

# Hyunju Kim

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👤 Google Scholar

## RESEARCH INTERESTS

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### Computational Neuroscience

Apply deep learning to understand neural dynamics, brain connectivity, and functional representations. Build brain-inspired deep learning models based on neural processing principles.

### Graph Data Mining & Graph Algorithms

Design algorithms and AI models for analyzing large-scale, complex graph data.

## EDUCATION

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### Georgia Institute of Technology

Ph.D. Student in Computational Science & Engineering. Advisor: Nabil Imam

Aug. 2024 –

Atlanta, GA, United States

### KAIST (Korea Advanced Institute of Science and Technology)

M.S. in Artificial Intelligence. Advisor: Kijung Shin

Feb. 2022 – Feb. 2024

Daejeon, Republic of Korea

### POSTECH (Pohang University of Science and Technology)

B.S. in Mathematics. Summa cum laude. GPA 3.96/4.3, Major GPA 4.02/4.3 (ranked 1st)

Feb. 2018 – Feb. 2022

Pohang, Republic of Korea

## PUBLICATIONS

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\*: equal contributions   C: Conference   J: Journal   P: Preprint

- [P2] Geometric Learning for Predicting Functional Connectivity on Folded Cortical Surfaces. *Under review*. **Hyunju Kim**, Michael Arcaro, Nabil Imam
- [P1] Geometric Constraints in the Development of Primate Extrastriate Visual Cortex. *Under review*. **Hyunju Kim**, Michael Arcaro, Nabil Imam (DOI: 10.64898/2026.02.04.703881)
- [J3] Four-Set Hypergraphlets for Characterization of Directed Hypergraphs. *TKDE*. Heechan Moon\*, **Hyunju Kim\***, Sunwoo Kim and Kijung Shin (DOI: 10.1109/TKDE.2026.3677137)
- [J2] Estimating Simplex Counts via Sampling. *The VLDB Journal*. **Hyunju Kim\***, Heechan Moon\*, Sunwoo Kim and Kijung Shin (DOI: 10.1007/s00778-024-00890-9)
- [J1] Hypergraph Motifs and their Extensions beyond Binary. *The VLDB Journal*. Geon Lee\*, Seokbum Yoon\*, Jihoon Ko, **Hyunju Kim** and Kijung Shin (DOI: 10.1007/s00778-023-00827-8)
- [C3] DiffIM: Differentiable Influence Minimization with Surrogate Modeling and Continuous Relaxation. *AAAI 2025*. Junghun Lee, **Hyunju Kim**, Fanchen Bu, Jihoon Ko and Kijung Shin
- [C2] FlowerFormer: Empowering Neural Architecture Encoding using a Flow-aware Graph Transformer. *CVPR 2024*. Dongyeong Hwang, **Hyunju Kim**, Sunwoo Kim and Kijung Shin (DOI: 10.1109/CVPR52733.2024.00586)
- [C1] Characterization of Simplicial Complexes by Counting Simplexes beyond Four Nodes. *WWW 2023*. **Hyunju Kim**, Jihoon Ko, Fanchen Bu and Kijung Shin (DOI: 10.1145/3543507.3583332)

## RESEARCH EXPERIENCES

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### EEG Analysis for Cognitive and Clinical Modeling

Georgia Tech

Drift-Diffusion Model (DDM) analysis of EEG signals for characterizing decision-making processes. EEG-based disease prediction leveraging neural biomarkers and deep learning methods.

Sep. 2024 –

### fMRI-driven Graph Modeling of Self-Organization Mechanisms in the Visual Cortex

Georgia Tech

Develop graph generation methods using both AI-driven approaches and rule-based algorithms. Design brain-inspired models by leveraging neural data visualization mechanisms [P1, P2].

Sep. 2024 –

### Algorithm, Analysis, and Application of Higher-Order Structures

KAIST

Designed scalable algorithms for counting and characterizing higher-order structures (simplexes, hypergraphlets, motifs) in simplicial complexes, hypergraphs, and directed hypergraphs.

Developed sampling-based estimation methods with provable accuracy guarantees [C1, J1, J2, J3].

Mar. 2022 – Feb. 2024

## Development of a Null Model for GNN Incorporating Node Features

May 2023 – Dec. 2023

KAIST

Developed a null model maintaining performance rankings aligned with the original network while anonymizing users' information.

