Hang Woon Lee

CONTACT INFORMATION

Assistant Professor
Herbert P. Dripps Faculty Fellow
Director, Space Systems Operations Research Laboratory
Department of Mechanical, Materials and Aerospace Engineering
Benjamin M. Statler College of Engineering and Mineral Resources
West Virginia University

1306 Evansdale Drive
Engineering Sciences Building 929
Morgantown, WV 26506

Office: +1 (304) 293-2119
Email: hangwoon.lee@mail.wvu.edu
Website: https://hangwoonlee.faculty.wvu.edu/

CITIZENSHIP

USA

ACADEMIC APPOINTMENTS

Assistant Professor Aug. 2022 – Present
Department of Mechanical, Materials and Aerospace Engineering
West Virginia University

Herbert P. Dripps Faculty Fellow Jan. 2024 – Present
College of Engineering and Mineral Resources
West Virginia University

Affiliations:
- Faculty member, West Virginia Small Satellite Center of Excellence
- Faculty member, Center for Innovation in Space Exploration and Research, WVU
- Affiliate member, WVU Robotics

EDUCATION

Ph.D., Aerospace Engineering Aug. 2022
Georgia Institute of Technology, Atlanta, GA
Minor in Mathematics
Advisor: Koki Ho

M.S., Aerospace Engineering Aug. 2018
University of Illinois at Urbana-Champaign, Urbana, IL

S.B., Aerospace Engineering June 2015
Massachusetts Institute of Technology, Cambridge, MA

AWARDS

NASA Early Career Faculty Award 2023

John V. Breakwell Award 2020
- Space Flight Mechanics Committee, American Astronautical Society
- Awarded for [C6], presented at the *2020 AAS/AIAA Astrodynamics Specialist Conference*

Molly K. Macauley Award 2020
- American Astronautical Society
- Awarded for [C5]; invited to give an award-winning talk at the *2020 AAS John Glenn Memorial Symposium*

National Science Foundation Graduate Research Fellowship (NSF GRFP) 2018 – 2022
- Completed with Degree

Graduate College Conference Travel Award, 2017
- University of Illinois at Urbana-Champaign
- Awarded for [C2], presented at the *9th International Workshop on Satellite Constellations and Formation Flying*

PREPRINTS & UNDER REVIEW

[P2] E. Gkaravela, **H. Lee**, and H. Chen, "Distributed Space Resource Logistics Architecture Optimization under Economies of Scale, " *Journal of Spacecraft and Rockets* (Under Revision).

[P1] **D. Williams Rogers**, **M. Fox**, P. Stysley, and **H. Lee**, "Envisioning an Optimal Network of Space-based Lasers Orbital Debris Remediation."

JOURNAL PUBLICATIONS

[J8] **B. Pearl**, **L. Gold**, and **H. Lee**, "Benchmarking Agility and Reconfigurability in Satellite Systems for Tropical Cyclone Monitoring," *Journal of Spacecraft and Rockets*, (Forthcoming).

[J7] **T. H. Clareson**, **M. Fox**, **D. Amato**, and **H. Lee**, "Embedded State Estimation for Optimization of Cislunar Space Domain Awareness Constellation Design," *Journal of Spacecraft and Rockets*, doi:10.2514/1.A36102, (Article in Advance).

[J6] **H. Lee**, **D. Williams Rogers**, **B. Pearl**, H. Chen, and K. Ho, "Deterministic Multi-stage Constellation Reconfiguration Using Integer Linear Programming and Sequential Decision-Making Methods," *Journal of Spacecraft and Rockets*, doi:10.2514/1.A35990. (Article in Advance).

[J5] M. Patel, Y. Shimane, **H. Lee**, and K. Ho, "Cislunar Satellite Constellation Design Via Integer Linear Programming," *The Journal of the Astronautical Sciences*, vol. 71, no. 26, 2024, doi:10.1007/s40295-024-00445-8.

[J4] **H. Lee** and K. Ho, "Regional Constellation Reconfiguration Problem: Integer Linear Programming Formulation and Lagrangian Heuristic Method," *Journal of Spacecraft and Rockets*, vol. 60, no. 6, pp. 1828-1845, 2023, doi:10.2514/1.A35685.

