Jaehong Oh

Robotics Engineer · AI Researcher · Mechanical Engineer

Seoul, South Korea

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Education

Soongsil University — Seoul, South Korea

B.S. in Mechanical Engineering — Feb 2019 - Present

- Major: Mechanical Engineering with focus on Robotics, AI/ML, and Control Systems
- Research areas: Reinforcement Learning, Robot Manipulation, Computer Vision, Fluid Mechanics
- Active member of Fluid Mechanics Laboratory and Intelligent Robotics Laboratory

Research Experience

Research Team Leader — Seoul, South Korea

Intelligent Robotics Laboratory, Soongsil University — Feb 2024 - Present

- Leading reinforcement learning-based Hidden Object Finding project with robot manipulator
- Developing novel algorithms for object discovery and manipulation in occluded environments
- Integrating computer vision, tactile feedback, and predictive reasoning for intelligent grasping
- Designing reward functions and environment models for RL training using PyTorch and ROS2

Project Team Leader — Seoul, South Korea

Fluid Mechanics Laboratory, Soongsil University — Jun 2022 - Jun 2023

- Led Janus particle synthesis project for bio-pharmaceutical applications
- Conducted electrohydrodynamics (EHD) research with 3D-printed Y-shaped microfluidic channels
- Performed CFD simulations and experimental validation of microscale flow phenomena
- Managed research planning, experimentation, and technical documentation

Development Team Leader — Seoul, South Korea

Aviation Society 'Cheonggeumbi', Soongsil University — Feb 2022 - Feb 2023

- Led overall development of 4-axis autonomous flight drone from concept to implementation
- Designed and fabricated custom drone frame using CAD (AutoCAD, SolidWorks)
- Developed autonomous flight algorithms and mission planning systems
- Implemented PID control and sensor fusion for stable flight control
- Managed cross-functional team of mechanical, electrical, and software engineers

Selected Projects

RL-based Soma Cube Assembly System

Doosan Robotics M0609 Manipulator — 2024

- Led development of reinforcement learning system for autonomous Soma cube assembly using Doosan M0609
- Designed Legal-Action Masking algorithm, reducing action space from 4,536 to 2,484 valid actions (26% efficiency improvement)
- Developed ZYZ Euler angle singularity avoidance system, improving success rate from 54% to 96.1%
- Achieved 91% sim-to-real transfer efficiency through domain randomization in Unity environment
- Published research on arXiv (arXiv:2508.21272)

Ontology Neural Network Development

Independent Research — 2024

- Conceptualized and developed novel neural network architecture for topological reasoning
- Formulated mathematical framework using Forman-Ricci curvature and persistent homology
- Designed meaning preservation mechanisms for relational understanding in neural networks
- Created ORTSF (Ontology-based Real-Time State Feedback) framework for delay-robust control
- Published theoretical foundations on arXiv (arXiv:2506.19277)

Industrial Safety Monitoring System

TurtleBot3 with YOLOv5 — 2024

- Developed autonomous patrol robot for real-time industrial safety equipment detection
- Customized YOLOv5 model for detecting helmets, safety vests, and protective eyewear
- Implemented SLAM-based autonomous navigation with dynamic obstacle avoidance using Lidar and RGB-D camera
- Achieved over 95% detection accuracy for safety equipment compliance monitoring
- Integrated real-time alert system via MQTT for immediate notification of safety violations

Precision Liquid Injection Control System

Fluid Mechanics Laboratory 2023

- Designed complete system architecture for high-precision concentration control in bio-pharmaceutical applications
- Developed load cell-based mass measurement system with Extended Kalman Filter (0.1g precision)
- Implemented ROS2-based multi-threaded architecture for real-time sensor-control-UI integration
- Achieved 0.5% accuracy in target concentration control through modified Bernoulli equation-based feedback control
- Constructed MQTT protocol-based distributed communication system for system scalability

Cognitive Collaborative Robots Architecture

Independent Research 2024

- Proposed novel system architecture for semantic-level human-robot collaboration
- Designed cognitive partnership framework transcending traditional tool-based robot interaction
- Developed explainable control mechanisms for human-centric cooperation
- Published research on arXiv (arXiv:2505.03815)

Publications

Ontology Neural Network and ORTSF: A Framework for Topological Reasoning arXiv:2506.19277

First Author 2024

- Novel neural network architecture enabling relational meaning understanding through topological structures
- Mathematical framework using Forman-Ricci curvature and persistent homology for meaning preservation

Towards Cognitive Collaborative Robots: Semantic-Level Integration arXiv:2505.03815

First Author 2024

- System architecture for semantic-level human-robot collaboration beyond tool-based interaction
- Cognitive partnership framework for genuine collaborative intelligence

RL-based Soma Cube Assembly using Doosan M0609 Robotic Manipulator arXiv:2508.21272

First Author 2024

- Legal-Action Masking algorithm achieving 26% improvement in sample efficiency
- ZYZ singularity avoidance system improving success rate from 54% to 96.1%

Technical Skills

Robotics & Control	**ROS2**, **Robot Manipulation**, **Autonomous Systems**, SLAM, PID Control, Sensor Fusion
AI & Machine Learning	**PyTorch**, **TensorFlow**, **Reinforcement Learning**, Computer Vision, YOLOv5, Deep Learning
Programming Languages	**Python**, **C++**, MATLAB, Git, Linux
CAD & Mechanical Design	**AutoCAD**, **SolidWorks**, Autodesk Inventor, 3D Printing, CFD Simulation
Tools & Frameworks	Unity, MQTT, WebSocket, Docker, Intel RealSense, Arduino, Raspberry Pi

Certifications

CAT (Certified Associate in Technology) Level 1 Korea Productivity Center

Aug 2024

Doosan Robotics Bootcamp Doosan Robotics

2024