

Hanbum Ko

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EDUCATION

Korea University <i>Doctor of Philosophy in Artificial Intelligence</i> Advisor: Prof. Sungbin Lim & Prof. Sungwoong Kim	Seoul, South Korea <i>Sep 2023 - Present</i>
Ulsan National Institute of Science and Technology (UNIST) <i>Master of Science in Artificial Intelligence</i> Advisor: Prof. Sungbin Lim	Ulsan, South Korea <i>Mar 2021 - Aug 2023</i>
Chungnam National University <i>Bachelor of Science in Computer Science and Engineering</i> - Minor in Statistics - Study Abroad at Purdue University	Daejeon, South Korea <i>Mar 2014 - Feb 2021</i> <i>Dec 2018 - Jan 2019</i>

RESEARCH INTERESTS

AI for Science

- Efficient Processing of Large Language Models, Data Engineering, and Information Retrieval for Science
- Development & Advancing AI Platform for Scientific Discovery
- Multi-Modal Pre-Training on Scientific Dataset

Stochastic Optimization

- Neural Combinatorial Optimization for Solving Industrial Problems
- Graph Representation Learning for Decision Makings
- Deep Reinforcement Learning-based Solver for Routing Problems

PUBLICATIONS

Hanbum Ko, Chanhui Lee, Ye Rin Kim, Rodrigo S. Hormazabal, Sehui Han, Sungbin Lim, Sungwoong Kim. **RetroReasoner: A Reasoning LLM for Strategic Retrosynthesis Prediction**. *Findings of the Association for Computational Linguistics: EMNLP*, 2026.

Yongjun Jeong, Hanbum Ko, Ye Rin Kim, Chanhui Lee, Rodrigo S. Hormazabal, Jaewan Lee, Sehui Han, Sungbin Lim, Sungwoong Kim. **MolDesignBench: Evaluating LLM-based Agent for Scenario-grounded Molecular Design**. *Conference on Language Modeling (COLM)*, 2026.

Hanbum Ko, Chanhui Lee, Ye Rin Kim, Rodrigo S. Hormazabal, Sehui Han, Sungbin Lim, Sungwoong Kim. **ReactionReasoner: Towards Reasoning LLM for Chemical Reaction Prediction**. *NeurIPS Workshop on AI for Science*, 2025.

Chanhui Lee, Hanbum Ko, Yuheon Song, YongJun Jeong, Rodrigo Hormazabal, Sehui Han, Kyunghoon Bae, Sungbin Lim, Sungwoong Kim. **Mol-LLM: Multimodal Generalist Molecular LLM with Improved Graph Utilization**. *arXiv preprint, NeurIPS Workshop on AI for Science*, 2025.

Hanbum Ko, Minu Kim, Honglak Lee, Sungbin Lim, Sungryull Sohn et al. **Hierarchical Decomposition Framework for Steiner Tree Packing Problem**. *ICML Workshop on Sampling and Optimization in Discrete Space (SODS)*, 2023; *ICORES*, 2025 (Best Paper).

Hanbum Ko, Hongjun Yang, Sehui Han, Sungbin Lim, Sungwoong Kim, Kyunghoon Bae, Rodrigo S. Hormazabal. **Filling in the Gaps: LLM-Based Structured Data Generation from Semi-Structured Scientific Data**. *ICML Workshop on AI for Science*, 2024.

Aigerim Bogrybayeva, Taehyun Yoon, Hanbum Ko, Sungbin Lim, Hyokun Yun, Changhyun Kwon. **A Deep Reinforcement Learning Approach for Solving the Traveling Salesman Problem with Drone**. *Transportation Research Part C: Emerging Technologies*, 148, 2023.

Kanghoon Lee, Youngjoon Park, Han-Seul Jeong, Sunghoon Hong, Deunsol Yoon, Sungryull Sohn, Minu Kim, Hanbum Ko et al. **ReSPack: A Large-Scale Rectilinear Steiner Tree Packing Data Generator and Benchmark**. *NeurIPS Workshop on SyntheticData4ML*, 2022.

Cheolmin Jeon, Jeongsoo Ha, Hanbum Ko, Byeongman Lee, Bo Ryu. **Swarmsense: Effective and Resilient Drone Swarm and Search for Disaster Response and Management Application**. *The World Congress on ANBRE*, 2019.