[J3] **H. Lee**, S. Shimizu, S. Yoshikawa, and K. Ho, "Satellite Pattern Constellation Optimization for Complex Regional Coverage," *Journal of Spacecraft and Rockets*, vol. 57, no. 6, pp. 1309-1327, 2020, doi:10.2514/1.A34657.

[J2] H. Chen, **H. Lee**, and K. Ho, "Space Transportation System and Mission Planning for Regular Interplanetary Missions," *Journal of Spacecraft and Rockets*, vol. 56, no. 1, pp. 12-20, 2019, doi:10.2514/1.A34168.

[J1] **H. Lee**, P. Jakob, K. Ho, S. Shimizu, and S. Yoshikawa, "Optimization of Satellite Constellation Deployment Strategy Considering Uncertain Areas of Interest," *Acta Astronautica*, vol. 153, pp. 213-228, 2018, doi:10.1016/j.actaastro.2018.03.054.

CONFERENCE PAPERS

[C25] **D. Williams Rogers**, D. Won, D. Koh, K. Hong, and **H. Lee**, "Optimal Satellite Network Topology Design with Time-Dependent Traffic Demands," *2025 IEEE Aerospace Conference*, Big Sky, MT, Mar. 2025.

[C24] **B. Pearl** and **H. Lee**, "Stochastic Multi-stage Satellite Constellation Reconfiguration for Tracking Uncertain Targets," *2025 IEEE Aerospace Conference*, Big Sky, MT, Mar. 2025.

[C23] **B. Pearl**, **J. Miller**, and **H. Lee**, "Developing the Reconfigurable Earth Observation Satellite Scheduling Problem," *AIAA SciTech*, Orlando, FL, Jan. 2025.

[C22] **D. Williams Rogers**, **M. Fox**, and **H. Lee**, "Minimum Cost Cislunar Delay-Tolerant Network Design Using Integer Linear Programming," *AIAA SciTech*, Orlando, FL, Jan. 2025.

[C21] **M. Fox**, **G. Baker**, **D. Williams Rogers**, and **H. Lee**, "Space-Based Lasers for Orbital Debris Remediation: Observability, State Estimation, and Deorbiting Performance Analysis," *AIAA SciTech*, Orlando, FL, Jan. 2025.

[C20] **M. Fox**, **E. Boggs**, and **H. Lee**, "Microgravity Linear Acceleration Effects on Lagrange Point Orbit Stability During Propellant Settling," *AIAA SciTech*, Orlando, FL, Jan. 2025.

[C19] L. Cottrill, A. Tiscareno, L. Park, J. Bardaji, A. Abdul-Hamid, **H. Lee**, and H. Chen, "Cost and Benefit Analysis of Removing Small Debris Using Space-Based and Ground-Based Laser Systems," *AIAA SciTech*, Orlando, FL, Jan. 2025.

[C18] A. Abdul-Hamid, **B. Pearl**, **H. Lee**, and H. Chen, "Developing Commercialization Framework for Space Debris Removal," *AIAA SciTech*, Orlando, FL, Jan. 2025.

[C17] **T. Gosavi**, **D. Amato**, **J. Swecker**, and **H. Lee**, "Optimizing the Placement and Low-Thrust Maneuvers of Multi-Purpose Orbiters around Venus," *2024 AAS/AIAA Astrodynamics Specialist Conference*, Broomfield, CO, Aug. 2024.

[C16] S. Paul and **H. Lee**, "Hypothesis Surface-Based Sensor Tasking for LEO Objects: Leveraging Space Sensor Data for Ground-Based Optical Observations," *AIAA SciTech*, Orlando, FL, Jan. 2024.

[C15] **D. Williams Rogers**, S. Kim, M. Lee, Y. Kim, and **H. Lee**, "Designing Optimal Satellite Constellation Patterns with Facility Location Problem Models and Mixed Integer Linear Programming," *AIAA ASCEND*, Las Vegas, NV, Oct. 2023.

