

Dong Ho Lee

Curriculum Vitae

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RESEARCH INTERESTS

Autonomous Mission Planning and Intelligent Decision-making

- Learning-based routing and scheduling of multiple agents under dynamic environments

Deep Reinforcement Learning for Optimization Problems

- Efficient learning of heuristics for combinatorial optimization with physical constraints

Theoretical Development of Rigorous Planning and Control

- Fundamental research on *intelligent transportation systems*, *safe planning of multi-agent systems*, and *autonomous systems*

EDUCATION

Korea Advanced Institute of Science & Technology (KAIST)

Daejeon, Korea

Master of Science (MS) in Aerospace Engineering (Advisor: Prof. Jaemyung Ahn)

Sep. 2020 – Aug. 2022

- Thesis: Multiple UAV Routing for Re-planning under Dynamic Environment using Deep Reinforcement Learning
- GPA: 4.11/4.30

Bachelor of Science (BS) in Aerospace Engineering

Sep. 2012 – Feb. 2017

- Class Rank: 56/573, Top 9.8%
- GPA: 3.92/4.30, *Magna Cum Laude*

RESEARCH EXPERIENCES

Strategic Aerospace Initiative, KAIST 📄

Daejeon, Korea

Research Assistant (Advisor: Prof. Jaemyung Ahn)

Sep. 2020 - Present

1. Routing Problems Considering Value System for Exploration Missions

- Proposed a data-efficient deep reinforcement learning algorithm to train a Transformer-based policy network for solving routing problems [JR1], [C1], [T1]

2. Data-driven Flow Modeling and Analysis

- Developed a deep-learning model for efficient prediction of aerodynamic coefficients under extreme flow conditions [JR2], [C2]

Aerospace Technology Research Institute, ADD 📄

Daejeon, Korea

First Lieutenant (Research Officer for National Defense[†]) (Mentor: Dr. Woohyuk Chang)

Jun. 2017 – May. 2020

1. Autonomous Navigation and Mission Management Technology

- Developed mission planning algorithm for UAVs operating in dynamic environment [J1], [C3-4]
- Formulated and solved an optimal UAV planning problem (MILP)
- Developed a parallel genetic algorithm for fast online planning on GPU

2. Autonomous Mission Planning System Simulator

- Developed an autonomous mission planning program for UAV simulator on Linux [P1]

Unmanned Systems Research Group, KAIST 📄

Daejeon, Korea

Undergraduate Research Intern (Advisor: Prof. David Hyun-chul Shim)

Dec. 2015 – Sep. 2016

1. Development of Modular Drone with Self-Configuration

- Designed and constructed a 3D-printable modular drone that can configure itself before flight
- Received *Excellent Research Award* among 53 projects in Undergraduate Research Participation (URP) program

[†] ROND: Korean research program modeled after Israel's Talpiot program, selecting 20 undergraduates across the country to serve their military duties as research officers at Agency for Defense Development (ADD)

JOURNAL PUBLICATIONS

- [J1] **Lee, D. H.**, Jang, H., Kim, S. H., & Chang, W. (2020). Multi-UAV Mission Allocation and Optimization Technique Based on Discrete-Event Modeling and Simulation. *Journal of the Korean Society for Aeronautical & Space Sciences*, 48(2), 159-166.
- [JR1] **Lee, D. H.** & Ahn, J. (2022). Multi-Start Team Orienteering Problem for UAS Mission Re-Planning with Data-Efficient Deep Reinforcement Learning. *Journal of Intelligent & Robotic Systems* (Under Review)
- [JR2] **Lee, D. H.**, Lee, D.U., Han, S., Seo, S., Lee, B. J., & Ahn, J. (2022). Deep Residual Neural Network for Predicting Aerodynamic Coefficient Changes with Ablation. *Aerospace Science and Technology* (Under Review)

