

Jaewoo Kim

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RESEARCH INTERESTS

Design Optimization of Space Systems

- Mathematical modeling of various space systems
- System design considering the lifecycle, from inception to retirement
- Considering various stakeholders and deriving solutions from a holistic viewpoint
- Exploring potentials of emerging technologies

Decision-Making Under Uncertainties

- Defining real-world problems related to highly uncertain nature and identifying key factors
- Developing decision-making framework based on fundamentals of mathematical reasoning

EDUCATION

Korea Advanced Institute of Science & Technology (KAIST) 🇰🇷

Daejeon, Korea

Ph.D. in Aerospace Engineering

Feb. 2024 – Present

- Advisor: Prof. Jaemyung Ahn 🇰🇷

M.S. in Aerospace Engineering

Feb. 2024

- Thesis Title: Optimal Satellite System Architecting Considering On-Orbit Refueling (Advisor: Prof. Jaemyung Ahn 🇰🇷)

Seoul National University (SNU) 🇰🇷

Seoul, Korea

B.S. in Mechanical and Aerospace Engineering

Feb. 2022

- Thesis Title: Celestial Navigation Using Stars and Planets on Lunar Exploration Orbit (Advisor: Prof. Changdon Kee 🇰🇷)

RESEARCH EXPERIENCE

Strategic Aerospace Initiative, KAIST 🇰🇷 | *Research Assistance*

Feb. 2022 – Present

1. Spare Strategy for Satellite Mega-Constellation
 - Developed an inventory management model of spare strategy for a satellite mega-constellation with an auxiliary launch option [J1]
 - Developed an inventory management model of joint spare strategy for multiple satellite mega-constellations [C1]
2. A Study on the Principle of Modular Architecture Engineering to Improve Level of Completion for Vehicle Architecture
 - Developed an integer programming approach to design structure matrix-based system modularization with various constraints [J3]
 - Performed several case studies of automobile subsystems and obtained improved design solutions
3. Research on ADR/OOS Applications for National Security Space Assets
 - Reviewed on-orbit servicing technologies and related projects [C5]
4. Development of Launch Vehicle Mission & Conceptual Design Software
 - Developed analysis tools for the propulsion module and the staging module
 - Contributed to developing all-at-once design optimization framework of launch vehicles [J4][C2, C3]
5. Optimal Satellite System Architecting Considering On-Orbit Servicing
 - Developed an optimal satellite system architecting framework based on a lifecycle simulation [J2][C4]

GNSS Laboratory, SNU 🇰🇷 | *Undergraduate Researcher*

Mar. 2021 – Aug. 2021

1. Deep Space Navigation with Optical Sensor Data

- Reviewed some non-inertial deep space navigation algorithms
- Analyzed the performance of the selected algorithm based on the basic linear algebra and Monte-Carlo simulation

PUBLICATIONS

Journal Articles

- [J1] Sung, T., **Kim, J.** and & Ahn, J. “Optimal spare strategy for satellite mega-constellation with auxiliary launch option,” in preparation (target journal: Journal of Spacecraft and Rockets).
- [J2] **Kim, J.** and & Ahn, J. “Optimal satellite system architecting considering on-orbit refueling,” in preparation (target journal: Journal of Spacecraft and Rockets).
- [J3] **Kim, J.**, Choi, E., & Ahn, J. “Optimal clustering of design structure matrix with mathematical programming for modular architecture design,” in preparation (target journal: IEEE Transactions on Engineering Management).
- [J4] Ko, J., **Kim, J.**, Choi, J., & Ahn, J. “Simultaneous optimization of launch vehicle stage and trajectory considering flight-requirement constraints,” *International Journal of Aeronautical and Space Sciences*, vol. 1, no. 11, 2024. <https://doi.org/10.1007/s42405-024-00737-1>

Conference Proceedings

- [C1] **Kim, J.**, Ahn, J. “An integrated inventory management model for maintenance of multiple satellite constellations,” in *Proceedings of the Korean Society for Aeronautical and Space Sciences, Space Conference*, Changwon, Korea, 2024.
- [C2] **Kim, J.**, Ko, J., Choi, J., Ahn, J., Yoon, N., Kim, H. “Conceptual design of launch vehicle considering axial acceleration constraints,” in *Proceedings of the Korean Society for Aeronautical and Space Sciences, Space Conference*, Changwon, Korea, 2024.
- [C3] Ko, J., **Kim, J.**, Choi, J., Ahn, J., Yoon, N., Kim, H. “Development of conceptual design software for space launch vehicle,” in *Proceedings of the Korean Society for Aeronautical and Space Sciences, Spring Conference*, Jeju, Korea, 2024.
- [C4] **Kim, J.**, & Ahn, J. “Multiobjective design optimization of commercial satellite considering on-orbit refueling policy,” in *Proceedings of the Korean Society for Aeronautical and Space Sciences, Spring Conference*, Jeju, Korea, 2023.
- [C5] **Kim, J.**, Lee, D. U., & Ahn, J. “Research on the overseas on-orbit servicing trends and implications,” in *Proceedings of the Korean Society for Aeronautical and Space Sciences, Fall Conference*, Jeju, Korea, 2022.

AWARDS & HONORS

Hanhwa-KAIST Space Hub Space Grand Challenge | Bronze

Nov. 2023

- Team Name: LETA (Lunar Exploration Trajectory Analytics)
- Topic: Lunar exploration trajectory design with low-thrust propulsion and multiple gravity assist

TEACHING EXPERIENCE

Teaching Assistant | KAIST

Fall 2023 - Present

- AE401 Aerospace System Design II, Fall 2023
- AE210 Aerospace Thermodynamics, Spring 2024

EXTRACURRICULAR EXPERIENCES

Part-Time Lecturer | Data Diving co.

Aug. 2022 – Present

- Provided lectures about basic concepts and programming tools for data science
- Institutions: Busan City Government, Korea Education & Research Information Service (KERIS), Statistics Korea (KO-STAT), Ewha Womans University, Sookmyung Women’s University, Seoul Digital Foundation

Military Service | Defense Security Command (DSC)

Apr. 2018 – Nov. 2019

- Supported educational programs in DSC
- Squad leader
- Commendation from Brigadier General

Interviewer | Humans of SNU

Jul. 2017 – Dec. 2017

- Interviewed diverse members in SNU and discovered impactful stories from them

President of SNU Chapter and Univ. Union | *People to People International*

Mar. 2016 – Feb. 2018

- Supported underprivileged members of the urban community and abandoned pets
- Supported conferences for the promotion of international friendship

OTHER SKILLS

Programming

- Python, MATLAB, Julia, C, C++ for various quantitative analysis techniques including optimization, simulation, and machine learning

Language

- Korean (first), English (second, professional working proficiency)

Problem Solving

- Identifying problematic situations and key components to tackle them
- Dividing complex tasks into solvable subtasks and designing the overall workflow
- Designing a viable timeline for task completion
- Leading and encouraging with passion and commitment in teamwork situations