

NATASHA BOSANAC

Curriculum Vitae

CONTACT INFORMATION

Colorado Center for Astrodynamics Research
Smead Department of Aerospace Engineering Sciences
University of Colorado Boulder
429 UCB, Boulder CO 80303
Email: natasha.bosanac@colorado.edu

EDUCATIONAL BACKGROUND

Ph.D. in Aeronautical & Astronautical Engineering, Purdue University, 2013-2016
“Leveraging Natural Dynamical Structures to Explore Multi-Body Systems”
Ph.D. advisor: Prof. Kathleen Howell
M.S.A.A in Aeronautical & Astronautical Engineering, Purdue University, 2010-2012
“Exploring the Influence of a Three-Body Interaction Added to the Gravitational Potential in the Circular Restricted Three-Body Problem: A Numerical Frequency Analysis”
M.S. advisor: Prof. Kathleen Howell
S.B. in Aerospace Engineering, Massachusetts Institute of Technology, 2006-2010

ACADEMIC EMPLOYMENT HISTORY

2017- Present Assistant Professor, Colorado Center for Astrodynamics Research, Smead Department of Aerospace Engineering Sciences, University of Colorado Boulder
2016 Postdoctoral Research Assistant, School of Aeronautics & Astronautics, Purdue University (research performed at NASA Goddard Space Flight Center)
Postdoctoral advisor: Prof. Kathleen Howell
2013-2016 Graduate Research Assistant, School of Aeronautics & Astronautics, Purdue University

HONORS & AWARDS

2024 AFOSR Young Investigator Program recipient
2024 University of Colorado Boulder Smead Department of Aerospace Engineering Sciences Outstanding Junior Faculty Award
2023 AIAA Rocky Mountain Section Young Professional Engineer of the Year Award
2022 American Astronautical Society Emerging Astrodynamacist Award (presented August 2023)
2021 AIAA Senior Member
2020 University of Colorado Boulder Smead Department of Aerospace Engineering Sciences Outstanding Graduate Teaching and Mentoring Award
2020 University of Colorado Boulder College of Engineering Dean’s Faculty Fellowship
2016 Purdue University Aeronautics and Astronautics Outstanding Graduate Student Research Award
2014 & 2015 Zonta International Amelia Earhart Fellowship

2010-2011 Computational Science and Engineering Lynn Fellowship
2009 David J. Shapiro Memorial Award

Travel Awards

2018 NASA Outer Planets Assessment Group Meeting Early Career Travel Award
2017 JPL Center for Academic Partnerships Faculty Travel Funds (\$10K)
2015 AAS John V. Breakwell Student Travel Award

JOURNAL PUBLICATIONS Key: **N. Bosanac**, N. Bosanac's Students

16. Smith, T.R.; **Bosanac, N**, 'Motion Primitive Approach to Spacecraft Trajectory Design in a Multi-Body System,' **September 2023**, Vol. 70, No. 34, The Journal of Astronautical Sciences, DOI: 10.1007/s40295-023-00395-7

15. Bonasera, S; **Bosanac, N**, 'Computing Natural Transitions Between Tori Near Resonances in the Earth-Moon System,' **March 2023**, Vol. 46, No. 3, pp. 443-454, Journal of Guidance, Control, and Dynamics, DOI: 10.2514/1.G006941

14. Sullivan, C.J.; **Bosanac, N**; Anderson, R.L., 'Designing Low-Thrust Transfers near Earth-Moon L2 via Multi-Objective Reinforcement Learning,' **January 2023**, Vol. 60, No. 2, Journal of Spacecraft and Rockets. DOI: 10.2514/1.A35463

13. Bonasera, S; **Bosanac, N**; Sullivan, C; Elliott, I; Ahmed, N; McMahon, J, 'Designing Sun-Earth L2 Halo Orbit Stationkeeping Maneuvers via Reinforcement Learning,' **February 2023**, Vol. 46, No. 2, Journal of Guidance, Control and Dynamics, DOI: 10.2514/1.G006783

