Yeojin (Jin) Kim

Ph.D. Student | Georgia Institute of Technology

▣ **Spatial Transcriptomics** ▣ **Machine Learning for Biology**
▣ **Interpretable Deep Learning** ▣ **Drug Discovery**

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OBJECTIVE STATEMENT

Ph.D. student in computational biology specializing in spatial and single-cell transcriptomics, interpretable deep learning, and biomarker discovery. Experienced in designing machine learning and statistical frameworks for spatial data analysis and protein–ligand modeling. Seeking opportunities to advance data-driven biology and translational research through innovative computational methods.

EDUCATION

▣ **Georgia Institute of Technology, United States** | Bioinformatics, Department of Biomedical Engineering (Expected) — Sep 2023 – Present

Doctor of Philosophy (Ph.D.) (Advisor: Prof. Sinha, Saurabh)

Total GPA: 4.0

▣ **Gwangju Institute of Science and Technology, Korea** | Artificial Intelligence, Department of AI Convergence — Mar 2021 – Feb 2023

Master of Science (M.S.) (Advisor: Prof. Lee, Hyunju)

Total GPA: 4.25 / 4.50 (4.00 / 4.00 U.S. scale)

▣ **Gwangju Institute of Science and Technology, Korea** | School of Life Science — Mar 2016 – Feb 2021

Bachelor of Science (B.S.)

Total GPA: 3.88 / 4.50 (3.69 / 4.00 U.S. scale)

▣ **University of Copenhagen, Denmark** — Jul 2017

Exchange Student

PROFESSIONAL EXPERIENCE

▣ **Sinha Lab, Georgia Institute of Technology |** Graduate Research Assistant — Sep 2023 – Present

▣ **Data Mining and Computational Biology Lab, GIST** | Research Associate — Feb 2023 – May 2024

▣ **Gwangju Institute of Science and Technology** | Teaching Assistant — Mar 2021 – Jun 2021

▣ **Data Mining and Computational Biology Lab, GIST** | Graduate Research Assistant — Mar 2021 – Feb 2023

▣ **Data Mining and Computational Biology Lab, GIST** | Undergraduate Research Assistant — May 2019 – Feb 2021

▣ **United Nations University Institute for Water, Environment and Health (UNU-INWEH)** | Intern — Jan 2019 – Mar 2019

▣ **Applied & Environmental Microbiology Lab, GIST** | Undergraduate Research Assistant — Jun 2018 – Aug 2018

▣ **National University of Laos |** Experiment Instructor — Jul 2018, Jul 2019

• Served as an educational volunteer, teaching lab experiments to college students from NUOL and Khon Kaen University (Thailand)

TECHNICAL STRENGTHS

▣ **Programming Languages** | Python, R, C/C++, Bash

▣ **Deep Learning Frameworks** | PyTorch, TensorFlow, Keras

▣ **Computational Biology Expertise** | Spatial transcriptomics, Single-cell transcriptomics, Proteomics, Cheminformatics data, Genomics

RESEARCH PROJECTS

▣ **Comparative Spatial Transcriptomics Analysis Tool**

• Developed a statistical framework to detect phenotype-associated spatial gene expression changes. [j.2]

• Designed and implemented a neural network-based embedding using PyTorch to integrate multiple spatial transcriptomics datasets, mitigating technical noise and phenotypic variability while enabling robust cross-sample comparisons. [j.2]

• Designed a spline regression model in R for differential spatial expression testing with rigorous false discovery control, enabling detection of differentially spatially expressed genes between conditions, support for multi-replicate datasets, and visualization tools for interpretable spatial comparisons. [j.2]

• Applied the method to synthetic and real datasets (MERFISH, Visium, Stereo-seq), uncovering neurogenomic mechanisms in honey bees and mice, in collaboration with Prof. Sihai Dave Zhao and Prof. Hee-Sun Han at the University of Illinois Urbana-Champaign (UIUC). [j.2]

• Presented methodological advances and use cases in invited talks and posters to the spatial omics community. [w.1, p.2]

▣ **Sequence Determinants of RNA Colocalization in Subcellular Spatial Transcriptomics [Ongoing]**

• Developing interpretable machine learning framework to identify cis-acting RNA sequence elements driving RNA colocalization using subcellular spatial transcriptomic (MERFISH, seqFISH) data. [p.1]

• Uses model explanations to generate mechanistic hypotheses linking sequence motifs to spatial organization. [p.1]

▣ **Self-Supervised Learning for Cellular Morphology [Ongoing Collaboration]**

• Developing vision transformer-based models that leverage imaging-based and spatial transcriptomics data (Xenium) to extract multiscale morphological features and enable scalable analysis of cellular structure and biological variation.

