

# Myoung Hoon Ha

Postdoctoral Researcher

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## RESEARCH INTERESTS

My research interests span the fields of *reinforcement learning*, *representation learning*, and *adversarial robustness*, inspired by the human brain and cognition process. My recent research topics are *interpolation between model-free and model-based RL*, *group-level social dilemma in Markov game (MARL)*, *disentangled representation learning*, *the adversarial robustness-generalization tradeoff in the perspective of Lipschitz continuity*, and *explaining adversarial robustness using a counterintuitive property of a high-dimensional space*.

## EDUCATION & RESEARCH EXPERIENCES

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

Postdoctoral Researcher at Center for Neuroscience-inspired AI

Supervisor: Prof. Sang wan Lee

**Daejeon, Korea**

*Nov. 2019–Present*

### Seoul National University

Ph.D. in Electrical Engineering and Computer Science

Advisor: Prof. Byung-Ro Moon

**Seoul, Korea**

*Mar. 2011–Aug. 2019*

### Ajou University

B.S. in Information and Computer Science

Minor: Mathematics

Advisor: Tae-Sun Chung

• Honors: summa cum laude

• 2004-2006, military service

**Suwon, Korea**

*Mar. 2002–Feb. 2010*

## PROFESSIONAL EXPERIENCES

### Optus Investment

Certified Investment Manager

• Worked as a part-time worker (2011-2013) and a full-time worker (2014-2019) at an investment company owned by my adviser while doing my Ph.D.

• Conducted research on investment strategies (stock pattern search [5, 6] and portfolio optimization [3]) based on technical analysis and evolutionary reinforcement learning.

• Managed private equity funds and developed auto-trading programs.

**Seoul, Korea**

*May. 2011–Nov. 2019*

### Pantech

Software Engineer

• Developed home applications and widgets for the android smartphones made by Pantech which was the 3rd biggest smartphone manufacturer in Korea at the moment.

**Seoul, Korea**

*Jan. 2010–Dec. 2010*

## PUBLICATIONS

- [1] Jungwon Ryu, **Myoung Hoon Ha**, and Sang-wan Lee, Generalizable perceptual embedding with noise-tuning alignment, In proceedings of the 31st Annual Computational Neuroscience Meeting (CNS), 2022
- [2] **Myoung Hoon Ha**\*, Hyung-gun Chi\*, Seung-geun Chi, Sang-wan Lee, Q. Huang, and K. Ramani, InfoGCN: Representation Learning for Human Skeleton-based Action Recognition, In proceedings of Conference on Computer Vision and Pattern Recognition (CVPR), 2022, to be appeared (\* Equal contribution)

- [3] **Myoung Hoon Ha**, Seung-geun Chi, Sangyeop Lee, Yujin Cha, Byung-Ro Moon. Evolutionary meta reinforcement learning for portfolio optimization, In proceedings of the Genetic and Evolutionary Computation Conference (GECCO), 2021
- [4] Sangyeop Lee, **Myoung Hoon Ha**, and Byung-Ro Moon, Understanding features on evolutionary policy optimizations: feature learning difference between gradient-based and evolutionary policy optimizations, In proceedings of the 35th Annual ACM Symposium on Applied Computing (SAC), 2020
- [5] **Myoung Hoon Ha** and Byung-Ro Moon, The Evolution of Neural Network-based Chart Patterns: A Preliminary Study, In proceedings of the Genetic and Evolutionary Computation Conference (GECCO), 2017
- [6] **Myoung Hoon Ha**, Sangyeop Lee, and Byung-Ro Moon, A Genetic Algorithm for Rule-based Chart Pattern Search in Stock Market Prices, In proceedings of the Genetic and Evolutionary Computation Conference (GECCO), 2016
- [7] Hansang Yun, **Myoung Hoon Ha**, and Robert Ian McKay, VLR: A Memory-based Optimization Heuristic, In proceedings of the International Conference on Parallel Problem Solving from Nature (PPSN), 2014

## PAPERS UNDER REVIEW

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- [8] **Myoung Hoon Ha**, Seung-geun Chi, and Sang-wan Lee, Learning to Escape: Multi-mode Policy Learning for the Traveling Salesman Problem, IEEE Transactions on Neural Networks and Learning Systems, 2022

## PROJECTS

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### **Genie brain: brain-like abstraction and reasoning engine**

Postdoctoral Researcher

- Participated in the design of proposal and all research [1, 2, 8] within the project (developing the core technology of the brain-simulating abstraction system 1 and reasoning system 2).
- Conducting collaborative research on language modeling interpreting the problem as a self-supervised curriculum reinforcement learning one.