12. Elliott, I; **Bosanac, N**, 'Describing Relative Motion near Periodic Orbits via Local Toroidal Coordinates,' **April 2022**, Vol. 134, Celestial Mechanics & Dynamical Astronomy, DOI: 10.1007/s10569-022-10074-8

11. Smith, T.R.; **Bosanac, N**, 'Constructing Motion Primitive Sets to Summarize Periodic Orbit Families and Hyperbolic Invariant Manifolds in a Multi-Body System,' **February 2022**, Vol. 134, Celestial Mechanics and Dynamical Astronomy, DOI: 10.1007/s10569-022-10063-x

10. Bonasera, S; **Bosanac, N**, 'Applying Data Mining Techniques to Higher-Dimensional Poincaré Maps in the Circular Restricted Three-Body Problem,' **November 2021**, Vol. 133, No. 51, Celestial Mechanics and Dynamical Astronomy, DOI: 10.1007/s10569-021-10047-3

9. Sullivan, C; Stuart, J; Anderson, R.L.; **Bosanac, N**, 'Designing Low-Thrust Transfers to High-Inclination Science Orbits via Hybrid Optimization,' **September 2021**, Vol. 58, No. 5, pp. 1339-1351, Journal of Spacecraft and Rockets, DOI: 10.2514/1.A34980.

8. Elliott, I; Sullivan, C; **Bosanac, N**; Stuart, J; Alibay, F, 'Designing Low-Thrust Trajectories for a SmallSat Mission to Sun-Earth L5,' **October 2020**, Vol. 43, No. 10, pp. 1854-1864, Journal of Guidance, Control and Dynamics, DOI: 10.2514/1.G004993

7. **Bosanac, N**, 'A Data Mining Approach to Poincaré Maps in Multi-Body Trajectory Design,' **June 2020**, Vol. 43, No. 6, pp. 1190-1200, Journal of Guidance, Control and Dynamics, DOI: 10.2514/1.G004857
6. **Bosanac, N**; Webster, C.M.; Howell, K.C.; Folta, D.C, 'Trajectory Design for the Wide Field Infrared Survey Telescope Mission,' **September 2019**, Vol. 42, No. 9, pp. 1899-1911, Journal of Guidance, Control and Dynamics, DOI: 10.2514/1.G004179
5. **Bosanac, N**; Cox, A; Howell, K.C.; Folta, D.C., 'Trajectory Design for a Cislunar CubeSat Leveraging Dynamical Systems Techniques: The Lunar IceCube Mission,' **March 2018**, Vol. 144, pp. 283-296, Acta Astronautica, DOI: 10.1016/j.actaastro.2017.12.025
4. Guzzetti, D; **Bosanac, N**; Haapala, A; Howell, K.C.; Folta, D.C., 'Rapid Trajectory Design in the Earth-Moon Ephemeris System via an Interactive Catalog of Periodic and Quasi-Periodic Orbits,' **September-October 2016**, Volume 126, pp. 439-455, Acta Astronautica, DOI: 10.1016/j.actaastro.2016.06.029
3. **Bosanac, N**; Howell, K.C; Fischbach, E, 'A Natural Autonomous Force Added in the Restricted Problem and Explored via Stability Analysis and Discrete Variational Mechanics,' **February 2016**, Volume 361, No. 49, Astrophysics and Space Science. DOI: 10.1007/s10509-015-2638-3
2. **Bosanac, N**; Howell, K.C; Fischbach, E, 'Stability of Orbits Near Large Mass Ratio Binary Systems,' **May 2015**, Volume 122, pp. 27-52, Celestial Mechanics and Dynamical Astronomy. DOI: 10.1007/s10569-015-9607-6
1. Folta, D.C; **Bosanac, N**; Guzzetti, D; Howell, K.C, 'An Earth-Moon System Trajectory Design Reference Catalog,' **May-June 2015**, Volume 110, pp. 341-353, Acta Astronautica. DOI: 10.1016/j.actaastro.2014.07.037

