# JUNYEOB BAEK

Ph.D. Student @ KAIST

#### **RESEARCH INTEREST**

My research goal is to build "An Embodied Machine that can develop intelligence throughout its lifetime, just like humans." Specifically, the machine should be able to establish and grow its own lens of worlds, goals, and values in open-ended environments. In pursuit of this goal, the main questions I want to investigate are:

- Q1. How can AI understand the world more systematically? Systematic World Understanding & Generalization
- Q2. How can AI continuously accumulate and apply knowledge/skills? Continual Learning
- Q3. Can AI develop its own goals following intrinsic motivation? Autotelic Agents
- Q4. How can AI maintain autonomy while sharing human values? Human Value Alignment

Keywords: world models, lifelong learning, intrinsic motivation, AI alignment

#### **EDUCATION**

Korea Advanced Institute of Science and Technology(KAIST)	Mar. $2025 - Present$
Ph.D. in Computer Science - Advisor: Sungjin Ahn	Daejeon, Korea

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

M.S. in Artificial Intelligence - Advisor: Sungjin Ahn

• Thesis: Dreamweaver: Learning Compositional World Models from Pixels

## Hanyang University(ERICA)

B.S. in Robot Engineering - GPA - 4.29 / 4.5

- Summa Cum Laude
- Capstone Project1: Disaster and Rescue Robot Simulation Modeling(Darrsm) 2nd Prize in College
- Capstone Project2: Walk Yourself, Toddler!(WalkYTo) 3rd Prize in Department

# PUBLICATIONS

- 1. Junyeob Baek, Hosung Lee, Christopher Hoang, Mengye Ren, and Sungjin Ahn. "Discrete JEPA: Learning Discrete Token Representations without Reconstruction". Under Review (2025).
- Donghwan Chi, Hyomin Kim, Yoojin Oh, Yongjin Kim, Donghoon Lee, Daejin Jo, Jongmin Kim, Junyeob Baek, Sungjin Ahn, and Sungwoong Kim. "Slot-MLLM: Object-Centric Visual Tokenization for Multimodal LLM". Preprint (2025).
- 3. Junyeob Baek, Yi-Fu Wu, Gautam Singh, and Sungjin Ahn. "Dreamweaver: Learning Compositional World Models from Pixels". In: International Conference on Learning Representation (ICLR) (2025).
- Chang Chen, Junyeob Baek, Fei Deng, Kenji Kawaguchi, Caglar Gulcehre, and Sungjin Ahn. "PlanDQ: Hierarchical Plan Orchestration via D-Conductor and Q-Performer". In: International Conference on Machine Learning (ICML) (2024).

#### THESIS

• Junyeob Baek. "Dreamweaver: Learning Compositional World Models from Pixels". Master's Thesis, KAIST, Advisor: Sungjin Ahn (Feb. 2025).

Mar. 2023 – Feb. 2025 Daejeon, Korea

Mar. 2014 – Feb. 2018 Ansan, Korea

# ACADEMIC SERVICE

#### **Conference Reviewer**

• International Conference on Learning Representations (ICLR) 2025

## TEACHING EXPERIENCE

#### **Teaching Assistant**

CS377: Introduction to Reinforcement Learning, KAIST

## PROFESSIONAL EXPERIENCE

#### MakinaRocks

ML Research Engineer(Robotics Focused)

#### • Optimization of Welding Task and Motion Planning in Vehicle Manufacturing Process

- \* Challenges: 1. Large-scale and high complexity in Optimization Problem. 2. Required high-accuracy planning in highly cluttered environments. 3. Required tight Time Window for control
- \* [Contribution 1] GA-based Multi-objective Optimization Module for Welding-point Assignment
- \* [Contribution 2] Multi-Robot Interlock Scheduling System with Swept-volume-based collision detection

# Syscon, Co., Ltd.

Robotics Software Engineer/Research Strategy Manager

- AMR Navigation System Design & Product Development
- [Field Exp.] Successful Deployment for Smart Factory Project
  - \* More than 300 delivery tasks per day with 14 robots
- [Research Exp.] Learning-based High-accuracy Object Pose Estimator(Dock Pose Estimation)
- [Research Exp.] Distilled Meta Policy Navigation System for Multi-behavior Skillset and its Strategies

# **TECHNICAL SKILLS**

Languages: C/C++, Python Frameworks: ROS, pytorch, tensorflow/keras, openCV, PCL, MongoDB, mySQL Tools: Linux, Git, CMake, Docker, markdown, LaTeX

Jun. 2021 – Jun. 2022

Dec. 2017 – Jun. 2021 Incheon, Korea

Spring 2025 Daejeon, Korea

Seoul, Korea