[C14] **T. H. Clareson**, **M. Fox**, **D. Amato**, and **H. Lee**, "Optimization Framework for Multi-Sensor Systems in Cislunar Space Domain Awareness," *2023 AAS/AIAA Astrodynamics Specialist Conference*, Big Sky, MT, Aug. 2023.

[C13] **B. Pearl**, **L. Gold**, and **H. Lee**, "Comparing the Effectiveness of Agility and Reconfigurability in Earth Observation Satellite Systems for Disaster Response," *2023 AAS/AIAA Astrodynamics Specialist Conference*, Big Sky, MT, Aug. 2023.

[C12] M. Patel, Y. Shimane, **H. Lee**, and K. Ho, "Cislunar Satellite Constellation Design Via Integer Linear Programming," *2023 AAS/AIAA Astrodynamics Specialist Conference*, Big Sky, MT, Aug. 2023.

[C11] **H. Lee** and Z. Liu, "A Novel Formulation for the Multi-Stage Satellite Constellation Reconfiguration Problem: Initial Results," *33rd AAS/AIAA Space Flight Mechanics Meeting*, Austin, TX, Jan. 2023.

[C10] **H. Lee**, H. Chen, and K. Ho, "Maximizing Observation Throughput via Multi-Stage Satellite Constellation Reconfiguration," *2022 AAS/AIAA Astrodynamics Specialist Conference*, Charlotte, NC, Aug. 2022.

[C9] P. Clifton, **H. Lee**, A. Honda, S. Yoshikawa, and K. Ho, "Optimization Framework for Minimal Conjunction Satellite Constellation Design and Post Mission Disposal Trajectories," *IEEE Aerospace Conference*, Big Sky, MT, Mar. 2022.

[C8] H. Chen and **H. Lee**, "Distributed In-Situ Resource Utilization System Optimization for Multi-Mission Space Exploration," *AIAA ASCEND*, Las Vegas, NV, Nov. 2021.

[C7] **H. Lee** and K. Ho, "A Lagrangian Relaxation-Based Heuristic Approach to Regional Constellation Reconfiguration Problem," *2021 AAS/AIAA Astrodynamics Specialist Conference*, Virtual, Aug. 2021.

[C6] **H. Lee** and K. Ho, "Binary Integer Linear Programming Formulation for Optimal Satellite Constellation Reconfiguration," *2020 AAS/AIAA Astrodynamics Specialist Conference*, Virtual, Aug. 2020.

[C5] **H. Lee** and K. Ho, "Regional constellations as alternative business strategy: Overcoming startups' challenges in the space-based communications industry," *AAS John Glenn Memorial Symposium*, Virtual, July 2020.

[C4] **H. Lee**, K. Ho, S. Shimizu, and S. Yoshikawa, "A Semi-Analytical Approach to Satellite Constellation Design for Regional Coverage," *2018 AAS/AIAA Astrodynamics Specialist Conference*, Snowbird, UT, Aug. 2018.

[C3] H. Chen, **H. Lee**, and K. Ho, "Space Transportation System and Infrastructure Design for Regular Interplanetary Cargo Missions," *AIAA SPACE Conference and Exposition*, Orlando, FL, Sep. 2017.

[C2] **H. Lee**, P. Jakob, K. Ho, S. Shimizu, and S. Yoshikawa, "Optimization of Satellite Constellation Deployment Strategy Considering Uncertain Areas of Interest," *9th International Workshop on Satellite Constellations and Formation Flying*, Boulder, CO, Jun. 2017.

[C1] M. Prinkey, D. Miller, P. Bauer, K. Cahoy, E. Wise, C. Pong, R. Kingsbury, A. Marinan, **H. Lee**, and E. Main, "CubeSat Attitude Control Testbed Design: Merritt 4-Coil per axis Helmholtz Cage and Spherical Air Bearing," *AIAA Guidance, Navigation, and Control Conference*, Boston, MA, Aug. 2013.

THESES

T. H. Clareson, "Embedded State Estimation for Optimization of Cislunar Space Domain Awareness Constellation Design," M.S. Thesis, West Virginia University, Aug. 2024.