▣ **Protein-Ligand Binding Affinity Prediction [In Review]**

• Developing a graph-based deep learning model using PyTorch and foundation models to integrate protein sequence, structure, and chemical data for accurate protein-ligand binding affinity prediction across diverse molecular datasets.

▣ **Pathway-driven Neural Network for Alzheimer's Disease**

• Developed a pathway-driven deep learning model using PyTorch, integrating GO and KEGG knowledge to predict Alzheimer's disease from blood and brain transcriptomic datasets, enabling biologically interpretable predictions. [j.1]

• Applied SHAP-based interpretation to identify disease-associated genes and pathways, uncovering transcriptomic signatures shared between blood and brain samples and providing insight into potential biomarkers for early diagnosis. [j.1]

▣ **Sustainable Development of the Seaweed Industry in South Korea**

• Conducted data-driven analysis as an intern at the United Nations University Institute for Water, Environment and Health (UNU-INWEH) under Dr. Nidhi Nagabhatla. [b.1]

• Analyzed trade statistics and environmental datasets to assess climate change impacts and plastic contamination in seaweed production and produced a comprehensive report contributing to the Encyclopedia of the UN Sustainable Development Goals. [b.1]

▣ **Aquatic Microbial Ecology and Water Treatment**

• Performed experimental research as an undergraduate assistant, investigating the impact of various water treatment processes on aquatic microbial communities through laboratory experiments, data collection, and microbial analysis techniques.

PUBLICATIONS

[j.2] **Kim, Y.**, Ojha, A., Schrader, A., Lee, J., Wu, Z., Traniello, I. M., Robinson, G. E., Han, H. S., Zhao, S. D., & Sinha, S. (2024). SpaceExpress: A method for comparative spatial transcriptomics based on intrinsic coordinate systems of tissues. *bioRxiv*. https://doi.org/10.1101/2024.12.19.628720

[j.1] **Kim,Y.**, & Lee,H.(2023). PINNet: A deep neural network with pathway prior knowledge for Alzheimer's disease. *Frontiers in Aging Neuroscience*, 15, 1126156. https://doi.org/10.3389/fnagi.2023.1126156

[b.1] Wale, C., Nagabhatla, N., **Kim, Y.**, & Cottier-Cook, E. J. (2022). Trends and patterns of the seaweed industry and its links with SDGs. *Encyclopedia of the UN Sustainable Development Goals*, 1-17. doi:10.1007/978-3-319-71064-8 128-2

POSTERS & WORKSHOPS

[w.1] **Kim, Y.**, Wu, Z., Kumar, A., Han, H. S., Zhao, S. D., & Sinha, S. Predicting Spatial Location from Gene Expression: A New Analytical Approach to Spatial Transcriptomics. *Oral presentation at the Atlanta Workshop for Single-Cell Omics (AWSOM), Apr 2024*.

[p.2] **Kim, Y.**, Kumar, A., Han, H. S., Zhao, S. D., & Sinha, S. Predicting Spatial Location from Gene Expression: A New Analytical Approach to Spatial Transcriptomics. *Poster presentation at the Cold Spring Harbor Laboratory Systems Biology: Global Regulation of Gene Expression Meeting, Mar 2024*

[p.1] **Kim, Y.**, & Sinha, S. Sequence determinants of RNA colocalization in subcellular spatial transcriptomics data. *Poster presentation at the RECOMB/ISCB Conference on Regulatory & Systems Genomics with DREAM Challenges (RSGDREAM) 2023*

AWARDS & HONORS

▣ **CMaT Mentor Stipend Award** May 2025

▣ **Research Assistant Scholarship, GIST** 2022

▣ **Government-Sponsored Scholarship, Korea** | Master's Degree Government Scholarship Mar 2021 – Feb 2023

▣ **Innovative Convergence Technology Contest** | 1st Place, Algorithm Track 2020

• Awarded by the Director of the Gwangju National Science Museum

▣ **Outstanding Undergraduate Research Award, School of EECS, GIST** 2019

▣ **Korea National Science and Engineering Scholarship** 2018

• Full-tuition scholarship from Korea Student Aid Foundation, Ministry of Education

▣ **Academic Excellence Scholarship, GIST** 2016, 2017, 2018

▣ **Government-Sponsored Scholarship, Korea** | Bachelor's Degree Government Scholarship 2016 – 2020

▣ **Summer Exchange Students Scholarship** | University of Copenhagen Jul 2017