TECHNICAL REPORTS Key: N. Bosanac, N. Bosanac's Students

2. Linn, T.; Bhaskaran, S.; **Bosanac, N.**; Feaga, L.; Jenkins, S., 'Autonomous Navigation Demonstration Relevance Assessment Team (ANDRAT): Charter, Findings, and Recommendations,' Study funded by NASA SMD, **August 2024**.
1. Folta, D.; **Bosanac, N.**; Elliott, I.L.; Mann, L.; Mesarch, R.; Rosales, J., "Astrodynamics Convention and Modeling Reference for Lunar, Cislunar, and Libration Point Orbits (Version 1.1)", NASA Technical Report, NASA/TP-20220014814, **December 2022**.

PEER-REVIEWED CONFERENCE PAPERS Key: N. Bosanac, N. Bosanac's Students

2. Sullivan, C; **Bosanac, N**; Anderson, R; Mashiku, A; Stuart, J.R., 'Exploring Transfers between Earth-Moon Halo Orbits via Multi-Objective Reinforcement Learning,' IEEE Aerospace Conference, **March 2021**, Virtual.

1. **Bosanac, N;** Alibay, F; Stuart, J.R., ‘A Low-Thrust-Enabled SmallSat Heliophysics Mission to Sun-Earth L5,’ IEEE Aerospace Conference, **March 2018**, Big Sky, MT.

CONFERENCE PAPERS

Key: **N. Bosanac**, N. Bosanac’s Students

52. **Bosanac, N., Joyner, M.;** ‘Data-Driven Summary of Continuous Thrust Trajectories in a Low-Fidelity Model of Cislunar Space,’ AAS/AIAA Astrodynamics Specialist Conference, **August 2024**, Broomfield, CO. 20 pages.

51. Miceli, G.E.; **Bosanac, N.;** Karimi, R., ‘Generating the Trajectory Design Space for Neptunian System Exploration,’ AAS/AIAA Astrodynamics Specialist Conference, **August 2024**, Broomfield, CO. 20 pages.

50. **Bosanac, N.;** ‘Curvature Extrema Along Trajectories in the Circular Restricted Three-Body Problem,’ AAS/AIAA Astrodynamics Specialist Conference, **August 2024**, Broomfield, CO. 18 pages.

49. Miceli, G.E.; **Bosanac, N.;** Stuart, J.R.; Alibay, F., ‘Motion Primitive Approach to Spacecraft Trajectory Design in the Neptune-Triton System,’ AIAA SciTech Forum and AAS/AIAA Space Flight Mechanics Meeting, **January 2024**.

48. **Bosanac, N,** ‘Data-Driven Summary of Natural Spacecraft Trajectories in the Earth-Moon System,’ 2023 AAS/AIAA Astrodynamics Specialist Conference, **August 2023**, Big Sky, MT.

47. Miceli, G; **Bosanac, N;** Mesarch, M.A.; Folta, D.C.; Mesarch, R.L., ‘Clustering Approach To Identifying Low Lunar Frozen Orbits In A High-Fidelity Model,’ 2023 AAS/AIAA Astrodynamics Specialist Conference, **August 2023**, Big Sky, MT. **Awarded Breakwell Student Paper Award to Giuliana Miceli.**

46. Spear, R.L.; **Bosanac, N,** ‘Data-Driven Categorization of Spacecraft Motion with Uncertainty in the Earth-Moon System’ 2023 AAS/AIAA Astrodynamics Specialist Conference, **August 2023**, Big Sky, MT.

45. Bruchko, K; **Bosanac, N,** ‘Rapid Trajectory Design In Multi-Body Systems Using Sampling-Based Kinodynamic Planning,’ 2023 AAS/AIAA Astrodynamics Specialist Conference, **August 2023**, Big Sky, MT.

44. Bruchko, K; **Bosanac, N,** ‘Adaptive Roadmap Generation for Trajectory Design in the Earth-Moon System’, Accepted to 33rd AIAA/AAS Space Flight Mechanics Meeting, **January 2023**, Austin, TX.