H. Lee, "Design and Operations of Satellite Constellations for Complex Regional Coverage," Georgia Institute of Technology, Ph.D. Dissertation, Aug. 2022.

H. Lee, "Optimization of Satellite Constellation Deployment Strategy Considering Uncertain Areas of Interest," University of Illinois at Urbana-Champaign, M.S. Thesis, Aug. 2018.

INVITED TALKS

A. Abdul-Hamid, **B. Pearl**, **H. Lee**, and H. Chen, "Space Logistics Analysis and Incentive Design for Commercialization of Orbital Debris Remediation," Space Sustainability Workshop, NASA Headquarters, Washington, D.C., Dec. 2024.

H. Lee, "Optimizing Satellite Constellation Patterns for Complex Coverage," Heterogeneous Satellite constellation based ISR Research Center Workshop, Jeongseon, South Korea, Nov. 2024.

H. Lee, "Recent Progress in Space Systems Operations Research," Sejong University, Seoul, South Korea, July 2024.

H. Lee, "A Mathematical Optimization-Based Satellite Constellation Design and Operational Framework," New Frontiers in Constellation Design for Microsatellite Missions, TelePIX, Daejeon, South Korea, July 2024.

D. Williams Rogers, **M. Fox**, and **H. Lee**, "Rapid Response Debris Removal Using Reconfigurable Space-Based Laser Networks," NASA Early Career Faculty Annual Technical Seminar, NASA Goddard Space Flight Center, Greenbelt, MD, June 2024.

H. Lee, "Recent Progress in Space Systems Operations Research," Center for KINETIC Plasma Physics, West Virginia University, Morgantown, WV, Nov. 2022.

H. Lee, "Regional constellations as alternative business strategy: Overcoming startups' challenges in the space-based communications industry," *AAS John Glenn Memorial Symposium*, Virtual, July 2020.

MAGAZINE ARTICLES

O. Gunasekara, **H. Lee**, and K. Ho, "Commercial human spaceflight leads year of firsts," *Aerospace America*, Vol. 58, No. 11, pp. 68, Dec. 2020.

H. Lee and K. Ho, "Supplying the space station, preparing to put humans back on the moon," *Aerospace America*, Vol. 57, No. 11, pp. 63, Dec. 2019.

POSTER PRESENTATIONS

D. Williams Rogers, **M. Fox**, P. Stysley, and **H. Lee**, "Developing the Reconfigurable Earth Observation Satellite Scheduling Problem," *All Voices as One Student Conference*, Morgantown, WV, Oct. 2024.

B. Pearl, **J. Miller**, and **H. Lee**, "Developing the Reconfigurable Earth Observation Satellite Scheduling Problem," *WVU 17th Undergraduate Research Symposium*, Morgantown, WV, July 2024.

E. Boggs, **M. Fox**, and **H. Lee**, "Addressing the Challenges of Refueling Spacecraft Beyond Low Earth Orbit," *WVU 8th Annual Spring Undergraduate Research Symposium*, Morgantown, WV, April 2024.

B. Pearl, **L. Gold**, and **H. Lee**, "Comparing the Effectiveness of Agility and Reconfigurability in Earth Observation Satellite Systems for Disaster Response," *2023 Statler College Research Week Annual Open House Poster Symposium*, Morgantown, WV, Mar. 2023.

D. Williams Rogers, S. Kim, M. Lee, Y. Kim, and **H. Lee**, "Facility Location Problem Formulations for Satellite Constellation Pattern Design," *2023 Statler College Research Week Annual Open House Poster Symposium*, Morgantown, WV, Mar. 2023.

T. H. Clareson, **M. Fox**, **D. Amato**, and **H. Lee**, "Optimization of Multi-Sensor Systems for Cislunar Space Domain Awareness," *2023 AAS/AIAA Astrodynamics Specialist Conference*, Morgantown, WV, Mar. 2023.

