Jayden Dongwoo **Lee**

Postdoctoral Researcher, AITA InnoCORE · KAIST

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"Toward reliable and resilient autonomy for aerial vehicles: bridging model-based control, data-driven methods, and GNSS-denied navigation."

Summary

A GNC (guidance, navigation, and control) researcher working on aerial vehicles that stay safe under model uncertainty, component faults, and loss of GNSS. My Ph.D. dissertation on data-driven fault diagnosis and fault-tolerant control for eVTOL received the **KAIST College of Engineering Outstanding Ph.D. Dissertation Award** (Feb. 2026). I am currently a postdoctoral researcher in the AITA InnoCORE program at KAIST with Prof. Hyochoong Bang. My work combines (i) model-based control (Lyapunov, SMC, MPC, MRAC), (ii) data-driven methods (Gaussian processes, Koopman operator, SINDy, reinforcement learning), and (iii) hardware-in-the-loop and flight-test validation.

Field of Interest

- **AI-based guidance and control**: Gaussian processes, SINDy, and reinforcement learning for adaptive, incremental, and model-predictive control.
- **Fault diagnosis and fault-tolerant control**: data-driven FDD and control allocation for multirotors, eVTOL, and UAM.
- **GNSS-denied navigation**: factor graph optimization with INS, UWB, terrain, and quantum magnetometer measurements.
- **Future directions**: digital twins and integrated validation; certifiable AI flight control (handling-qualities requirements, run-time assurance).

Education

Korea Advanced Institute of Science and Technology (KAIST) — *Daejeon, Republic of Korea*
Ph.D. in Aerospace Engineering — *Sep. 2021 – Aug. 2025*

- Dissertation: *"Data-Driven Fault Diagnosis and Fault-Tolerant Control for Redundancy of eVTOL Systems"*
- **Outstanding Ph.D. Dissertation Award, KAIST College of Engineering (Feb. 2026)**
- Advisor: Prof. Hyochoong Bang, Flight Dynamics, Guidance and Control Laboratory GPA: 3.88 / 4.3

Korea Advanced Institute of Science and Technology (KAIST) — *Daejeon, Republic of Korea*
M.S. in Aerospace Engineering — *Sep. 2019 – Aug. 2021*

- Thesis: *"Model Reference Adaptive Control Design for Quadrotor UAV Transporting Unknown Payloads"*
- Advisor: Prof. Hyochoong Bang GPA: 3.91 / 4.3

Ulsan National Institute of Science and Technology (UNIST) — *Ulsan, Republic of Korea*
B.S. in Mechanical and Aerospace Engineering (Cum Laude) — *Mar. 2015 – Aug. 2019*

- Thesis: *"Design of Hybrid Propulsion Multirotor System"* Research advisor: Prof. Hungsun Son GPA: 3.62 / 4.3

Professional Experience

AITA InnoCORE Program, Department of Aerospace Engineering, KAIST — *Daejeon, Republic of Korea*
Postdoctoral Researcher — *Sep. 2025 – Present*

- AI-based fault-tolerant control and quantum-magnetometer-aided navigation for eVTOL and unmanned aerial systems (advisor: Prof. Hyochoong Bang).
- Mentoring graduate and undergraduate students; flight-test campaigns with VN-200 INS, ZED-F9P RTK-GPS, and magnetometer payloads.

AI Research Center, Hanyoung Nux Co., Ltd. — *Republic of Korea*
AI Research Engineer (concurrent with graduate studies) — *Apr. 2021 – Feb. 2024*

- Industrial temperature-controller algorithms combining PID tuning with data-driven adaptation; productized control modules.

Honors & Awards

Dissertation & Academic Honors

2026 Outstanding Ph.D. Dissertation Award, KAIST College of Engineering
2024 Grand Paper Award, Institute of Control, Robotics and Systems (ICROS)

Entrepreneurship

2024 Top Excellence Award, Defense-Technology-Based Startup Competition, Defense Acquisition Program Administration (DAPA)
2024 Excellence Prize (team), Challenge! K-Startup Grand Finale, Ministry of SMEs and Startups

Best Paper Awards

2025 Best Paper Award, Korea Institute of Military Science and Technology (KIMST)
2025 Best Paper Award, Society for Aerospace System Engineering (SASE)
2024 Best Paper Award, Institute of Control, Robotics and Systems (ICROS)
2024 Best Paper Award ($\times$2), Society for Aerospace System Engineering (SASE)
2024 Best Paper Award, Korean Society for Aeronautical and Space Sciences (KSAS)
2023 Best Paper Award, 23rd International Conference on Control, Automation and Systems (ICCAS)
2020 Best Paper Award, Society for Aerospace System Engineering (SASE)

Scholarships & Distinctions

2025 Paan Foundation Academic Scholarship; Cho Jung-hoon Scholarship, KAIST; Moral Character Scholarship, KAIST
2024 Excellent Teaching Assistant Award, KAIST
2019 Cum Laude, UNIST