Center of Neuroscience-inspired AI,  
KAIST  
*Oct. 2021–Present*

### **Development of optimal frame RTB algorithm using deep reinforcement learning**

Postdoctoral Researcher

- Stated the optimization problem for customized online ad frames as an MDP task.
- Designed an offline deep reinforcement learning method based on counterfactual learning and led the team to develop the solution software.

Center of Neuroscience-inspired AI,  
KAIST  
*Mar. 2020–Mar. 2021*

### **Development of next generation AI based on neural circuit mechanism of metacognition**

Postdoctoral Researcher

- Participated in a project to establish brain-behavioral big data using the AVATAR system that records the behavior of mice and develop metacognitive-function simulation artificial intelligence.
- Analyzed of the characteristics of rodent behavioral data and designed information bottleneck-based objectives and losses [2]

Center of Neuroscience-inspired AI,  
KAIST  
*–Present*

### **Development of brain-inspired AI with human-like intelligence**

Postdoctoral Researcher

- Participated in a project to derive the prototype of the operating mechanism for each key human-intelligence element and develop a model for simulating brain cognitive development.
- Found that the noise-tuning alignment of latent variable predicts the generalization performance [1].
- Conducting a theoretical study on regional Lipschitz continuity regarding the generalization-robustness trade-off and designing a framework for robust self-learning of a model with constrained Lipschitz continuity.
- Designing an invariant representation learning framework for stochastic neural networks based on metamerism, a phenomenon that the ventral stream of the human visual cortex exhibits similar neural representations for contextually-related visual stimuli.

Center of Neuroscience-inspired AI,  
KAIST  
*Apr.2019–Present*

### **Technical guidance: Setting questions for SW algorithm test**

Graduate Researcher

- Participated in the setting-problem process of software algorithm coding test of an IT company.
- Participated in the overall process such as correcting problem errors, generating answers, and checking time.

Optimization Lab,  
Seoul National Univ.  
*Mar.2013–Feb.2021*

### **Development of ATM cash reserves predictor**

Graduate Researcher

- Participated in a project to determine the amount of cash reserves by anticipating withdrawals from ATMs using historical data.
- Conducted data analysis and developed UI of the solution program.

Optimization Lab,  
Seoul National Univ.  
*Mar.2012–Feb.2013*

## **INVITED TALKS**

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- Disentangled Representation of Social Defeat Trace from Freely Moving Rodent Behavior, Korean AI Association, *2021*
- Evolutionary Policy Optimization for Control Problems in Computational Finance, Center of Neuroscience-inspired AI Seminar, *2019*
- A Deep Understanding of Artificial Neural Networks, AI research council at Department of Mathematics, Ajou University, *2017*

## **LECTURES**

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- Lecture for implementation of RL algorithms, Hanyang Univ. IDEC, *Aug. 2022*
- Short Lecture Series: NLP+RL, Center of Neuroscience-inspired AI Seminar, *Jun.-Jul. 2022*
- Implementation of RL algorithms in the lecture of “Brain-inspired Artificial intelligence”, KAIST, *Fall. 2021*

## **SERVICES**

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- Session chair, Neuroscience+AI, Korean AI Association, *2021*
- Session chair, Next-generation AI: Towards Human-level Intelligence, *2020*
- Paper Review: ACAIN 2021, GECCO 2018, 2019
- SIGEVO Summer School, Berlin, *2017*

## **MENTORING EXPERIENCES**

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- Ye Mook Choi, graduate student at KAIST, *2021-present*
- Juno Kim, graduate student at KAIST, *2020-present*
- Seungeun Chi, graduate student at Seoul National University, *2019*

## **CERTIFICATE**

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- Certified Investment Manager, Korea Financial Investment Association (KOFIA), *2011*

## REFERENCES

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Byung-Ro Moon  
Professor and CEO  
Seoul National University, Seoul, Korea  
Optus Investment Inc., Seoul, Korea  
Email: [moon@snu.ac.kr](mailto:moon@snu.ac.kr)  
Relationship: Doctoral advisor and supervisor

Sang-Wan Lee  
Associate Professor  
KAIST, Daejeon, Korea  
Email: [swlee@kaist.ac.kr](mailto:swlee@kaist.ac.kr)  
Relationship: Postdoctoral advisor

Anil Yaman  
Assistant Professor  
Vrije Universiteit Amsterdam, Amsterdam, Netherland  
Email: [a.yaman@vu.nl](mailto:a.yaman@vu.nl)  
Relationship: Collaborator