2023*
Topic: Integrative and Disintegrative Processes in Complex Human Societies

VII Mediterranean school on complex networks
Catania, Italy, *2022*
Topic: Selected topics in complex networks

Domestic schools

22nd KIAS-APCTP Winter School on Statistical Physics
Pohang, South Korea, *2025*
Topic: selected topics in statistical physics on biological or related synthetic systems

21st KIAS-APCTP Winter School on Statistical Physics
Pohang, South Korea, *2024*
Topic: Selected topics in statistical physics on complex systems

Complex systems summer school
Seoul, South Korea, *2023*
Topic: Lectures on "Network Science" written by Barabasi

20th KIAS-APCTP Winter School on Statistical Physics
Pohang, South Korea, *2023*
Topic: Statistical Physics of Quantum Systems

19th KIAS-APCTP Winter School on Statistical Physics
Online, *2022*
Topic: Phase transitions and critical phenomena

18th KIAS-APCTP Winter School on Statistical Physics
Online, *2021*
Topic: Kinetic models in statistical physics

17th KIAS-APCTP Winter School on Statistical Physics
Pohang, South Korea, *2020*
Topic: Machine learning for statistical physics in practice

16th KIAS-APCTP Winter School on Statistical Physics
Yeosu, South Korea, *2019*
Topic: critical phenomena and renormalization group

Presentations

International oral presentations

[6] "Hysteresis in coupled identical oscillators with generalized coupling function and coupling strength inhomogeneity", Complex Networks 2023 (Menton, France, Nov. 28, 2023)

[5] "Stability of twisted states in Kuramoto oscillators on a circle with power-law interaction strength", Roles of heterogeneity in non-equilibrium collective dynamics (RHINO 2022) (Tokyo, Japan, Sep. 18, 2022)

[4] "Twisted states in Kuramoto oscillators on a circle with distance-decaying coupling strength", 15th Asia Pacific Physics Conference (Online, Aug. 22, 2022)

[3] "Synchronization of oscillators with power-law coupling and spatial time delay", 2022 Korea-Canada Symposium and International Workshop on Multiplex Brain Networks (Calgary & Banff, Canada, Apr. 21, 2022)

[2] "The central word set in a language", Networks 2021 (Online, Jul. 5, 2021)

[1] “Modified Kuramoto model with power law coupling and spatial time delay", Conference on Complex Systems 2019 (Singapore, Sep. 30, 2019)

Domestic oral presentations

[8] "Evolution of rist-taking strategy in von Neumann poker game", Workshop on the game theory and its applications (Gwangmyeong, South Korea, Nov. 24, 2023)

[7] "Stability of Twisted States in Kuramoto Oscillators on a Circle with Distance-Decaying and Time-Delayed Coupling", 2023 Korean Physical Society Spring Meeting (Daejeon, Apr. 20, 2023)

[6] "The compartment learning model and the core vocabulary in Korean language", 2021 Korean Physical Society Spring Meeting (Online, Apr. 22, 2021)

[5] “A set of central words in Korean language”, 2020 Korea Academy of Complexity Studies Fall Conference (Online, Nov. 28, 2020)

[4] “A set of central words in Korean language”, Joint mini-workshop on collective dynamics (Busan, South Korea, Nov. 12, 2020)

[3] “A set of central words in Korean language”, 2020 Korean Physical Society Fall Meeting (Online, Nov. 5, 2020)

[2] “Modified Kuramoto model with power law coupling and site-dependent time delay”, 2019 Korean Physical Society Fall Meeting (Gwangju, South Korea, Oct. 24, 2019)

[1] “Modified Kuramoto model with power law coupling and spatial time delay”, The 20th Workshop for Statistical Physics (Byeonsan, South Korea, Aug. 21, 2019)

International poster presentations

[3] "Why we sing in a round at a stadium: stability analysis of twisted states in Kuramoto oscillators on a circle", Netsci 2024 (Quebec, Canada, Jun. 17, 2024)

[2] "Finding core vocabulary in a language", Statphys28 (Tokyo, Japan, Aug. 8, 2023)

[1] "Effect of prior knowledge on vocabulary learning", Conference on Complex Systems 2022 (Palma, Spain, Oct. 18, 2022)

Domestic poster presentations

[4] “Biodiversity in Random Lotka-Volterra model with degree-correlated interaction strength”, Stochastic Processes as Tools for Understanding Biological Systems (Busan, South Korea, Feb. 17, 2025

[3] “Locally twisted states of Kuramoto oscillators in a brain network with site-dependent time delay”, 2024 Korean Physical Society Fall Meeting (Yeosu, South Korea, Oct. 25, 2024)

[2] “Finding important words: Network analysis of a Korean dictionary”, 2024 Korean Physical Society Spring Meeting (Daejeon, South Korea, Apr. 25, 2024).

[1] “Emergence of twisted states in Kuramoto oscillators on a circle with power-law coupling strength”, 2022 SKKU Physics Workshop (Suwon, South Korea, Nov. 30, 2022)