

# Hae Seong Lee | Curriculum Vitae

Statistical Physics Lab, Department of Physics – Sungkyunkwan University

✉ sng1225@skku.edu

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## Research Interests

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- Emergent phenomena in complex systems
- Synchronization
- Dynamics on networks
- Non-equilibrium dynamics of spin systems
- Dynamics in brain networks

## Education

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### Ph.D. candidate in Physics

Sungkyunkwan University,

Supervisor: Dr. Beom Jun Kim

2019–present

### B.S. in Physics

Sungkyunkwan University,

2013–2017

## Publications

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- [4] (*in preparation*) **Hae Seong Lee** and Beom Jun Kim, "The effect of prior knowledge on vocabulary learning"
- [3] (*submitted*) 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", ArXiv:2410.18515
- [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).

## Presentations

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### International oral presentations

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- [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 risk-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.....

- [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)

## Honors & Awards

Scholarship for the registration fee

GEFENOL Summer School  
2024

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

## Attended schools

### International schools

<b>XII GEFENOL Summer School on Statistical Physics of Complex Systems</b> <i>Madrid, Spain,</i> Topic: Selected topics in statistical physics	2024
<b>Complexity72h</b> <i>Madrid, Spain,</i> Topic: Unraveling cancer dynamics: From multiscale stochastic models to tissue morphology	2024
<b>Complex Networks: Theory, Methods, and Applications</b> <i>Como, Italy,</i> Topic: Selected topics in complex networks	2024
<b>CSH Winter School 2023</b> <i>Obergurgl, Austria,</i> Topic: Integrative and Disintegrative Processes in Complex Human Societies	2023
<b>VII Mediterranean school on complex networks</b> <i>Catania, Italy,</i> Topic: Selected topics in complex networks	2022

### Domestic schools

<b>21st KIAS-APCTP Winter School on Statistical Physics</b> <i>Pohang, South Korea,</i> Topic: Selected topics in statistical physics on complex systems	2024
<b>Complex systems summer school</b> <i>Seoul, South Korea,</i> Topic: Lectures on "Network Science" written by Barabasi	2023
<b>20th KIAS-APCTP Winter School on Statistical Physics</b> <i>Pohang, South Korea,</i> Topic: Statistical Physics of Quantum Systems	2023
<b>19th KIAS-APCTP Winter School on Statistical Physics</b> <i>Online,</i> Topic: Phase transitions and critical phenomena	2022
<b>18th KIAS-APCTP Winter School on Statistical Physics</b> <i>Online,</i> Topic: Kinetic models in statistical physics	2021
<b>17th KIAS-APCTP Winter School on Statistical Physics</b> <i>Pohang, South Korea,</i> Topic: Machine learning for statistical physics in practice	2020

## 16th KIAS-APCTP Winter School on Statistical Physics

Yeosu, South Korea,

2019

Topic: critical phenomena and renormalization group

## Services

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### Organizer of the joint journal club of statistical physicists

Sungkyunkwan U., Hanyang U., Catholic U. of Korea, and Inha U.

Aug. 2024 - present

## Experiences

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### 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

## Skills

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

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