Hojoon Lee

Reinforcement Learning Researcher

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Research Interests

I'm passionate about developing embodied AI that can continuously learn and adapt in dynamic environments. I envision foundation models acting as the "brain," capturing vast general knowledge and planning long-term strategies. Then, these strategies can be executed by small, specialized agents. To do so, I am particularly interested in:

(i) Desining frameworks to integrate foundation models into embodied systems.

(ii) Designing scalable, compute- and sample-efficient RL algorithms to develop small, task-specific policies.

Education

KAIST *Seongnam, Korea*

M.S / Ph.D. student in AI, advised by Prof.Jaegul Choo (GPA: 4.1 / 4.3). *Mar.2020 - Present*

Korea University *Seoul, Korea*

B.S in Computer Science (GPA: 4.05 / 4.5). *Mar.2014 - Feb.2020*

Work

Sony AI *Tokyo, Japan*

Research Intern *Feb.2024 - Aug.2024*

- Developing a vision-based autonomous racing agent in a realistic simulator using RL.
- Mentor: Takuma Seno, Kaushik Subramanian, and Peter stone.

KakakEnterprise *Seongnam, Korea*

AI Research Intern *Sep.2021 - Feb.2022*

- Built an open-source RL framework, Jorldy (300+ ☆).

Neowiz *Seongnam, Korea*

AI Research Intern *Mar.2019 - Jul.2019*

- Develop a RL agent that can play a turn-based strategy game, BrowndustZero.

Selected Publications

A Champion-level Vision-based RL Agent for Competitive Racing in Gran Turismo 7 ***Preprint***

- **Hojoon Lee***, Takuma Seno*, Jun Jet Tai*, Kaushik Subramanian, Kenta Kawamoto, Peter R.Wurman, Peter Stone
- Developed a vision-based RL agent that achieves champion-level racing in Gran Turismo 7.

SimBa: Simplicity Bias For Scaling Up Parameters in Deep Reinforcement Learning ***Preprint***

- **Hojoon Lee***, Dongyoon Hwang*, Donghu Kim, Hyunseung Kim, Jun Jet Tai, Kaushik Subramanian, Peter R.Wurman, Jaegul Choo, Peter Stone, Takuma Seno
- Designed network architectures that favor simple functions, achieving state-of-the-art performance in state-based RL.

Slow and Steady Wins the Race: Maintaining Plasticity with Hare and Tortoise Networks ***ICML'24***

- **Hojoon Lee**, Hyeonseo Cho, Hyunseung Kim, Donghu Kim, Dugki Min, Jaegul Choo, Clare Lyle
- To maintain network plasticity, we introduce Hare and Tortoise networks, imitating the hippocampus and neocortex of the brain.

Languages

English	Fluent
Korean	Native

Technical-Skills

Proficient	Git, Python, PyTorch, Tensorflow, Jax
Experience	C, Docker, SQL, Hadoop

Publications

A Champion-level Vision-based RL Agent for Competitive Racing in Gran Turismo 7 — ***Preprint***

- **Hojoon Lee***, Takuma Seno*, Jun Jet Tai*, Kaushik Subramanian, Kenta Kawamoto, Peter R.Wurman, Peter Stone
- Developed a vision-based RL agent that achieves champion-level racing in Gran Turismo 7.

SimBa: Simplicity Bias For Scaling Up Parameters in Deep Reinforcement Learning — ***Preprint***

- **Hojoon Lee***, Dongyoon Hwang*, ..., Kaushik Subramanian, Peter R.Wurman, Jaegul Choo, Peter Stone, Takuma Seno
- Designing network architectures that steer convergence toward simple functions allows for scaling up parameters in RL.

Do's and Don'ts: Learning Desirable Skills with Instruction Videos — ***NeurIPS'24***

- Hyunseung Kim, Byungkun Lee, **Hojoon Lee**, Dongyoon Hwang, Donghu Kim, Jaegul Choo
- We present DoDont, a skill discovery algorithm that learns diverse behaviors while following the instruction videos.

Slow and Steady Wins the Race: Maintaining Plasticity with Hare and Tortoise Networks — ***ICML'24***

- **Hojoon Lee**, Hyeonseo Cho, Hyunseung Kim, Donghu Kim, Dugki Min, Jaegul Choo, Clare Lyle
- To maintain network plasticity, introduce Hare and Tortoise networks, imitating the hippocampus and neocortex of the brain.

Investigating Pre-Training Objectives for Generalization in Vision-Based RL — ***ICML'24***

- Donghu Kim*, **Hojoon Lee***, Kyungmin Lee*, Dongyoon Hwang, Jaegul Choo
- Investigate which pre-training objectives are beneficial for out-of-distribution generalization in visual RL.

Adapting Pretrained ViTs with Convolution Injector for Visuo-Motor Control — ***ICML'24***

- Donyoon Hwang*, Byungkun Lee*, **Hojoon Lee**, Hyunseung Kim, Jaegul Choo
- Introduce an add-on convolution module for ViT which injects locality and translation equivariant biases.

PLASTIC: Enhancing Input and Label Plasticity for Sample Efficient Reinforcement Learning — ***NeurIPS'23***

- **Hojoon Lee***, Hanseul Cho*, Hyunseung Kim*, Daehoon Gwak, Joonkee Kim, Jaegul Choo, Se-Young Yun, Chulhee Yun
- Construct a sample-efficient RL algorithm by preserving the model's input & label plasticity throughout training.

Learning to Discover Skills through Guidance — ***NeurIPS'23***

- Hyunseung Kim*, Byungkun Lee*, **Hojoon Lee**, Dongyoon Hwang, Kyushik Min, Sejik Park, Jaegul Cho
- Develop a skill-discovery algorithm based on the spirit of the Go-Explore algorithm.

On the Importance of Feature Decorrelation for Unsupervised Representation Learning in RL — ***ICML'23***

- **Hojoon Lee**, Gwanho Lee, Dongyoon Hwang, Hyunho Lee, Byungkyeun Lee, and Jaegul Choo
- Develop a self-predictive representation learning method from video for reinforcement learning.

ST-RAP: A Spatio-Temporal Framework for Real Estate Appraisal — *(short)* ***CIKM'23***

- **Hojoon Lee***, Hawon Jeong*, Byungkun Lee*, and Jaegul Choo
- Propose a novel real estate appraisal framework that integrates a real estate's spatial and temporal aspects.

Towards Validating Long-Term User Feedbacks in Interactive Recommender System — 🏆 *(short)* ***SIGIR'22***

- **Hojoon Lee**, Dongyoon Hwang, Kyusik Min, and Jaegul Choo
- Analyze the existence of long-term effects in reinforcement learning-based interactive recommender systems.

DraftRec: Personalized Draft Recommendation for Winning in MOBA Games — ***WWW'22***

- **Hojoon Lee***, Dongyoon Hwang*, Hyunseung Kim, Byungkun Lee, and Jaegul Choo
- Develop a personalized champion recommendation system in *League of Legends* with a hierarchical transformer architecture.

Honors & Awards

Travel Award ($3,000 as awards), Crevisse Partners, 2023.

SIGIR Best Short Paper Honorable Mention, 2022.

Korea Government Full Scholarship ($10,000 per year), Ministry of Science and ICT of Korea, 2020, 2021.

College Scholarship ($4,000 credit as awards), Seongnam Scholarship Foundation, 2017.

Eight Army General Paik Sun Yup Leadership Award, LTG Thomas.S.Vandal, U.S Army, 2017.

Academic Service

Reviewer Neurips'23-24, ICLR'24-25, ICML'24, AAAI'24