Hanbum Ko, Yeeun Lee, Suyeon Jin, Emma Kang, Nick Noonan, Minsun Lee, Michael J. Hopmeier, Eric T. Matson. **Augmenting Structure for Noise Reduction in UAV**. *The World Congress on ANBRE*, 2019.

EXPERIENCE

LG AI Research

Magok, Seoul, South Korea

Research Intern at Materials Intelligence Lab. (Mentor: Rodrigo Hormazabal)

Sep 2023 - Aug 2024

- Developing a Foundation Model for Science, Data Engineering, and Retrieval-Augmented Generation Framework
- Fine-Tuning Large Language Models to Incorporate Scientific Knowledge
- Constructing a Scientific Knowledge Graph for Retrieval System
- Research on Multimodal Pre-Training to Leverage Various Information Sources

Research Intern at Advanced ML Lab. (Mentor: Sungryull Sohn)

Mar 2022 - Dec 2022

- Research on Neural Combinatorial Optimization for Solving Real-World Problems
- Research on Combinatorial Optimization Problems with Hard-to-Find Feasible Solutions
- Developing a Hierarchical Decomposition Solver for Steiner Tree Packing Problem
- Constructing a Synthetic Dataset for Circuit Routing Cost Minimization Problem

AGI Laboratory, Korea University

Seoul, South Korea

Research Assistant

Sep 2023 - Present

- Large-scale Multimodal Generative Modeling
- Developing an Efficient Graph-Text Pre-Trained Model

Teaching Assistant

- Advanced Natural Language Processing
- Statistical Modeling for Deep Learning
- Stochastic Processes and Sampling for Reinforcement Learning

LIM Laboratory, Ulsan National Institute of Science and Technology

Ulsan, South Korea

Research Assistant

Mar 2021 - Aug 2023

- Developing an Efficient Deep Learning-Based Mixed-Integer Linear Programming Solver
- Research on Pre-Training Methods for Downstream Combinatorial Optimization Problems

Teaching Assistant

- Deep Reinforcement Learning
- AI Novatus Academia. Reinforcement Learning
- LG Electronics Employee Training. Reinforcement Learning

EpiSys Science, Inc.

Poway, CA, USA

Research Intern

Mar 2019 - Feb 2021

- Application of Deep Reinforcement Learning Algorithms for Job Scheduling and Air Combat
- Participated in AlphaDogFight Trial hosted by DARPA and Swarm and Search AI Challenge: Fire Hack 2019
- Implemented Reinforcement Learning Environment for Air Combat using Unity and integrated with VR device to Construct Testing Framework

PROJECTS

EXAONE Discovery Development • LG AI Research	Sep 2023 - Present
Tool Recommender for Large Language Models • LG AI Research	Sep 2023 - Dec 2023
AI Platform Lab for Next Generation Robot Design and Control • National Research Foundation of Korea(NRF) funded by the Korea government(MSIT)	June 2021 - Feb 2024
PCB Auto Routing • LG AI Research, LG Electronics	Mar 2022 - Dec 2022
NeurIPS 2021 Competition - Machine Learning for Combinatorial Optimization • 2nd on the Global Leaderboard and 1st on the Student Leaderboard	Sep 2021 - Dec 2021
AlphaDogFight Trials • EpiSys Science, Inc. Competition hosted by DARPA	June 2019 - Feb 2020
SwarmSense • EpiSys Science, Inc.	May 2018 - Dec 2018
Capston Design Project • Purdue University	Dec 2018 - Jan 2019
Super-Resolution Model for JPEG Compressed Image • Chungnam National University	Mar 2018 - Nov 2018

PATENTS

System for Increasing Resolution of JPEG Compressed Image and Method Thereof • KR, Registration No. 10-2098375 (Apr 2020), Application No. 10-2018-0140704 (Nov 2018) • Assignee: Chungnam National University (CNU) Industry-Academic Cooperation Foundation
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SKILLS

Languages: Korean (Native), English (Fluent)
Technical Skills: Proficient in Python (Pytorch, Tensorflow, HuggingFace), C/C++