43. Smith, TR; **Bosanac, N,** ‘A Motion Primitive Approach to Trajectory Design in a Multi-Body System,’ AAS/AIAA Astrodynamics Specialist Conference, **August 2022**, Charlotte, NC.

42. Bruchko, K; **Bosanac, N**, ‘Designing Spatial Transfers in Multi-Body Systems using Roadmap Generation,’ AAS/AIAA Astrodynamics Specialist Conference, **August 2022**, Charlotte, NC.
41. Sullivan, CJ; **Bosanac, N**; Anderson, RL; Mashiku, A, ‘Exploring the Low-Thrust Transfer Design Space in an Ephemeris Model via Multi-Objective Reinforcement Learning,’ AIAA Scitech and AAS/AIAA Space Flight Mechanics Meeting, **January 2022**.
40. Elliott, I; **Bosanac, N**, ‘Characterizing Natural Relative Motion of Formations on Invariant Tori in Multi-Body Systems’, AIAA Scitech and AAS/AIAA Space Flight Mechanics Meeting, **January 2022**.
39. Boone, S; Bonasera, S; McMahon, J; **Bosanac, N**; Ahmed, N, ‘Incorporating Observation Uncertainty into Reinforcement Learning-Based Spacecraft Guidance Schemes,’ AIAA Scitech and AAS/AIAA Space Flight Mechanics Meeting, **January 2022**.
38. Bruchko, K; **Bosanac, N**, ‘A Preliminary Exploration of Path Planning for Initial Guess Construction in Multi-Body Systems,’ AAS/AIAA Astrodynamics Specialist Virtual Conference, **August 2021**.
37. Smith, T.R; **Bosanac, N**, ‘Using Motion Primitives to Design Libration Point Orbit Transfers in the Earth-Moon System,’ AAS/AIAA Astrodynamics Specialist Virtual Conference, **August 2021**.
36. **Bosanac, N**; Bonasera, S; Sullivan, C; McMahon, J; Ahmed, N, ‘Reinforcement Learning for Reconfiguration Maneuver Design in Multi-Body Systems,’ AAS/AIAA Astrodynamics Specialist Virtual Conference, **August 2021**.
35. Sullivan, C; **Bosanac, N**; Mashiku, A.; Anderson, R.L., ‘Multi-Objective Reinforcement Learning for Low-Thrust Transfer Design between Libration Point Orbits,’ AAS/AIAA Astrodynamics Specialist Virtual Conference, **August 2021**.
34. Elliott, I; **Bosanac, N**, ‘A Geometric Approach to the Impulsive Control of Spacecraft Formations near Invariant Tori,’ AAS/AIAA Astrodynamics Specialist Virtual Conference, **August 2021**.
33. Rivera, K.P; Marsillach, D.A; Holzinger, M.J; Elliott, I; **Bosanac, N**, ‘Patterns of Life and Maneuver Detection for Cislunar Trajectory Maintenance,’ Advanced Maui Optical and Space Surveillance Technologies Conferences, September, 2021.
32. Bonasera, S; Elliott, I; Sullivan, C; **Bosanac N**; Ahmed, N; McMahon, J; ‘Designing Impulsive Station-Keeping Maneuvers Near a Sun-Earth L2 Halo Orbit via Reinforcement Learning’ AAS/AIAA Space Flight Mechanics Meeting, **February 2021**.
31. Elliott I; **Bosanac N**, ‘Spacecraft Formation Control Near a Periodic Orbit Using Geometric Relative Coordinates’ AAS/AIAA Space Flight Mechanics Meeting, **February 2021**.