## Performance Prediction of Architectures using Semi-Supervised Learning

Apr. 2022 – Dec. 2023

KAIST

Neural architecture performance prediction method using flow-aware Graph Transformer.

Registered two South Korea Copyrights for Software (C-2022-055775, C-2023-047128).

Patent filed: KR 10-2024-0047575 (filed 2024) [C2].

Supported by IITP grant funded by the Korea government (MSIT).

## INDUSTRY EXPERIENCES

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### Data Mining Lab, KAIST AI

Mar. 2021 – Dec. 2021

Dynamic Stream Triangle Counting Algorithms. Advisor: Kijung Shin

### Data Science Team, SK Hynix

Jun. 2020 – Aug. 2020

Discrimination of Defective Semiconductors using GNN

### SETsystem

Jul. 2019 – Aug. 2019

Ship Detection: Differentiating True Lines from Noise using CNN

## AWARDS & HONORS

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**KFAS (Korea Foundation for Advanced Studies) Scholarship** Field of Computer Science 2024 – 2029 (expected)

**The PROUD POSTECHIAN MEMBER with the Highest Honor** Excellence Award ( $\approx$  \$400) Feb. 2022

**UGRP (Undergraduate Group Research Program)** Excellence Award ( $\approx$  \$4,000) Jan. 2021

**Presidential Science Scholarship by Republic of Korea** Full Tuition + Extra Fee ( $\approx$  \$8,000) 2020 – 2022

**Jigok Scholarship by POSTECH** Full Tuition 2018 – 2020

## PROFESSIONAL SERVICE & TEACHING

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**Reviewer** AAAI 2026, AAAI 2026 (AI Alignment Track), KDD 2026 (AI for Science Track)

**URP Teaching Assistant** KAIST. Mentee: J.H. Lee  $\rightarrow$  [C3]. Excellence Award. Feb. 2023 – Oct. 2023

**Lab Mentor** KAIST. Mentee: S.B. Yoon  $\rightarrow$  [J1] Aug. 2022 – Jun. 2023

**Teaching Mentor & Tutor** POSTECH. Applied Linear Algebra, Analysis I, Programming and Problem Solving Fall 2019 – Fall 2021 (7 semesters)

**Educational Volunteering Mentor** POSTECH. Online Mentoring & Korea Scholarship Foundation Summer Camp Jul. 2019 – Dec. 2020

## SKILLS

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**Programming Languages** C/C++, Python (DL: PyTorch),  $\LaTeX$ , Julia, R, JavaScript

Korean (native), English (fluent: IELTS Overall 7.5; TOEFL – S 24, W 23)

## MISCELLANEOUS

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**Identifying Fraudulent Products in Secondhand Trading Websites** Mar. 2021 – Jun. 2021

POSTECH. IMEN472 Statistical Data Mining term project (1st place, model case). Implemented web crawlers, machine learning algorithms and performed statistical analysis.

**Personality Prediction AI and App Development** Apr. 2020 – Jan. 2021

POSTECH. UGRP Excellence Award (Advisor: Jaesik Park). Developed and distributed an app platform based on a DL-based model with high accuracy.

**Korean I-Corps Program: Team Lutra** Sep. 2021 – Oct. 2021

POSTECH. Korean I-Corps program for supporting preliminary startups. Title: Development of a Personalized Restaurant and Cafe Recommendation Web Service.

**Winner of POSTECH-KAIST Science War** Sep. 2020

POSTECH. Science Quiz Session. Mathematics representative.

**Leadership Experiences** Feb. 2020 – Dec. 2021

POSTECH. The student council of the Department of Mathematics (Head of Academic Affairs & Public Relations).

Orchestra club 'HanUIRim' (President & Conductor, Feb. 2020 – Dec. 2020).

## **Amateur Oboist & Classical Music Enthusiast**

*Guest player of several university orchestras (e.g., Sogang Univ., Sungkyunkwan Univ., Medical School Union, etc.).*

*Principal oboe player of Yeodo Elementary School Orchestra European tour for promoting International Exposition*

*Yeosu Korea 2012 (Venues: Musikverein, Mozarteum Grosser Saal, Slovak Radio Hall, World Trade Center Patria Hall, Rudolfinum Dvorak Hall, Lukaskirche). 9th Online Supporters, i.e., certified influencers, of Seoul Philharmonic Orchestra for promoting concerts.*