

# JINWOO KIM

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## Research Interest

My focus is in making deep learning models generalize better beyond their training data so that they can be used to solve challenging problems, such as those in scientific domains. I am studying this problem from the complementary perspectives of invariance and equivariance, parallel neural processing, and Solomonoff induction. I often use tools from theories of graphs, manifolds, (semi)groups and categories, as well as Markov processes such as random walks, diffusions, and flows. Recently, I am focused on flow language models, latent reasoning, synthetic data, and vision pretraining.

## Academic Placement and Employment

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|---------------------------------------------------------------------------------------|-------------------|
| <b>KAIST</b> , Postdoctoral Researcher                                                | 03/2026 – 02/2027 |
| <b>New York University</b> , Visiting Scholar (host: Kyunghyun Cho, Rajesh Ranganath) | 11/2025 – 01/2026 |
| <b>LG AI Research</b> , Research Intern (host: Moontae Lee, Honglak Lee)              | 01/2022 – 07/2022 |

## Education

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| <b>KAIST</b> , M.S./Ph.D. in Computer Science (advisor: Seunghoon Hong)<br>- Ph.D. Thesis: Architecture-Agnostic Invariances for Deep Learning<br><b>KAIST CoE Best Ph.D. Dissertation Award</b> | 03/2021 – 02/2026 |
| <b>KAIST</b> , B.S. in Brain Engineering and Computer Science (double major)<br>- GPA 4.05/4.3 (Summa Cum Laude)                                                                                 | 03/2016 – 02/2021 |

## Publications

C: conference, J: journal, W: workshop, P: preprint, \*: equal contribution, †: equal advising

### P1. Thinking with Looped Flows

Ayhan Suleymanzade, Chanhuk Lee, Floor Eijkelboom, Nicholas M. Boffi, İsmail İlkan Ceylan<sup>†</sup>, Jinwoo Kim<sup>†</sup>  
arXiv 2026

### C17. Flow Map Language Models: One-step Language Modeling via Continuous Denoising

Chanhuk Lee, Jaehoon Yoo, Manan Agarwal, Sheel Shah, Jerry Huang, Aditi Raghunathan, Seunghoon Hong, Nicholas M. Boffi<sup>†</sup>, Jinwoo Kim<sup>†</sup>  
NeurIPS 2026 / COLM 2026 NonAR-LM Workshop **Spotlight**

### C16. MUX: Continuous Reasoning via Multiplexed Tokens

Ayhan Suleymanzade, Halil Alperen Gozeten, Michael Bronstein, İsmail İlkan Ceylan<sup>†</sup>, Jinwoo Kim<sup>†</sup>  
NeurIPS 2026 **Spotlight**

### C15. Multi-View Relational Distillation for Spatial Reasoning with Vision-Language Models

Kiet T. Nguyen, Hanbo Shim, Jinwoo Kim<sup>†</sup>, Seunghoon Hong<sup>†</sup>  
NeurIPS 2026

### C14. RelAgent: LLM Agents as Data Scientists for Relational Learning

Xingyue Huang, Louis Tichelman, Jinwoo Kim, Krzysztof Olejniczak, İsmail İlkan Ceylan  
NeurIPS 2026

### W3. Self-conditioned Flow Map Language Models via Fixed-point Flows

Jaehoon Yoo\*, Wonjung Kim\*, Floor Eijkelboom, Chanhuk Lee, Nicholas M. Boffi, Seunghoon Hong<sup>†</sup>, Jinwoo Kim<sup>†</sup>  
COLM 2026 NonAR-LM Workshop **Oral**

### W2. Posterior Refinement: Fast Language Generation via Any-Order Flow Maps

Manan Agarwal\*, Sheel Shah\*, Chanhuk Lee, Jaehoon Yoo, Jerry Huang, Seunghoon Hong, Aditi Raghunathan, Jinwoo Kim<sup>†</sup>, Nicholas M. Boffi<sup>†</sup>  
COLM 2026 NonAR-LM Workshop **Spotlight**

