JAERYOUNG LEE

291, Daehak-ro, Yuseong-gu, Daejeon, South Korea | +82 10-7697-2454
jaeryoung.lee37@gmail.com | https://jaeryounglee.github.io/

EDUCATION

Korea Advanced Institute of Science and Technology (KAIST) **Daejeon, Korea**
M.S., Aerospace Engineering (AE) Sept. 2023 – Present

- CGPA: 3.93 /4.00
- Thesis: A Study of Vehicle Positioning and Its Safety Analysis based on Bayesian Estimation (Advisor: Prof. Jiyun Lee)
- Korean Government Scholarship for Overseas PhD Study (Expected: 2025-2027)

B.S., Aerospace Engineering (AE) Mar. 2018 – Aug. 2023
B.S., Electrical Engineering (EE) (double major)

- CGPA: 3.80 / 4.00, Major GPA: 3.88 / 4.00
- Overall Rank (AE): 2/13, Graduated *Magna Cum Laude*

RESEARCH INTERESTS

Bayesian Estimation, Sensor Fusion, Autonomous Navigation, Safety Analysis and Fault Detection for Positioning-Navigation-Timing (PNT), Decision-making Under Uncertainties

PUBLICATION

[1] **Lee, J.,** Sun, A. K., Choi, H., & Lee, J. (2024). Regional Optimization of NeQuick G Model for Improved TEC Estimation. Journal of Positioning, Navigation, and Timing, 13(1), 63–73. https://doi.org/10.11003/JPNT.2024.13.1.63

CONFERENCE PRESENTATIONS

[1] **Lee, J.,** Min, D., Kim, M., & Lee, J. Probabilistic Analysis of Position Errors in Factor Graph Optimization-based GNSS Systems Using Monte-Carlo Simulation. *Institute of Positioning, Navigation, and Timing Conference*, 2024 *(In preparation).*

[2] **Lee, J.,** Sun, A. K., & Lee, J. Analysis of NeQuick G-based TEC Estimation Error for the Korean Region: A Case Study of the 10-11 May 2024 Geomagnetic Strom. *Korean Society for Aeronautical & Space Sciences Conference*, 2024.

[3] **Lee, J.,** Moon, C., & Ahn, J. Vehicle Routing Problem with Profits based UAV Path Planning in Urban Air Mobility. *Korean Society for Aeronautical & Space Sciences 2021 Spring Conference*, 2021.

PROJECT HISTORY

[1] "Development of Integrity-assured AAM Navigation System based on Hyperconnected Network," National Research Foundation of Korea (NRF), Graduate Researcher, 05/2024-Present

[2] "Positioning Performance Analysis and Accuracy Improvement Techniques for GNSS Chipsets in Smartphones," Samsung Electronics, Graduate Researcher, 04/2024-Present.

[3] "Techniques for Enhancing GNSS Precision and Ensuring Integrity," National Research Foundation of Korea (NRF), Graduate Researcher, 09/2023-Present.

[4] "Development of Integrated Operations Center's Core Technologies for Korea Positioning System (KPS) Verification," Korea Aerospace Research Institute (KARI), Undergraduate/Graduate Researcher, 03/2023-Present.

[5] "Lab Study on Software-Defined Receivers (SDR)," GNSS Lab, Graduate Researcher, 02/2024-07/2024.

[6] "Lab Study on Low Earth Orbit Positioning (LEO-PNT)," GNSS Lab, Graduate Researcher, 01/2024-04/2024.

[7] "Construction of Fixed Wing Vision Guided Precision Landing Systems," Leeds-KAIST Summer Research Program, Exchange Researcher, 06/2022-08/2022.

[8] "Path Planning of Unmanned Aerial Vehicle for On-Demand Urban Air Mobility," KAIST Undergraduate Research Program, Undergraduate Researcher, 12/2020-07/2021.

[9] "Subway Disembarkation Notification App Design Using Mobile Phone Sensor Data," NAVER Maps Mobile, Intern, 12/2021-02/2022.

RESEARCH EXPERIENCE

Global Navigation Satellite System (GNSS) Lab, KAIST **Daejeon, Korea**
Graduate Researcher (Advisor: Prof. Jiyun Lee) Sept. 2023 – Present

- Implement a Bayesian estimation-derived, Factor Graph Optimization (FGO)-based GNSS positioning algorithm for robust navigation, reflecting the time correlation and non-Gaussian characteristics of sensor noise.
  - Applied the FGO algorithm using the Ceres Solver in C++, achieving a 10.6% reduction in position errors compared to the Extended Kalman filter (EKF).
  - Evaluated the probability distribution of positioning errors in the FGO-navigation approach and compared it to the theoretical error distribution of the non-linear least squares method, laying the groundwork for safety analysis.
- Led a team of three for a research project on Smartphone Positioning in collaboration with Samsung Electronics.
  - Monitored GNSS chipset signal and measurement quality in urban environments, where severe multipaths and non-line-of-sight (NLOS) signals significantly degrade GNSS measurements and cause frequent navigation faults.
  - Developed a fault detection algorithm by modeling smartphone position errors and defining monitoring statistics, resulting in improved detection performance.
- Researched Bayesian estimators for sensor fusion in autonomous navigation, including Kalman filters, FGO, and Simultaneous Localization and Mapping (SLAM).
- Investigated navigation techniques' status and prospects using Low-Earth-Orbit (LEO) satellites, focusing on their error sources, positioning algorithms, and integrity performance.
- Led a two-semester lab study for 7+ students on Software-Defined Receivers (SDR); lectured on signal processing and oversaw the complete SDR process (GNSS signal acquisition, tracking, and navigation filtering) in MATLAB.