Publications

International Journal Papers (SCI/SCIE, 24)

Full list including domestic journals and conference papers: lee-jd.com/publications

[1] **Jayden Dongwoo Lee**, Hyochoong Bang, "Data-Driven Fault Detection and Diagnosis for eVTOL Systems Using SINDy," *IEEE Transactions on Aerospace and Electronic Systems*, 2026. (Early Access) [doi]

[2] Byeonghyeon Jo, **Jayden Dongwoo Lee**, Hyochoong Bang, "Reinforcement Learning-Based Error-Gated σ-Modification Adaptive Control for Cascade Missile Longitudinal Autopilots under Aerodynamic Uncertainty," *International Journal of Control, Automation, and Systems*, 2026. (Accepted)

[3] Bohyun Chang, **Jayden Dongwoo Lee**, Hyochoong Bang, Donghun Lee, "Robust Point Cloud Registration using LiDAR Intensity Levels for On-orbit Proximity Operations," *Journal of Aerospace Information Systems*, 2026. (Accepted)

[4] Minwoo Kang, **Jayden Dongwoo Lee**, Seonghun Yun, Hyochoong Bang, "Sliding Mode Disturbance Observer-based Robust Model Predictive Control using Sparse Identification of Nonlinear Dynamics," *Journal of Aerospace Information Systems*, 2026.

[5] Hyeonmin Kim, **Jayden Dongwoo Lee**, Bohyun Chang, Hyochoong Bang, "Adaptive Sliding Window Factor Graph Optimization with Multi-tag UWB/INS Fusion for Multirotor UAVs," *Aerospace Science and Technology*, 2026.

[6] **Jayden Dongwoo Lee**, Yoonseong Kim, Youngjae Kim, Hosun Lee, Ji-Hun Cha, Hyochoong Bang, "Sensor and Actuator Fault Detection and Isolation for Urban Air Mobility," *IEEE Sensors Journal*, 2026.

[7] Lamsu Kim, Hosun Lee, **Jayden Dongwoo Lee**, Hyochoong Bang, "Gaussian Process-Driven Incremental Flight Dynamics Control and Center of Gravity Adjustment for Tailsitter UAVs," *Journal of Intelligent & Robotic Systems*, 2026. [doi]

[8] Yujin Lee, Juhyeong Park, **Jayden Dongwoo Lee**, Hyochoong Bang, "Attitude Takeover Control of Combined Spacecraft with Actuator Saturation using Prescribed Performance and Time-Delay Estimation," *International Journal of Aeronautical and Space Sciences*, 2026.

[9] Dongshik Won, Kyungwoo Hong, **Jayden Dongwoo Lee**, Heoncheol Lee, Hyochoong Bang, "In-Orbit Validation of a Heterogeneous COTS Architecture for Onboard AI: Characterizing System-Level Vulnerabilities and Operational Failure Pathways," *International Journal of Aeronautical and Space Sciences*, 2026.

[10] Gilsu Park, Chun-Gon Kim, Heechul Kwon, **Jayden Dongwoo Lee**, Jinwoo Park, Yoonkook Son, Jong Guk Kim, Ji-Hun Cha, "Tailored Stitching and Vertical Stacking for High-Voltage Multifunctional Structural Batteries with Enhanced Electrochemical–Mechanical Coupling," *Advanced Science*, 2025.

[11] Dohyun Kim, Seungho Lee, **Jayden Dongwoo Lee**, Hohyeong Lee, Hyochoong Bang, "Guided Exploration Reinforcement Learning for 3D UAV Pursuit-Evasion Games," *International Journal of Control, Automation, and Systems*, 2025.

[12] **Jayden Dongwoo Lee**, Youngjae Kim, Yoonseong Kim, Hyochoong Bang, "Sparse Identification of Nonlinear Dynamics-based Model Predictive Control for Multirotor Collision Avoidance," *IET Control Theory & Applications*, 2025.

[13] Juhyeong Park, **Jayden Dongwoo Lee**, Hyochoong Bang, "Vibration Suppression Adaptive Prescribed Performance Control for Flexible Spacecraft with Uncertain Moment of Inertia," *Acta Astronautica*, 2025.

[14] **Jayden Dongwoo Lee**, Donghoon Seo, Jongho Shin, Ji-Hun Cha, Hyochoong Bang, "Fast Real-Time State-of-Health Estimation Method for Lithium-ion Battery using Sparse Identification of Nonlinear Dynamics," *Journal of Intelligent & Robotic Systems*, 2025.

[15] Ji-Hun Cha, **Jayden Dongwoo Lee**, Tae-Hyun Kim, Jong Guk Kim, Yoonkook Son, Chun-Gon Kim, "Structural Battery Composites with Interlayer-Bonding Stitching Architecture for Maintaining Minimal Electrode Gap," *Composites Part B: Engineering*, 2025.

