KSHITIJ MALL

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FULL TIME JOB APPOINTMENTS

Assistant Professor of Aerospace Engineering, University of South Alabama Aug. 15, 2025-Present
-Director of BRAHMAND lab aimed to advance human and robotic space exploration
-Teaching courses including Dynamics and Engineering Graphics and Communication
-Advising students on varied research topics including entry, descent, and landing technologies, explainable artificial intelligence, systems engineering, CubeSats, etc.

Post-Doctoral Research Associate, CISA Lab, Purdue University Jul. 7, 2021-Jul. 6, 2025
-Using explainable AI (XAI) to understand very complicated aerospace trajectories generated using AI
-Generating advanced code to implement Robust Portfolio Optimization (RPO) for mission engineering problems
-Advancing a python-based *Beluga* solver to solve complicated Mars Entry, Descent, and Landing (EDL) problems
-Investigating along with NASA team on how to make Urban Air Mobility feasible
Awards: Post-Doc Travel Grant 2023, College of Engineering Travel Grants Spring 2023 and 2024

Post-Doctoral Research Assistant, CISA Lab, Purdue University Jul. 7, 2020-July 6, 2021
-Using explainable AI (XAI) to understand role of environments in game
-Generating advanced code to implement Robust Portfolio Optimization (RPO) for mission engineering problems
-Advancing a python-based *Beluga* solver to solve complicated Mars Entry, Descent, and Landing (EDL) problems

Post-Doctoral Research Fellow, ACE Lab, Auburn University Aug. 16, 2019-Jul. 6, 2020
-Developing a computer code to rapidly solve low-thrust trajectory optimization problems for lunar missions
-Solving complex problems in different domains including atmospheric flight mechanics, renewable energy, chemical engineering, and tumor treatment through the Uniform Trigonometrization Method

Systems Engineer Trainee, Infosys Technologies Limited, Mysore, India Oct. 18, 2010-May 19, 2011
-Worked on retail problems; learnt several software languages and software industry standards

EDUCATION

PURDUE UNIVERSITY, West Lafayette, IN
Doctor of Philosophy (Ph.D.), Aerospace Engineering Dec. 2018
Area of Study: Aerospace Systems and Astrodynamics GPA: 3.95/4.0
Dissertation Title: *Advancing Optimal Control Theory Using Trigonometry For Solving Complex Aerospace Problems*
Awards: Second place in departmental Research Symposium Series 2018, **Finalist** (among top 11 university wide) in Purdue's Three Minute Thesis Competition 2018, Purdue Graduate Student Government Tier-I Research Travel Grant 2018, Japan Student Services Organization Scholarships in 2014 and 2017, Purdue College of Engineering Travel Grant 2016, and Golden Key Honor Society Purdue Chapter award 2014

PURDUE UNIVERSITY, West Lafayette, IN
Master of Science in Engineering (M.S.E.), Aerospace Engineering Dec. 2013
Area of Study: Aerospace Systems, Astrodynamics, and Modern Controls GPA: 3.93/4.0
Directive Project Title: *High Mass Mars Exploration using Slender Entry Vehicles*

Awards: Among top 1/8 of graduate students as per Tau Beta Pi and Sigma Gamma Tau; **among top 1% of campus leaders** as per National Residence Hall Honorary

UTTAR PRADESH TECHNICAL UNIVERSITY, Lucknow, India
Bachelor of Technology (B.Tech), Mechanical Engineering Jun. 2010
Awards: **Best student** of 2010 batch in Mechanical Engineering from amongst 60 students in JSS Academy of Technical Education college of this university; Mechanical Engineering **Hall of Fame**; Illustrious Alumnus 2024

GRANT WRITING EXPERIENCE

NASA Innovative Advanced Concept October 27, 2025
Sponsoring Agency: Defense Advanced Research Projects Agency – **DARPA**
Proposal Title: High Lift-Over-Drag Flight Technology (High-LOFT) for Human Mars Missions
Role: Co-PI
Outcome: Not selected
-Proposed a modular, self-forming, autonomous system that can perform desired operations
-Planned to support the team with explainability of actions proposed by AI

Research & Scholarly Development Grant Pre-Proposal October 15, 2025
Sponsoring Agency: Office of Research & Economic Development – **ORED, University of South Alabama**
Proposal Title: Explainable Optimal Trajectories of Unmanned Aerial Vehicles for Operations on Earth and Mars
Role: Co-PI
Outcome: Not selected
-Proposed applications of cargo operations on Earth and Mars using multiple drones
-Planned to perform real-world tests in laboratory to measure the effectiveness of the proposed idea

Research & Scholarly Development Grant Pre-Proposal October 15, 2025
Sponsoring Agency: Office of Research & Economic Development - **ORED, University of South Alabama**
Proposal Title: Improved Vision-Based Localization Method for Outer Planet UAV Systems
Role: Co-PI
Outcome: Not selected
-Proposed a modular, self-forming, autonomous system that can perform desired

NASA Innovative Advanced Concept Summer 2023
Sponsoring Agency: NASA
Proposal Title: High Lift-Over-Drag Flight Technology (High-LOFT) for Human Mars Missions
Role: Co-PI
Outcome: Reached the final selection round (Phase 1 Step B)
-Proposed a novel flying technique to land human-class payloads on the Martian surface
-Qualified the first round (Phase 1 Step A) and made it to the final round of evaluations among top teams in the US

The Dynamics, Control and Systems Diagnostics (DCSD) Program Fall 2019
Sponsoring Agency: National Science Foundation (NSF)
Proposal Title: A Unified Framework for Performance Optimization of Dynamical Systems with Mixed Regular-Singular Control Arcs and State Path Constraints
Role: Co-PI
Outcome: Not selected
-Advance and apply the Uniform Trigonometrization Method to different dynamical problems from the science domain
-Included domains like wave energy, chemistry, tumor anti-angiogenesis, etc.

