Dong Ho Lee

Curriculum Vitae

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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*

- 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*

- 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* 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 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.

Journals Under Review

[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 *Mar. 2016*
  - Granted to top 5% students with active participation in the leadership programs.
- **Excellent Award in Undergraduate Research Program (URP)**, KAIST *Aug. 2016*
- **Dean's List**, College of Engineering, KAIST *Feb. 2016*
  - Awarded to top 3% (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*
  - Dean's list for 2015 Fall
- **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, Department of AE
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