

# Dong Ho Lee

Curriculum Vitae

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## RESEARCH INTERESTS

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### 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 to combinatorial optimization with physical constraints

### Mathematical Programming Formulation and Techniques

- Application of optimization principles and algorithms for *intelligent transportation systems*, *safe planning of multi-agent systems*, and *autonomous systems*

## EDUCATION

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### 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

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### 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], [C1-2]

#### 2. Data-driven Flow Modeling and Analysis

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

### Aerospace Technology Research Institute, ADD 🏠

Daejeon, Korea

*First Lieutenant (Research Officer for National Defense<sup>†</sup>) (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 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

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<sup>†</sup> 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

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- [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)

## CONFERENCE PROCEEDINGS

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- [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)

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

## AWARDS & HONORS

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

## SCHOLARSHIPS

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

## TEACHING

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### 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

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### 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

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### 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

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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

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