Beom Park

Postdoctoral Researcher
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Research Interests

Multi-body dynamics; Dynamical systems theory; Spacecraft trajectory design and optimization;

Employment

2025.8-2027 (expected) **Postdoctoral Researcher**, Purdue University, U.S.
Advisor: Professor Kathleen Howell

2025.5-2025.7 **Postdoctoral Researcher**, Korea Advanced Institute of Science and Technology (KAIST), Korea
Advisor: Professor Jaemyung Ahn

Education

2021-2025 **Ph.D. Candidate** in Aeronautics and Astronautics, Purdue University, U.S.
Advisor: Professor Kathleen Howell
Thesis Title: A Frequency-Based Model Hierarchy within Cislunar Space [link]
Committee: Professor Carolin Frueh, Professor Kenshiro Oguri, Dr. Diane Davis

2018-2021 **M.S.** in Aeronautics and Astronautics, Purdue University, U.S.
Advisor: Professor Kathleen Howell
Thesis Title: Low-Thrust Trajectory Design for Tours of the Martian Moons [link]
Committee: Professor Carolin Frueh, Professor James Longuski

2012-2018 **B.S.**, College of Liberal Studies (Aerospace Engineering), Seoul National University, Republic of Korea

Honors and Awards

2025-2027 *Apollo 11 Postdoctoral Fellowship* [link]:
Awarded by School of Aeronautics and Astronautics, Purdue University

2025 *Magoon Research Excellence Award* [link]:
Awarded by College of Engineering, Purdue University

2025 *American Astronautical Society John V. Breakwell Student Award* [link]

2024 *Korea Aerospace Research Institute's Travel Grant*:
Awarded for participating in the International Astronautical Congress 2024, Milan, Italy

2021-2025 *Kwanjeong Scholarship*:
Awarded by Kwanjeong Educational Foundation for Ph.D. studies abroad

2018-2020 *Kwanjeong Scholarship*:
Awarded by Kwanjeong Educational Foundation for M.S. studies abroad

2018 *Graduation with Honor*:
Awarded by the Seoul National University Alumni Association for the academic excellence upon graduation

Research Projects

2024-2025 Lunar satellite constellation design leveraging frozen orbits
Sponsor: Intuitive Machines
Relevant publications: C2. P4.

2022-2025 Characterizing cislunar dynamical regime in a higher-fidelity model
Partial sponsor: NASA Johnson Space Center
Relevant publications: J2. J3. J4. C1. C3. C4. C5. C6. C8.

2021-2024 Trajectory design and analysis for the IM-1 (*first lunar lander from the private sector in human history*) & Khon-1 mission [link]
Sponsor: Intuitive Machines
Relevant publication: C7.

2021 Low-thrust trajectory design in multi-body regimes
Partial sponsor: NASA Goddard Space Flight Center, Lunar IceCube (LIC, [link])
Relevant publication: C9. J5. C10.

Publications

Journal Papers

J1. Park, B., Sanaga, R. R., and Howell, K. (2025) "Bridging Ephemeris Transition Gaps: Quasi-Periodic Extensions for the Hill Restricted Four-Body Problem in Cislunar Space," *Acta Astronautica*, 233, 168-182. [link]

J2. Park, B., Sanaga, R. R., and Howell, K. (2025) "A Frequency-Based Hierarchy of Dynamical Models in Cislunar Space: Leveraging Periodically and Quasi-Periodically Perturbed Models," *Celestial Mechanics and Dynamical Astronomy*, 137, 5. [link] - invited to a webinar [link]

J3. Park, B., and Howell, K. (2025) "Characterization of Earth-Moon L2 Halo Analogs in an Ephemeris Model Utilizing the Elliptic Restricted Three-Body Problem," *Advances in Space Research*, 75, 6. [link]

J4. Park, B., and Howell, K. (2024) "Assessment of Dynamical Models for Transitioning from the Circular Restricted Three-Body Problem to an Ephemeris Model with Applications," *Celestial Mechanics and Dynamical Astronomy*, 136, 6. [link] - invited to a webinar [link]

J5. Canales, D., Gupta, M., Park, B., and Howell, K. (2022) "A Transfer Trajectory Framework for the Exploration of Phobos and Deimos Leveraging Resonant Orbits," *Acta Astronautica*, 194, 263-276. [link]

Conference Proceedings / National (International) Presentations

C1. Sanaga, R. R., Park, B., and Howell, K. C. (2025) "A Unified Numerical Transition Scheme between Dynamical Models within Cislunar Space," *35th AAS/AIAA Space Flight Mechanics Meeting*, Kaua'i, Hawaii, U.S., January 19-23, 2025. [link]

