☆ | ¶ | **in** | **Q** | **I** leedh0124@kaist.ac.kr |

Research Interests

Autonomous Misison Planning and Intelligent Decision-making

- Learning-based route planning and scheduling of multiple agents under dynamic environments

Deep Reinforcement Learning for Optimization Problems

 Efficient learning of heuristics for approximate solutions to combinatorial optimization with physical constraints

Mathematical Programming Formulation and Techniques

- Design of mathematical formulation for real-world optimization such as autonomous systems, intelligent transportation systems, and safe control of multi-agent systems

EDUCATION

Korea Advanced Institute of Science & Technology (KAIST)

Daejeon, Korea

Master of Science (MS) in Aerospace Engineering (Advisor: Prof. Jae-myung Ahn)

Sep. 2020 - Aug. 2022

- GPA: 4.11/4.30

Bachelor of Science (BS) in Aerospace Engineering

Sep. 2012 - Feb. 2017

- GPA: 3.92/4.30, Magna Cum Laude

- Class Rank: 56/573, Top 9.8%

RESEARCH EXPERIENCES

Strategic Aerospace Initiative, KAIST &

Daejeon, Korea

Research Assistant (Advisor: Prof. Jae-myung Ahn)

Sep. 2020 - Present

1. Routing problems considering value system for exploration missions

- Proposed a data-efficient online methodology to train a Transformer-based policy network for solving routing problems via deep reinforcement learning [JR1], [C1-2]

2. Data-driven flow modeling and analysis

 Developed a deep-learning model for efficient prediction of aerodynamic coefficients under extreme flow conditions [JR2], [C3]

Agency for Defense Development (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], [C4-5]
- Formulated UAV planning problem as MILP and solved via Gurobi optimizer
- Developed a genetic algorithm-based metaheuristic methodology for fast online planning

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 Award in Undergraduate Research Program (URP)

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.

 $^{^\}dagger$ 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 ADD

[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*.

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] Moon, C. H., Lee, D. H., & Ahn, J. Truck-Drone Delivery Using Heterogeneous Vehicle Routing Problem Based on Deep Reinforcement Learning. In AIAA Scitech Forum 2023, Maryland, USA. (Session: Autonomous Mission Management Concepts and Technologies II, to appear)
- [C3] 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)
- [C4] 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.
- [C5] 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.

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, ASSK 2018	July. 2018
 Excellence in Leadership & Volunteer Activity, KAIST Granted to top 5% students with active participation in the leadership programs. 	Mar. 2016
- Excellent Award in Undergraduate Research Program (URP), KAIST	Aug. 2016
 Dean's List, College of Engineering, KAIST Awarded to top 3% (GPA: 4.22/4.3) 	Feb. 2016

SCHOLARSHIPS

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

TEACHING

Teaching Assistant @KAIST

- AE201 Introductory Flight Project
- HSS024 Advanced English Writing
- HSS025 Advanced English Reading

Spring 2021

Spring 2015–Spring 2016

Spring 2015–Spring 2016

- LG-KAIST Science Camp

– Academic English Camp

Summer 2015 Winter 2014; Winter 2015

LEADERSHIP EXPERIENCES

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

KISA(KAIST International Students Association), 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++, LATEX