- W2. **What are the Right Symmetries for Formal Theorem Proving?**  
 Krzysztof Olejniczak, Radoslav Dimitrov, Xingyue Huang, Bernardo Cuenca Grau, Jinwoo Kim<sup>†</sup>, İsmail İlkan Ceylan<sup>†</sup>  
 ICML 2026 AI4Math Workshop
- C13. **Inverting Data Transformations via Diffusion Sampling**  
Jinwoo Kim<sup>\*</sup>, Sékou-Oumar Kaba<sup>\*</sup>, Jiyun Park, Seunghoon Hong<sup>†</sup>, Siamak Ravanbakhsh<sup>†</sup>  
 ICML 2026
- C12. **Flock: A Knowledge Graph Foundation Model via Learning on Random Walks**  
Jinwoo Kim<sup>\*</sup>, Xingyue Huang<sup>\*</sup>, Krzysztof Olejniczak, Kyunghin Min, Michael Bronstein, Seunghoon Hong, İsmail İlkan Ceylan  
 ICLR 2026
- C11. **Sequence Modeling with Spectral Mean Flows**  
Jinwoo Kim, Max Beier, Petar Bevanda, Nayun Kim, Seunghoon Hong  
 NeurIPS 2025
- C10. **Revisiting Random Walks for Learning on Graphs**  
Jinwoo Kim, Olga Zaghen<sup>\*</sup>, Ayhan Suleymanzade<sup>\*</sup>, Youngmin Ryou, Seunghoon Hong  
 ICLR 2025 **Spotlight (380/11672=3.26%)** / **ELLIS Mobility Grant, ICML 2024 GRaM Workshop**
- C9. **3D Denoisers are Good 2D Teachers: Molecular Pretraining via Denoising and Cross-Modal Distillation**  
 Sungjun Cho, Dae-Woong Jeong, Sung Moon Ko, Jinwoo Kim, Sehui Han, Seunghoon Hong, Honglak Lee, Moontae Lee  
 AAAI 2025 **Oral**
- C8. **Simulation-Free Training of Neural ODEs on Paired Data**  
 Semin Kim<sup>\*</sup>, Jaehoon Yoo<sup>\*</sup>, Jinwoo Kim, Yeonwoo Cha, Saehoon Kim, Seunghoon Hong  
 NeurIPS 2024
- W1. **Learning Symmetrization for Equivariance with Orbit Distance Minimization**  
 Tien Dat Nguyen<sup>\*</sup>, Jinwoo Kim<sup>\*</sup>, Hongseok Yang, Seunghoon Hong  
 NeurIPS 2023 NeurReps Workshop
- C7. **Learning Probabilistic Symmetrization for Architecture Agnostic Equivariance**  
Jinwoo Kim, Tien Dat Nguyen, Ayhan Suleymanzade, Hyeokjun An, Seunghoon Hong  
 NeurIPS 2023 **Spotlight (378/12345=3.06%)**
- C6. **Universal Few-shot Learning of Dense Prediction Tasks with Visual Token Matching**  
 Donggyun Kim, Jinwoo Kim, Seongwoong Cho, Chong Luo, Seunghoon Hong  
 ICLR 2023 **Outstanding Paper Award (4/4955=0.08%)** / **Silver Prize, Samsung Humantech Paper Award, 2023**
- C5. **Pure Transformers are Powerful Graph Learners**  
Jinwoo Kim, Tien Dat Nguyen, Seonwoo Min, Sungjun Cho, Moontae Lee, Honglak Lee<sup>†</sup>, Seunghoon Hong<sup>†</sup>  
 NeurIPS 2022
- C4. **Transformers meet Stochastic Block Models: Attention with Data-Adaptive Sparsity and Cost**  
 Sungjun Cho, Seonwoo Min, Jinwoo Kim, Moontae Lee, Honglak Lee, Seunghoon Hong  
 NeurIPS 2022
- C3. **Equivariant Hypergraph Neural Networks**  
Jinwoo Kim, Saeyoon Oh, Sungjun Cho, Seunghoon Hong  
 ECCV 2022
- C2. **Transformers Generalize DeepSets and Can be Extended to Graphs and Hypergraphs**  
Jinwoo Kim, Saeyoon Oh, Seunghoon Hong  
 NeurIPS 2021 / **Qualcomm Innovation Fellowship Korea, 2021**
- C1. **SetVAE: Learning Hierarchical Composition for Generative Modeling of Set-Structured Data**  
Jinwoo Kim<sup>\*</sup>, Jaehoon Yoo<sup>\*</sup>, Juho Lee, Seunghoon Hong  
 CVPR 2021
- J1. **Spontaneous Retinal Waves Can Generate Long-Range Horizontal Connectivity in Visual Cortex**  
Jinwoo Kim<sup>\*</sup>, Min Song<sup>\*</sup>, Jaeson Jang, Se-Bum Paik  
 The Journal of Neuroscience 40(34) 2020