[16] **Jayden Dongwoo Lee**, Youngjae Kim, Lamsu Kim, Natnael S. Zewge, Hyochoong Bang, "Sparse Online Gaussian Process Regression-based Robust Nonlinear Dynamics Inversion for Multirotor with Forward Flight Ground Effect," *Aerospace Science and Technology*, 2025.

[17] Dain Yoon, Kyung-Mi Na, **Jayden Dongwoo Lee**, Chang-Hun Lee, Hyochoong Bang, "Practical Fault-Tolerant Control Allocation based on Attainable Control Set Analysis for a Coaxial Dodecacopter," *Control Engineering Practice*, 2025.

[18] **Jayden Dongwoo Lee**, Lamsu Kim, Kwangwoo Jang, Seongheon Lee, Hyochoong Bang, "Feedback Linearization-based Model Reference Adaptive Control for Multirotor UAVs under Uncertainties from Fuel and Payload," *Proceedings of the Institution of Mechanical Engineers, Part G: Journal of Aerospace Engineering*, 2025.

[19] Deok-Young Lee, Gabin Yun, Minseok Choi, KyuHyeon Cho, **Jayden Dongwoo Lee**, Dong-Hoon Lee, "Miniaturized Dual-Photodiode Sensor for Simultaneous Wavelength and Irradiance Measurement across the 500–1000 nm Range," *Applied Optics*, 2024.

[20] Lamsu Kim, **Jayden Dongwoo Lee**, Seongheon Lee, Hyochoong Bang, "Fault Detection for Re-initialization of Online Gaussian Process Regression Using Kernel Linear Independence Test," *International Journal of Control, Automation, and Systems*, 2024.

[21] **Jayden Dongwoo Lee**, Lamsu Kim, Seongheon Lee, Hyochoong Bang, "Data-driven Fault Diagnosis of Nonlinear Systems with Parameter Uncertainty using Deep Koopman Operator and Weighted Window Extended Dynamic Mode Decomposition," *International Journal of Control, Automation, and Systems*, 2024.

[22] **Jayden Dongwoo Lee**, Sukjae Im, Lamsu Kim, Hyungjoo Ahn, Hyochoong Bang, "Data-driven Fault Detection and Isolation for Multirotor System using Koopman Operator," *Journal of Intelligent & Robotic Systems*, 2024.

[23] Lamsu Kim, **Jayden Dongwoo Lee**, Natnael S. Zewge, Hyochoong Bang, "Gaussian Process-based State Derivative Estimator with Temporal Input in Incremental Flight Control Design," *Aerospace Science and Technology*, 2024.

[24] **Jayden Dongwoo Lee**, Lamsu Kim, Natnael S. Zewge, Hyochoong Bang, "Fault-tolerant Control for Aircraft with Structural Damage using Sparse Online Gaussian Process Regression," *International Journal of Aeronautical and Space Sciences*, 2024.

Patents (Applications)

[1] Koopman-operator-based linear observer for multirotor motor fault diagnosis, KR 10-2024-0143755 (published 2025).

[2] Deep-Koopman-operator parity-space fault diagnosis for nonlinear systems, KR 10-2024-0146601 (published 2025).

[3] Flight-vehicle fault diagnosis via kernel linear independence test in RKHS, KR 10-2024-0171982 (published 2025).

[4] Triple-redundant flight control computer with an integrated voter, KR 10-2025-0026443 (published 2025).

Teaching & Mentoring

Department of Aerospace Engineering, KAIST *Daejeon, Republic of Korea*
Teaching Assistant, Excellent TA Award (2024) *2021 – 2025*

- AE30000 Flight Dynamics Project; AE350 Aerospace Control Engineering; AE552 Advanced Linear Stability and Control; AE40005 Spacecraft Systems

KAIST Department of Aerospace Engineering / Hanwha Aerospace *Daejeon, Republic of Korea*
Graduate Mentor, Hanwha–KAIST Space Pebble Program *2022 – 2025*

- Mentored middle-school teams through aerospace mission projects across all four cohorts.

Center for Research Officers for National Defense, KAIST *Daejeon, Republic of Korea*
Research Mentor, MiliTech Challenge *2021 – 2024*

- Mentored team won the Grand Prize (Minister of National Defense Award) at the 5th MiliTech Challenge (2024); another team received an Encouragement Prize at the 2024 Korea Air Force Academy Future Aerospace Conference.

Technical Skills

Programming	C/C++, Python, MATLAB/Simulink
ML / control	PyTorch, TensorFlow, scikit-learn, CVXPY, CasADi, GPyTorch, PySINDy
Flight / embedded	PX4, ArduPilot, LattePanda, NVIDIA Jetson, STM32, Red Pitaya (FPGA-DSP), FCC design (OrCAD), HILS/PILS
Navigation / sensors	VectorNav VN-200, u-blox ZED-F9P RTK, optically pumped magnetometer
Design / simulation	CATIA, SolidWorks, Gazebo, AirSim, X-Plane

References

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