30. Bonasera, S.; **Bosanac, N.**, 'Using Unsupervised Learning to Improve Analysis and Visualization of Higher-Dimensional Poincaré Maps in Multi-Body Trajectory Design,' 2020 AAS/AIAA Astrodynamics Specialist Virtual Conference, **August 2020**.
29. Smith, T.; **Bosanac, N.**, 'Motion Primitives Summarizing Periodic Orbits and Natural Transport Mechanisms in the Earth-Moon System,' 2020 AAS/AIAA Astrodynamics Specialist Virtual Conference, **August 2020**.
28. Bonasera, S.; **Bosanac, N.**, 'Transitions Between Quasi-Periodic Orbits Near Resonances in the Circular Restricted Three-Body Problem,' 2020 AAS/AIAA Astrodynamics Specialist Virtual Conference, **August 2020**.
27. Sullivan, C.; **Bosanac, N.**, 'Using Multi-Objective Deep Reinforcement Learning to Uncover a Pareto Front in Multi-Body Trajectory Design,' 2020 AAS/AIAA Astrodynamics Specialist Virtual Conference, **August 2020**.
26. Elliott, I.; **Bosanac, N.**, 'Geometric Relative Orbital Element Set for Motion Near a Periodic Orbit with Oscillatory Modes,' 2020 AAS/AIAA Astrodynamics Specialist Virtual Conference, **August 2020**.
25. Short, C; Haapala, A.; **Bosanac, N.**, 'Technical Implementation of the Circular Restricted Three-Body Model in STK Astrogator,' 2020 AAS/AIAA Astrodynamics Specialist Virtual Conference, **August 2020**.
24. Bonasera, S.; **Bosanac, N.**, 'Applications of Clustering to Higher-Dimensional Poincaré Maps in Multi-Body Systems,' 30th AIAA/AAS Space Flight Mechanics Meeting, **January 2020**, Orlando, FL.
23. Elliott, I.; **Bosanac, N.**; Ahmed, N; McMahon, J.W., 'Apprenticeship Learning for Maneuver Design in Multi-Body Systems,' 30th AIAA/AAS Space Flight Mechanics Meeting, **January 2020**, Orlando, FL.
22. Sullivan, C.; **Bosanac, N.**, 'Using Reinforcement Learning to Design Low-Thrust Approaches into Periodic Orbits in a Multi-Body System,' 30th AIAA/AAS Space Flight Mechanics Meeting, **January 2020**, Orlando, FL.
21. Smith, T.R.; **Bosanac, N.**, 'Constructing a Set of Motion Primitives in the Circular Restricted Three-Body Problem via Clustering,' AAS/AIAA Astrodynamics Specialist Conference, **August 2019**, Portland, ME.
20. Smith, T.R.; **Bosanac, N.**; Berger, T.E., Duncan, N; Wu, G, 'Trajectory Design for a Solar Polar Observing Constellation,' AAS/AIAA Astrodynamics Specialist Conference, **August 2019**, Portland, ME.