Undergraduate Researcher (Advisor: Prof. Jiyun Lee) Mar. 2023 – Aug 2023

- Proposed a regional ionospheric model optimized for Korean regions using the least-squares method, adapted from Galileo's NeQuick-G model, achieving up to an 85.95% reduction in Total Electron Content (TEC) modeling error during high solar activity.
- Calculated ionospheric delays from single-frequency GNSS raw measurement data in RINEX format using MATLAB, provided by International GNSS Service (IGS) and NASA.
- Generated ionospheric scenarios for Korean regions, to be used by Korea Aerospace Research Institute (KARI) for performance evaluation of the Korea Positioning System (KPS) during its development stage.

Aerial Robotics Project, University of Leeds **Leeds, England, UK**
Exchange Researcher, Dept. of Mechanical Engineering (Advisor: Prof. Bilal Kaddouh) Jun. 2022 – Aug. 2022

- Designed a vision-guided precision landing system for a fixed-wing UAV, estimating the aircraft's position and attitude relative to a fiducial marker on a runway by analyzing the marker's size and orientation.
- Devised a PID controller for ailerons, rudder, and elevator based on aircraft's estimated pose during the landing phase.
- Simulated the UAV landing system using Gazebo and ArduPilot in ROS on a Linux platform.

Strategic Aerospace Initiative (SAI) Laboratory, KAIST **Daejeon, Korea**
Undergraduate Researcher (Advisor: Prof. Jaemyung Ahn) Dec. 2020 – Jul. 2021

- Developed a UAV path planning algorithm for on-demand aerial mobility missions, optimizing multiple transportation tasks through feasible routes under resource constraints.
- Formulated and solved the path planning problem as a Vehicle Routing Problem with Profits (VRPP) using Markov Decision Process (MDP)-based reinforcement learning in MATLAB.

INDUSTRY EXPERIENCE

NAVER Corporation **Seongnam, Korea**
Intern, NAVER Maps Mobile Dec. 2021 – Feb. 2022

- Created a positioning algorithm for subway passengers in GNSS-challenging environments by estimating the number of stations passed using smartphone sensor data including IMU, magnetometer, and barometer readings.
- Implemented a Long Short-Term Memory (LSTM) machine learning algorithm to classify subway motion as either running or stopped by analyzing features from mobile phone sensors, achieving up to 86% classification accuracy.
- Integrated the subway positioning algorithm into Android apps, using mobile phone sensors to provide timely passenger disembarkation alerts; contributed to achieving the app's commercial use.
- Mastered Git for version control, facilitating efficient collaboration and code management on engineering projects.

SCHOLARSHIPS

Graduate

Korean Government Scholarship for Overseas PhD Study ($80,000) 2025 – 2027 (expected)
Two-year Full-tuition Scholarship, KAIST & Ministry of Science and ICT 2023 – 2025

Undergraduate

Kim Young-Han (KYH) Global Leader Scholarship, KAIST 2021
Academic Excellence Scholarship (two semesters), KAIST 2021
Two-year Boeing Scholarship, KAIST & Boeing Korea 2020 – 2021
Five-year Full-tuition Scholarship, KAIST & Ministry of Science and ICT 2018 – 2023

LEADERSHIP ACTIVITIES

Space Kids of KAIST AE – Hanwha Space Hub **Daejeon, Korea**
Research Mentor Mar. 2022 – Feb. 2023

- Supervised a team of six middle school students on a Mars exploration project, focusing on rover system design for rare earth element excavation.
- Led 20+ students' tour to the Japan Aerospace Exploration Agency (JAXA), providing insights into engineering careers.

KAIST AE Student Council **Daejeon, Korea**
Vice President (2020), Student Representative (2019) Mar. 2019 – Feb. 2021

- Coordinated programs and events to support international students, including translation, cultural activities, and welfare services, fostering a more inclusive campus community; implemented and managed online classes during COVID-19.
- Organized aerospace mentoring sessions for freshmen students and provided additional 1:1 career counseling for three, resulting in their sophomore-year enrollment in the AE program.
- Led an engineering field trip to the Naro Space Center in Goheung for 20+ undergraduate students, providing in-depth technical insights into South Korea's space exploration and rocket launch technologies.

Satellite Technology Research Center (SATREC), KAIST **Daejeon, Korea**
Teaching Assistant, CAN-SAT Competition Jul. 2019

- Supervised four middle school students in a CanSat competition, guiding them in satellite system fundamentals and system implementation using Arduino.

***Vice President,* KAIST Tennis Club** Mar. 2019 – Feb. 2020

- Managed the recruitment process and coordinated training sessions for club members.
- Organized a regional amateur tennis tournament, contributing the growth of the local tennis community in Daejeon.

PROFICIENCY IN SKILLS

Programming: C, C++, MATLAB, Python, SQL (data analysis), Kotlin (Android apps)
Software: ROS, Gazebo (robotics), Ceres-Solver (optimization), RTKLIB (positioning), Simulink, PyTorch, Git
Technical Skills: Bayesian Estimation, GNSS/INS Sensor Fusion, SLAM, Deep/Reinforcement learning, Vehicle path planning, Processing GNSS RINEX files
Languages: Korean (native fluency), English (full professional proficiency), Japanese (elementary), French (elementary)