GRANTS (AWARDED)

WVU PI, "Advancing the SmallSat Digital Twin (SSDT) for Active Debris Removal (ADR) Simulations," NASA SBIR Phase I (Prime: TMC Technologies), Aug. 2024

PI, "Wildfire Detection Using Convolutional Neural Network and Multispectral Dataset," NASA West Virginia EPSCoR Research Seed Grant, June 2024.

PI, "Rapid Response Debris Removal Using Reconfigurable Space-Based Laser Networks," NASA Early Career Faculty (ECF) Award, $599,792, Oct. 2023.

Co-PI, "Space Logistics Analysis and Incentive Design for Commercialization of Orbital Debris Remediation," NASA OSTP, $105,916, Aug. 2023.

Science-PI, "OrBNaV - Orbiter-assisted Balloon Navigation for Venus Exploration," NASA EPSCoR Rapid Response Research, $99,967, Aug. 2023 to July 2024.

PI, "Examining the Relationship between Orbital Stability and On-Orbit Servicing in Cislunar Space," NASA WV EPSCoR Research Seed Grant, $19,874 (NASA: $14,999 and cost-share: $4,875), June 2023 to May 2024.

PI, "A Mathematical Optimization-Based Satellite Constellation Design and Operational Framework," TelePIX, (undisclosed amount), Jan. 2023 to Jan. 2025.

ADVISING AND MENTORING

Visiting Scholars

- Dr. Jae-ik Park, Principal Researcher, Korea Aerospace Research Institute 2023–24

Ph.D. Students, Chair

- David Williams Rogers — In progress
  - Aerospace Engineering; Joined Spring 2023
  - *Dianne Dubetz Anderson Fellowship**, 2024–25
- Brycen Pearl — In progress
  - Aerospace Engineering; Joined Fall 2022; Converted to DT-Ph.D. in Fall 2023
  - *Gerald A. Soffen Memorial Fund**, Fall 2024
- Matthew Fox — In progress
  - Aerospace Engineering; Joined Summer 2023; Converted to DT-Ph.D. in Fall 2024
  - *NASA WVSGC Graduate Research Fellowship**, 2024-25
- Trupti Gosavi — In progress
  - Aerospace Engineering; Joined Spring 2024
- Gavin Baker — In progress
  - Aerospace Engineering; Joined Summer 2024

M.S. Students, Chair

- Thomas (Henry) Clareson — Fall 2022 – Summer 2024
  - Mechanical Engineering
- Dominic Amato — In progress
  - Aerospace Engineering; Joined Summer 2024

Ph.D. Students, Committee Member

- Gerardo Rivera — In progress
  - Aerospace Engineering
  - Advisor: Dr. Piyush Mehta
- Rafael Polanco — In progress
  - Aerospace Engineering
  - Advisor: Dr. Piyush Mehta
- Daniele Sicoli — In progress
  - Aerospace Engineering
  - Advisor: Dr. Piyush Mehta
- Mohsen Mehrabiyan — In progress
  - Industrial & Management Systems Engineering
  - Advisor: Dr. Zeyu Liu

M.S. Students, Committee Member

- Eamonn Payton — In progress
  Advisor: Dr. Andrew Rhodes
- Heath Cottrill — Summer 2024
  Advisor: Dr. Yu Gu
- Joshua Daniell — Fall 2023
  Advisor: Dr. Piyush Mehta

Undergraduate Students

- Earle Boggs — 2023 –
- Jacob Swecker — 2024 –
- Jonah Forinash — 2024 –
  - *NASA WVSGC Undergraduate Scholarship**, 2024-25
- Joshua Warner — 2025 –
- Logan Gold — 2022–24
  - Research Apprenticeship Program
- Yimin Cai — 2022–24
  - Research Apprenticeship Program
- Joseph Miller — 2024
  - *WVU Summer Undergraduate Research Experience Program**, Summer 2024
- Isaac McCormick — 2024

- Dominic Amato 2023–24
  - Advanced as an M.S. student at SSORL
- Matthew Fox 2022–23
  - *NASA WVSGC Undergraduate Scholarship*[*], 2022-23
  - Advanced as an M.S. student at SSORL
- Matthew Hwang 2023
- Jack Simmons 2023
- Natasha Dickerman 2023
  - Research Apprenticeship Program

[*] Student achievements during advisorship.