CONFERENCE PROCEEDINGS

- [C1] **Lee, D. H.**, & Ahn, J. A Deep Reinforcement Learning Approach to solve the Vehicle Routing Problem with Resource Constraints. In *AIAA Scitech Forum 2023*, Maryland, USA. (Session: Autonomy IV, to appear)
- [C2] **Lee, D. H.**, Lee, D. U., Lee, J., Lee, B. J., & Ahn, J. Prediction of Multiple Aerodynamic Coefficients of Missiles using CNN. In *AIAA Scitech Forum 2022*, San Diego, USA. (Session: Learning, Reasoning, and Data Driven Systems III)
- [C3] **Lee, D. H.**, Chang, W., & Byun, J. An Optimization Technique for Discrete Event Model-based UAV Real-Time Heterogeneous Mission Allocation. In 2018 *Proceedings of the Korean Society for Aeronautical and Space Sciences, Fall Conference*, Jeju, Korea.
- [C4] **Lee, D. H.**, Chang, W., & Byun, J. Discrete-event Modeling and Simulation of Autonomous Multi-UAV Mission Management. In 2018 *Avionics Systems Symposium Korea (ASSK)*, Yeosu, Korea.

INVITED TALK / SEMINAR

- [T1] "Multiple UAV Re-planning using Deep Reinforcement Learning," Aerospace Technology Research Institute, Agency for Defense Development, Daejeon, Korea, Nov. 2022.

PATENTS (REGISTERED)

- [P1] Chang, W., **Lee, D. H.**, Jang, H., Method and apparatus for optimization of unmanned vehicle mission allocation, KR102063851 (Jan. 2020)

AWARDS & HONORS

- **Excellent Paper Award**, Avionics Systems Symposium Korea *July. 2018*
- **Excellence in Leadership & Volunteer Activity**, KAIST *Apr. 2016*
 - Granted to top 5% students with active participation in the leadership programs.
- **Excellent Research Award in URP**, KAIST *Aug. 2016*
- **Dean's List**, College of Engineering, KAIST *Feb. 2016*
 - Awarded to top 3% (Fall 2015 GPA: 4.22/4.3)

SCHOLARSHIPS

- **National Scholarship for Graduate Study**, KAIST *2020 - 2022*
 - Full support for graduate school tuition and monthly stipends
- **Department Honors Scholarship**, KAIST *Feb. 2016*
- **The Boeing Company-KAIST Undergraduate Scholarship**, KAIST *2014 - 2016*
 - Merit-based scholarship which offered \$1,500 per semester for academic excellence
- **National Scholarship for Science & Engineering**, Korea Student Aid Foundation (KOSAF) *2015 - 2016*
 - Full support for university tuition and \$8,700 scholarship as a *ROND* cadet
- **National Scholarship for Undergraduate Study**, KAIST *2012 - 2014*

TEACHING

Teaching Assistant @KAIST

- AE201 Introductory Flight Project *Spring 2021*
- HSS024 Advanced English Writing *Spring 2015–Spring 2016*
- HSS025 Advanced English Reading *Spring 2015–Spring 2016*
- LG-KAIST Science Camp *Summer 2015*
- Academic English Camp *Winter 2014; Winter 2015*

LEADERSHIP EXPERIENCES

Graduate Student Association, KAIST Aerospace Engineering

Vice President *Feb. 2021 - Feb. 2022*

ROND Cadet Association

President *Aug. 2015 - Mar. 2017*

Undergraduate Student Council, KAIST

Student Representative, Bureau of International Relations *Aug. 2014 - Dec. 2014*

KAIST International Students Association (KISA), KAIST

Head, Bureau of Public Relations *2015*

EXTRACURRICULAR ACTIVITIES

KAIST-Saudi Aramco Mentoring Program

Mentor *Feb. 2015 - Dec. 2015*

- Mentor for prospective freshmen from Saudi Arabia and UAE during their preparatory first year

LANGUAGES

Fluent in **English** and native in **Korean**

- GRE: 326 (Verbal: 159, Quantitative: 167, Writing: 4.5)
- TOEFL: 115 (Reading: 29, Listening: 29, Speaking: 27, Writing: 30)

PROGRAMMING SKILLS

Python {PyTorch, NumPy, Matplotlib}, MATLAB, C/C++, NVIDIA CUDA, \LaTeX