## Honors

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### Awards

|                                                                                   |      |
|-----------------------------------------------------------------------------------|------|
| Best Ph.D. Dissertation Award, KAIST College of Engineering                       | 2026 |
| Outstanding Researcher Award, KAIST-Mila Prefrontal AI Research Center            | 2024 |
| ELLIS Mobility Grant [C10], ICML 2024 GRaM Workshop                               | 2024 |
| Outstanding Paper Award [C6], ICLR 2023                                           | 2023 |
| Silver Prize, Samsung Humantech Paper Award [C6]                                  | 2023 |
| Qualcomm Innovation Fellowship Korea [C2]                                         | 2022 |
| KAIST Engineering Innovator Award (five recipients), KAIST College of Engineering | 2020 |

### Scholarships and Fellowships

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|-------------------------------------------------|-------------|
| Kwanjeong Education Foundation Scholarship      | 2022 – 2023 |
| Korea National Science & Technology Scholarship | 2018 – 2019 |
| KAIST Alumni Fellowship                         | 2017 – 2020 |
| KAIST Presidential Fellowship                   | 2016 – 2020 |
| Hansung Scholarship for Gifted Students         | 2015 – 2016 |

### Invited Talks

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|                                                                              |         |
|------------------------------------------------------------------------------|---------|
| Flow Language Models [C11, C17, W2, W3, P1]                                  |         |
| • MIT CSAIL (host: Hyunwoo Ryu)                                              | 10/2026 |
| • POSTECH IME (host: Sangwoo Mo)                                             | 10/2026 |
| • SNU IPAI Seminar (host: Jaesik Park, Pierre Musacchio)                     | 07/2026 |
| • Discrete Diffusion Reading Group (host: Subham Sahoo, Zhihan Yang)         | 04/2026 |
| • Ben-Gurion University of the Negev (host: Ilan Naiman)                     | 12/2025 |
| Architecture-Agnostic Invariances for Deep Learning [C7, W1, C10, C12, C13]  |         |
| • Mila - Quebec AI Institute (host: Minsu Kim, Junyeob Baek)                 | 07/2025 |
| • KAIST AI899 Geometric DL (host: Sungsoo Ahn)                               | 05/2025 |
| • Mila - Quebec AI Institute (host: Siamak Ravanbakhsh, Sékou-Oumar Kaba)    | 12/2024 |
| • KAIST-Mila Prefrontal AI Research Center (host: Sungjin Ahn)               | 11/2024 |
| • Sungkyunkwan University (SKKU) (host: Chang Woo Myung)                     | 08/2024 |
| • Pohang University of Science and Technology (POSTECH) (host: Sungsoo Ahn)  | 11/2023 |
| Visual Token Matching [C6]                                                   |         |
| • KAIST–Samsung Electronics DS Division Exchange Meetup (host: Chulmoo Kang) | 08/2023 |
| Transformers for Sets, Graphs, and Hypergraphs [C1, C2, C5]                  |         |
| • Microsoft USA (host: Nabiha Asghar)                                        | 01/2023 |
| • Qualcomm Korea (host: Jaewon Choi)                                         | 01/2023 |
| • NeurIPS 2022 at KAIST (host: Dongkwan Kim)                                 | 11/2022 |
| • Learning on Graphs and Geometry Reading Group (LoGaG) (host: Hannes Stärk) | 08/2022 |
| • KAIST AI Workshop 21/22 (host: Dongkwan Kim)                               | 01/2022 |
| • NeurIPS 2021 Social: ML in Korea (host: Jung-Woo Ha)                       | 12/2021 |
| • Naver AI Author Meetup for CVPR 2021 (host: Jung-Woo Ha)                   | 09/2021 |
| • Korean Conference on Computer Vision 2021 (host: Jongwoo Lim)              | 09/2021 |
| Retinal Waves and Prenatal Wiring of Primary Visual Cortex [J1]              |         |
| • Society for Neuroscience, Chicago, IL, US                                  | 10/2019 |