C2. Park, B., Howell, K. C., and Stewart, S. (2025) "Elliptical Lunar Frozen Orbit Constellation Design within a Model of Evolving Fidelity," *35th AAS/AIAA Space Flight Mechanics Meeting*, Kaua'i, Hawaii, U.S., January 19-23, 2025. [link]

C3. Park, B., Sanaga, R. R., and Howell, K. C. (2025) "Numerical Assessment of Intermediate Models in a Frequency-Based Hierarchy for the Cislunar Domain," *35th AAS/AIAA Space Flight Mechanics Meeting*, Kaua'i, Hawaii, U.S., January 19-23, 2025. [link] - awarded John V. Breakwell Student Award

C4. Park, B., Sanaga, R. R., and Howell, K. C. (2024) "Bridging Ephemeris Transition Gaps: Quasi-Periodic Extensions for the Hill Restricted Four-Body Problem in Cislunar Space," *75th International Astronautical Congress*, Milan, Italy, October 14-18, 2024. [link] - awarded Korea Aerospace Research Institute's Travel Grant

C5. Park, B. and Howell, K. C. (2024) "Characterizing Transition-Challenging Regions Leveraging the Elliptic Restricted Three-Body Problem: L2 Halo Orbits," *AIAA SciTech Forum*, Orlando, Florida, U.S., January 8-12, 2024. [link]

C6. Park, B. and Howell, K. C. (2023) "Leveraging the Elliptic Restricted Three-Body Problem for Characterization of Multi-Year Earth-Moon L2 Halos in an Ephemeris Model," *AAS/AIAA Astrodynamics Specialist Conference*, Big Sky, Montana, U.S., August 13-17, 2023. [link]

C7. Hoffman, A., Park, B., and Howell, K. C. (2022) "Trajectory Design for a Secondary Payload Within a Complex Gravitational Environment: The Khon-1 Spacecraft," *AAS/AIAA Astrodynamics Specialist Conference*, Charlotte, North Carolina, U.S., August 7-10, 2022. [link]

C8. Park, B. and Howell, K. C. (2022) "Leveraging Intermediate Dynamical Models for Transitioning from the Circular Restricted Three-Body Problem to an Ephemeris Model," *AAS/AIAA Astrodynamics Specialist Conference*, Charlotte, North Carolina, U.S., August 7-10, 2022. [link]

C9. Park, B., Howell, K. C., and Folta, D. C. (2021) "Design of Low-Thrust Transfers from an NRHO to Low Lunar Orbits: Applications for Small Spacecraft," *AAS/AIAA Astrodynamics Specialist Conference*, Big Sky, Montana (Virtual), U.S., August 9-11, 2021. [link]

C10. Canales, D., Gupta, M., Park, B., and Howell, K. C. (2021) "Exploration of Deimos and Phobos Leveraging Resonant Orbits," *31st AAS/AIAA Spaceflight Mechanics Meeting*, Charlotte, North Carolina (Virtual), U.S., February 1-3, 2021. [link]

Preprints

P1. Park, B., Sanaga, R. R., and Howell, K. (2025) "Numerical Assessment of Intermediate Models in a Frequency-Based Hierarchy for The Cislunar domain," *Journal of Guidance, Control, and Dynamics*, Under Review.

P2. Sanaga, R. R., Park, B., and Howell, K. (2025) "A Unified Numerical Transition Scheme between Dynamical Models within Cislunar Space," *The Journal of Astronautical Sciences*, Under Review.

P3. Sanaga, R. R., Park, B., and Howell, K. (2025) "Unified Continuation Scheme for Periodic and Quasi-Periodic Structures across Various Models in the Cislunar Domain," Communications in Nonlinear Science and Numerical Simulation, Under Review. [link]

P4. Park, B., Howell, K., and Stewart, S. (2025) "A Frequency-Domain Differential Corrector for Quasi-Periodic Trajectory Design and Analysis," arXiv. [link]

Talks

2025 Invited talk at *Celestial Mechanics and Dynamical Astronomy*'s webinar on J2.[link], selected "as being particularly innovative and/or having had significant recent impact"

2024 Invited talk at *Celestial Mechanics and Dynamical Astronomy*'s webinar on J4.[link], selected "as being particularly innovative and/or having had significant recent impact"

Teaching Experiences

2020 **Teaching Assistant**, School of Aeronautics and Astronautics, Purdue University.
- AAE 440/590 (Spacecraft Attitude Dynamics)
- AAE 532 (Orbit Dynamics)

2019 **Teaching Assistant**, Department of Mathmatics, Purdue University.
- MA 161 (Plane Analytic Geometry And Calculus I)

Professional Experience

2013-2015 **Air Surveilance Operator (Sergeant)**, Republic of Korea Air Force

Academic Services

Journal of Spacecraft and Rockets (2 papers), The Journal of Astronautical Sciences (4), Astrodynamics (1)