19. Stuart, J.R.; Anderson, R.L.; Sullivan, C; **Bosanac, N**, 'Accessing Highly Out-of-Ecliptic Science Orbits via Low-Energy, Low-Thrust Transport Mechanisms,' AAS/AIAA Astrodynamics Specialist Conference, **August 2019**, Portland, ME.
18. **Bosanac, N**, 'A Data Mining Approach to Using Poincaré Maps in Multi-Body Trajectory Design Strategies,' 29th AAS/AIAA Spaceflight Mechanics Meeting, **January 2019**, Ka'anapali, HI.
17. Elliott, I.L; Sullivan, C.J; **Bosanac, N**; Alibay, F; Stuart, J, 'Designing Low-Thrust Enabled Trajectories for A Heliophysics SmallSat Mission to Sun-Earth L5,' 29th AAS/AIAA Spaceflight Mechanics Meeting, **January 2019**, Ka'anapali, HI.
16. Sullivan, C.J; Elliott, I.L; **Bosanac, N**; Alibay, F; Stuart, J, 'Exploring the Low-Thrust Trajectory Design Space for SmallSat Missions to the Sun-Earth Triangular Equilibrium Points,' 29th AAS/AIAA Spaceflight Mechanics Meeting, **January 2019**, Ka'anapali, HI.
15. **Bosanac, N**, 'Bounded Motions Near Resonant Orbits in the Earth-Moon and Sun-Earth Systems,' AAS/AIAA Astrodynamics Specialist Conference, **August 2018**, Snowbird, UT.
14. **Bosanac, N**; Webster, C.M; Howell, K.C; Folta, D.C, 'Trajectory Design and Station-Keeping Analysis for the Wide Field Infrared Survey Telescope Mission,' AAS/AIAA Astrodynamics Specialist Conference, **August 2017**, Stevenson, WA.
13. **Bosanac, N**; Cox, A; Howell, K.C.; Folta, D, 'Trajectory Design for a Cislunar CubeSat Leveraging Dynamical Systems Techniques: The Lunar IceCube Mission,' 27th AAS/AIAA Space Flight Mechanics Meeting, **February 2017**, San Antonio, TX.
12. Folta, D; **Bosanac, N**; Cox, A; Howell, K.C., 'The Lunar IceCube Mission Challenge: Attaining Science Orbit Parameters From a Constrained Approach Trajectory,' 27th AAS/AIAA Space Flight Mechanics Meeting, **February 2017**, San Antonio, TX.
11. Folta, D; Webster, C.M; **Bosanac, N**; Cox, A; Guzzetti, D; Howell, K.C, 'Trajectory Design Tools for Libration and Cislunar Environments,' 6th International Conference on Astrodynamics Tools and Techniques, **March 2016**, Darmstadtium, Germany.
10. Cox, A; **Bosanac, N**; Guzzetti, D; Howell, K.C; Folta, D; Webster, C.M, 'An Interactive Trajectory Design Environment Leveraging Dynamical Structures in Multi-Body Regimes,' 6th International Conference on Astrodynamics Tools and Techniques, **March 2016**, Darmstadtium, Germany.
9. Folta, D; **Bosanac, N**; Cox, A; Howell, K.C, 'The Lunar IceCube Mission Design: Construction of Feasible Transfer Trajectories with a Constrained Departure,' AAS/AIAA Space Flight Mechanics Meeting, **February 2016**, Napa Valley, CA.

8. Guzzetti, D; **Bosanac, N**; Haapala, A; Howell, K.C; Folta, D.C, 'Rapid Trajectory Design in the Earth-Moon Ephemeris System via an Interactive Catalog of Periodic and Quasi-Periodic Orbits,' 66th International Astronautical Congress, **October 2015**, Jerusalem, Israel.
7. **Bosanac, N**; Howell, K.C; Fischbach, E, 'Leveraging Discrete Variational Mechanics to Explore the Effect of an Autonomous Three-Body Interaction Added to the Restricted Problem,' AstroNet-II International Final Conference, **June 2015**, Tossa De Mar, Spain.
6. **Bosanac, N**; Howell, K.C; Fischbach, E, 'A Natural Autonomous Force Added in the Restricted Problem and Explored Via Stability Analysis and Discrete Variational Mechanics,' AAS/AIAA Space Flight Mechanics Meeting, **January 2015**, Williamsburg, VA.
5. Guzzetti, D; **Bosanac, N**; Howell, K.C, 'A Framework for Efficient Trajectory Comparisons in the Earth-Moon Design Space,' AIAA/AAS Astrodynamics Specialist Conference, **August 2014**, San Diego, CA.
4. **Bosanac, N**; Howell, K.C; Fischbach, E, 'Stability of Orbits Near Large Mass Ratio Binary Systems,' 2nd IAA Conference on Dynamics and Control of Space Systems, **March 2014**, Rome, Italy.
3. Folta, D.C; **Bosanac, N**; Guzzetti, D; Howell, K.C, 'An Earth-Moon System Trajectory Design Reference Catalog,' 2nd IAA Conference on Dynamics and Control of Space Systems, **March 2014**, Rome, Italy.
2. Capparelli, E; Delgado-López, L; **Bosanac, N**; Burg, A; Conley, J; Ho, K; Kugler, J; Langston, S.M; Lo Gatto, V; Mansurov, O.G; Nizenkov, P; Vrolijk, A; Zea, L; Battat, J.A, 'Evaluating International Collaboration for Human Exploration Beyond LEO,' IAA Space Exploration Conference, **January 2014**, Washington D.C.
1. **Bosanac, N**; Howell, K; Fischbach, E, 'Exploring the Impact of a Three-Body Interaction Added to the Gravitational Potential Function in the Restricted Three-Body Problem,' AAS/AIAA Space Flight Mechanics Meeting, **February 2013**, San Diego, CA.