TEACHING EXPERIENCE

West Virginia University, Morgantown, WV

Instructor

- MAE 476 – Space Flight and Systems (Undergraduate level)
  - Spring 2023: SEI score of 4.9/5.0[*] (59 students)
  - Fall 2023: SEI score of 4.9/5.0[*] (19 students)
  - Spring 2024: SEI score of 4.9/5.0[*] (45 students)
  - Fall 2024: SPOT score of 92%[†] (25 students)
- MAE 593 – Optimization Methods in Engineering (New course; Graduate level)
  - Spring 2025 (Scheduled)

[*] SEI: Student Evaluation of Instruction; on *instructor's teaching effectiveness*.

[†] SPOT: Student Perception of Teaching (started since Fall 2024); mean of "Beneficial" responses to all questions.

PROFESSIONAL SERVICE

Referee Service: Journals

- *Journal of Spacecraft and Rockets* (2023, 2024)
- *Journal of Guidance, Control, and Dynamics* (2021, 2022)
- *Journal of Aerospace Engineering* (2019, 2022, 2023, 2024)
- *IEEE Transactions on Aerospace and Electronic Systems* (2021, 2022, 2023, 2024)
- *IEEE Transactions on Wireless Communications* (2023)
- *IEEE Transactions on Geosciences and Remote Sensing* (2023)
- *The Journal of the Astronautical Sciences* (2022, 2023, 2024)
- *Advances in Space Research* (2023, 2024)
- *Acta Astronautica* (2021, 2023, 2024)
- *Defense Technology* (2022)
- *Systems Engineering* (2018)
- *CEAS Space Journal* (2024)
- *International Journal of Digital Earth* (2024)

Referee Service: Conferences

- *2024, 2025 AIAA ASCEND*
- *33rd, 35th AAS/AIAA Space Flight Mechanics Meeting*

Referee Service: Grants and Awards

- *NASA* (2024)
- *NSF* (2023)
- *John V. Breakwell Award* (2023)
- *UTSA Preproposal Review* (2023)

Conference Service

- Session Co-chair, "TECH.EXPL-11" and "TECH.EXPL-17," *AIAA ASCEND*, Las Vegas, NV, Oct. 2022.

- Session Chair, "Satellite Constellations" and "Machine Learning and Artificial Intelligence Applied to Space Flight Problems 1," *33rd AAS/AIAA Space Flight Mechanics Meeting*, Austin, TX, Jan. 2023.

Professional Experience

Planet, San Francisco, CA

Spacecraft Manufacturing Engineer, Special Projects Group — Oct. 2015 – Apr. 2016

- Management of design for manufacturing, assembly, and testing of Dove satellites
- Solar panel and battery pack manufacturing development and testing fixtures
- Spacecraft PCBA and sub-assembly, quality, testing, and fixture management

Space Exploration Technologies Corporation (SpaceX), Hawthorne, CA

Mission and Launch Operations Intern — June – Sept. 2015

- Crew Dragon preliminary procedures list and organization
- Universal numbering scheme for all Dragon procedures (CRS, Commercial Crew, CRS2, DragonLab)
- CRS-8 BEAM primary payload extraction procedure
- RF ground alarm background information and failure response guides
- Design of SpaceX mission control ground software Blue Alarm
- Dragon/ISS timeline constraint formulation between SpaceX and NASA mission control centers

Satrec Initiative, Daejeon, Korea

Systems Engineering Team Intern — June – July 2012
Mechanical Design & Integration Team Intern — June – July 2012

- Manufacturing and testing of DubaiSat-2 flight model & Deimos-2 qualification model

Professional Memberships

Member, American Institute of Aeronautics and Astronautics (AIAA) — 2022–

Member, American Astronautical Society (AAS)
- Technical Member, Conference Administration Subcommittee — 2024–28

Member, Institute of Electrical and Electronics Engineers (IEEE) — 2024–

Member, American Society for Engineering Education (ASEE) — 2022–24

Last update: January 2025