### Academic Services

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Area Chair: ICLR 2027

Workshop Area Chair: ICML 2026 GFM

Conference Reviewer: NeurIPS, ICLR, ICML, CVPR, ICCV, AISTATS, LoG, TAG-DS, IJCNN, ACCV

Journal Reviewer: TMLR, Neural Networks, IJCV

## Teaching

### Teaching Assistant, KAIST School of Computing

|                                               |                  |
|-----------------------------------------------|------------------|
| Undergraduate Research Program (URP)          | 2022, 2024       |
| Introduction to Deep Learning (CS492I)        | 2021, 2022, 2023 |
| Computer Vision (CS576)                       | 2022, 2023       |
| School of Computing Colloquium (CS966, CS986) | 2021             |

### Teaching Assistant, Samsung Electronics

|                                    |             |
|------------------------------------|-------------|
| Samsung Research AI Expert Program | 2021 – 2024 |
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## Mentoring

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|-------------------------------------------------------------------------------------|-------------|
| Chanwoo Kim, M.S. student @ KAIST                                                   | 2026        |
| Toghrul Abbasov, B.S. student @ KAIST                                               | 2026        |
| Kiet T. Nguyen, Ph.D. student @ KAIST [C14]                                         | 2026        |
| Chanhyuk Lee, M.S. student @ KAIST [C17, W2, W3, P1]                                | 2025 – 2026 |
| Kyungbin Min, B.S. student @ KAIST [C12] → M.S. student @ KAIST                     | 2025 – 2026 |
| Jiyeon Park, B.S. student @ KAIST [C13] → M.S. student @ KAIST                      | 2024 – 2026 |
| Nayun Kim, B.S. student @ KAIST [C11] → M.S. student @ KAIST                        | 2024 – 2026 |
| Ayhan Suleymanzade, B.S. student @ KAIST [C7, C10] → Ph.D. student @ EPFL [C16, P1] | 2023 – 2026 |
| Youngmin Ryou, B.S. student @ KAIST [C10] → M.S. Student @ KAIST                    | 2023 – 2026 |
| Nicole Shen, B.S. student @ MIT → Intern @ MIT LIDS                                 | 2024        |
| Semin Kim, M.S. student @ KAIST [C8] → Ph.D. student @ KAIST                        | 2023 – 2024 |
| Olga Zaghen, M.S. student @ UniTrento [C10] → Ph.D. student @ UvA Amsterdam         | 2023        |
| Tien Dat Nguyen, B.S. student @ KAIST [C5, C7, W1] → M.S. student @ UWaterloo       | 2021 – 2023 |
| Daniel Sungho Jung, B.S. student @ Penn State → Ph.D. student @ SNU                 | 2021        |
| Saeyoon Oh, B.S. student @ KAIST [C2, C3] → Engineer @ FuriosaAI                    | 2021        |

## Projects

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|---------------------------------------------------------------------------------|-------------|
| Korea National Research Foundation (NRF), Physical Reasoning in Language Models | 2024 – 2025 |
| Korea Ministry of Science and ICT, Visual Commonsense Reasoning                 | 2021 – 2023 |
| Korea National Research Foundation (NRF), Cooperative Robotic Intelligence      | 2021 – 2023 |

## References

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|----------------------------------------------------------------------|--------------------------------------------------------------------------------|
| Seunghoon Hong, Associate Professor at KAIST                         | <a href="mailto:seunghoon.hong@kaist.ac.kr">seunghoon.hong@kaist.ac.kr</a>     |
| İsmail İlkan Ceylan, Associate Professor at TU Wien                  | <a href="mailto:ismail.ceylan@tuwien.ac.at">ismail.ceylan@tuwien.ac.at</a>     |
| Nicholas M. Boffi, Assistant Professor at Carnegie Mellon University | <a href="mailto:nboffi@andrew.cmu.edu">nboffi@andrew.cmu.edu</a>               |
| Kyunghyun Cho, Full Professor at New York University                 | <a href="mailto:kyunghyun.cho@nyu.edu">kyunghyun.cho@nyu.edu</a>               |
| Siamak Ravanbakhsh, Associate Professor at McGill University         | <a href="mailto:siamak.ravanbakhsh@mcgill.ca">siamak.ravanbakhsh@mcgill.ca</a> |
| Moontae Lee, Head of Superintelligence Lab at LG AI Research         | <a href="mailto:moontae.lee@lgresearch.ai">moontae.lee@lgresearch.ai</a>       |