THESES

Advisor for Graduated PhD Students:

1. Bruchko, K.L., 'Trajectory Design Using Sampling-Based Kinodynamic Planning in Multi-Body Systems', Ph.D. Dissertation, University of Colorado Boulder, **August 2024**.
2. Smith, T.R., 'Using Motion Primitives to Rapidly Design Trajectories in Multi-Body Systems', Ph.D. Dissertation, University of Colorado Boulder, **May 2023**.
3. Bonasera, S., 'Incorporating Machine Learning into Trajectory Design Strategies in Multi-Body Systems,' Ph.D. Dissertation, University of Colorado Boulder, **May 2022**.

4. Elliott, I., 'Relative Trajectory Design and Control near Periodic Orbits in Multi-Body Systems using Local Toroidal Coordinates,' Ph.D. Dissertation, University of Colorado Boulder, **May 2022**.

5. Sullivan, C., 'Low-Thrust Trajectory Design in Multi-Body Systems via Multi-Objective Reinforcement Learning,' Ph.D. Dissertation, University of Colorado Boulder, **May 2022**.

N. Bosanac's theses:

Bosanac, N., 'Leveraging Natural Dynamical Structures to Explore Multi-Body Systems,' Ph.D. Dissertation, Purdue University, August 2016.

Bosanac, N., 'Exploring the Influence of a Three-Body Interaction Added to the Gravitational Potential in the Circular Restricted Three-Body Problem: A Numerical Frequency Analysis,' Masters Thesis, Purdue University, December 2012.

Advisor for MS Thesis Students:

10. Peña Mercadé, T., 'Optimal Low-Thrust Trajectories to Solar System Bodies' Masters Thesis, University of Colorado Boulder, May 2024.

9. Hernandez, D., 'Designing Trajectories to Uranus Using Particle Swarm Optimization,' Masters Thesis, University of Colorado Boulder, December 2023.

8. Patel, R., 'Low Thrust Transfers Between Periodic Orbits in the Earth-Moon Circular Restricted Three-Body Problem,' Masters Thesis, University of Colorado Boulder, May 2023.

7. Hevia, G., 'Low Thrust Optimal Trajectories in the Circular Restricted Three-Body Problem,' Masters Thesis, University of Colorado Boulder, May 2023.

6. Joyner, M., 'Exploring the Geometry of Departure Trajectories from an Earth-Moon Near Rectilinear Halo Orbit,' Masters Thesis, University of Colorado Boulder, August 2022.

5. Johnstone, R.C., 'Designing Optimal Low-Thrust Interplanetary Trajectories Utilizing Monotonic Basin Hopping,' Masters Thesis, University of Colorado Boulder, May 2022.

4. Spear, R., 'Planar Heteroclinic Connections in the Neptune-Triton Circular Restricted Three Body Problem,' Masters Thesis, University of Colorado Boulder, August 2021.

3. Thangavelu, C., 'Transfers between Near Rectilinear Halo Orbits and Low Lunar Orbits,' Masters Thesis, University of Colorado Boulder, December 2019.

2. Chikine, S., 'Low-thrust Trajectory Optimization in the Circular Restricted Three Body Problem,' Masters Thesis, University of Colorado Boulder, August 2019.

1. Huber, B, 'Designing High Thrust, Interplanetary Trajectories Using the NeuroEvolution of Augmenting Topologies (NEAT) Algorithm,' Masters Thesis, University of Colorado Boulder, May 2019.

