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 to combinatorial optimization with physical constraints

Mathematical Programming Formulation and Techniques
- Application of optimization priciples and algorithms for *intelligent transportation systems*, *safe planning of multi-agent systems*, and *autonomomous 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], [C1-2]
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†) (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

† 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] 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**, Avionics Systems Symposium Korea *July. 2018*
- **Excellence in Leadership & Volunteer Activity**, KAIST *Mar. 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