TEACHING

At the University of Colorado Boulder:

- ASEN 2003: Introduction to Dynamics and Systems [Spring 2022]
- ASEN 3200/3700: Orbit Mechanics and Attitude Dynamics and Control [Spring 2017, Spring 2018, Spring 2019, Spring 2020, Fall 2022, Spring 2024]
- ASEN 3801: Aerospace Vehicles Dynamics and Controls Lab [Spring 2024]
- ASEN 5050: Spaceflight Dynamics (Includes distance section) [Fall 2017, Fall 2018, Fall 2019, Fall 2021, Spring 2021, Spring 2023, Fall 2023, Fall 2024]
- ASEN 6060: Advanced Astrodynamics (Includes distance section, created new course materials and plan) [Fall 2020, Fall 2022, Spring 2024]

At Purdue University: Orbit Mechanics, AAE 532 (Fall 2015)

SERVICE

Significant Service to Profession

- | | |
|--------------|--|
| 2024 | AAS Space Flight Mechanics Technical Committee Breakwell Student Award Chair |
| 2019-Present | AAS Space Flight Mechanics Technical Committee – Technical Administration Subcommittee |
| 2024 | Member of Habitable Worlds Observatory Servicing Working Group.
Invited by NASA experts to lead small team assessing trajectory considerations for servicer and observatory spacecraft in a Habitable Worlds Observatory mission concept. Larger group composed of experts from NASA, industry, and academia. |
| 2024 | Member of Autonomous Navigation Demonstration Relevance Assessment Team
Funded by NASA SMD, our small team of 5 experts from NASA, industry, and academia worked over 6 months to assess whether a low-cost, cislunar technology demonstration mission would buy down risk for onboard autonomous navigation |
| 2024 | AAS Space Flight Mechanics Technical Committee Emerging Astrodynamist Award Panel |
| 2023 | Guest Editor, The Journal of Astronautical Sciences special issue on astrodynamics in cislunar space |
| 2021-23 | Technical Chair for AAS/AIAA Astrodynamics Specialist Conference in 08/22 |

Review Panels

- | | |
|-----------------|--------------------|
| 2019, 20, 22-24 | Reviewer for NASA |
| 2022, 23, 24 | Reviewer for AFOSR |
| 2018-19 | Reviewer for NSF |

Outreach: Technical

- 2023 Invited speaker for the 3/24/23 meeting of the National Academies' Space Technology Industry-Government-University Roundtable (STIGUR) roundtable discussion on NASA's Space Technology Research Grants Program
- 2020 Interviewed for Teaching the Moonshot.
- 2020 Participated in telecons organized by National Geospatial Intelligence Agency and other governmental/defense agencies focused on coordinate transformations for cislunar space domain awareness

Outreach: Diversity, Equity, and Inclusion

- 2022 Organizing committee co-chair for CU Boulder, MIT, Stanford Rising Stars in Aerospace Symposium; presenter for a session
- 2020 Organizing committee co-chair for CU Boulder, MIT, Stanford Women in Aerospace Symposium (event cancelled due to COVID-19 after some service)
- 2019 Panelist for ACTIVE: Faculty Development and Leadership Initiative at CU Boulder
- 2019 Panelist for MIT, Stanford, CU Boulder Women in Aerospace Symposium
- 2018 Panelist, Session Chair for MIT, Stanford, CU Boulder Women in Aerospace Symposium
- 2018 Panelist for ACTIVE: Faculty Development and Leadership Initiative at CU Boulder
- 2017 Organizing committee for CU Boulder, MIT, Stanford Women in Aerospace Symposium, Session Chair and Panelist

Journal Reviews

Acta Astronautica, Advances in Space Research, Aerospace Science and Technology, Astrophysics and Space Science, Celestial Mechanics and Dynamical Astronomy, Journal of the Astronautical Sciences, Journal of Guidance, Control & Dynamics, Journal of Spacecraft and Rockets

External Service

2014-16,18-20 MIT Educational Counselor

Professional Affiliations

American Institute of Aeronautics and Astronautics (Senior Member), American Astronautical Society, Tau Beta Pi Engineering Honor Society