TEACHING EXPERIENCE

Dynamics (EG 284) [University of South Alabama] Present
-Teaching 64 students from several engineering departments from the University of South Alabama on dynamical systems, creating assignments and exams

Engineering Graphics and Communication (ME 135) [University of South Alabama] Fall 2025 - Present
-Taught more than 100 undergraduate freshmen and sophomore from Mechanical, Aerospace, and Biomedical Engineering at the University of South Alabama, creating assignments and exams, and evaluating their projects
-Created video content for future faculty members who plan to take this course

System Praxis (SYS 400) [40 Lectures at Purdue University] Spring 2025
-Teaching 36 undergraduate seniors and juniors from different departments at Purdue University, grading their assignments, and evaluating their projects

Systems-of-Systems Modeling & Analysis (AAE 560) [3 Lectures at Purdue University] Spring 2023
-Taught around 100 in-person and online graduate students about Robust Portfolio Optimization

Orbit Mechanics (AAE 560) [1 Lecture at Auburn University] Spring 2020
-Taught around 100 undergraduate students about basics of Celestial Mechanics

Hypersonic Performance and Design (AAE 590) [Teaching Assistant at Purdue University] Spring 2015
-Developed new problem sets for the course along with Professor Grant
-Conducted teaching and help office hours for 40 graduate students, graded their assignments, and proctored their exams

Introduction to Aerospace Design (AAE 251) [Teaching Assistant at Purdue University] Fall 2014
-Conducted teaching and help office hours for 60 sophomores, graded their assignments, and proctored their exams for Professor Grant

AEROSPACE ENGINEERING COURSES

- Hypersonic Performance and Design
- Optimization in Aerospace Engineering
- Multidisciplinary Design Optimization
- Orbit Mechanics
- Orbital Perturbations
- Design Theory and Methods for Aerospace Systems
- Air Transportation Systems
- Linear Systems Analysis and Synthesis

SOFTWARE SKILLS

- Beluga
- OpenMDAO
- Satellite Tool Kit, GMAT
- Perusall, CATME, Circuit
- GPOPS-II
- Python, SHAP XAI
- MATLAB, Simulink
- Innoslate
- SolidWorks
- GIT, Cluster Computing
- RDBMS, CSS, HTML
- BrightSpace

OTHER PROFESSIONAL EXPERIENCE

Research Assistant, Rapid Design of Systems Lab, Purdue University Fall 2012-Fall 2018
-Developed advanced optimal control theory and new landing techniques for human-class Mars missions

-Worked on Purdue-NASA MSFC human Mars architecture selection project in a team of 10

Graduate Database Programmer, Purdue University Fall 2015-Summer 2018
-Team lead for a PHP and PL-SQL based new website for the Purdue Graduate School

Project Assistant, Aerospace Department, IIT Kanpur, India Summer 2009
-Developed an architecture to measure the moment of inertia of lightweight unmanned aerial vehicles

MAJOR PROJECTS

Advanced Air Mobility Operations Limits Exploration (NASA) Fall 2023-Spring 2025
-Team lead for this project involving 7 Purdue students, two Purdue professors, and some NASA engineers
-Leading team meetings with NASA and helping with plan of action
-Worked on trajectory optimization of urban air mobility missions for the cruise, descent, and landing phases
-Helped generate the final documentation for the overall project including an NTRS document, conference papers, and a final presentation document

Systems Engineering Research Council Projects Fall 2021- Spring 2025
-Worked on enhancing a systems engineering in-house tool suite called Analytical Workbench (AWB)
-Leading the development of Robust Portfolio Optimization

Learn to Gamebreak (DARPA's Gamebreaker) Summer 2020-Spring 2022
-Reviewed and implemented explainable AI in the three-layered framework developed for this project at Purdue
-Implemented Monte Carlo Dropouts for Uncertainty Quantification and developed a demo dashboard
-Led publishing a journal paper in this area and working on another journal article based on latest phase of this project

Purdue-NASA MSFC Human Mars Missions Architecture Project Fall 2016
-Entry, descent, and landing (EDL) team member in a team of four students, four Professors, and one Research Associate from Purdue University
-Developed a top-down systems level assessment tool for NASA MSFC to select future Mars mission architectures

Entry, Descent, and Landing Trajectory Optimization for Human Journey to Mars Fall 2016
-Led 7 students in a graduate course to determine the best possible Mars EDL architecture for human-class payloads
-The output data was provided to the Mars landing site selection team, and the analysis was performed using GPOPS-II

Advancing Optimal Control Theory for Solving Complex Aerospace Problems Spring 2014-Fall 2018
-Devised new techniques including the Epsilon-Trig regularization method and Trigonometrization for solving various classes of optimal control problems including Mars EDL problems
-Co-developed a MATLAB-Mathematica based advanced optimization framework at Rapid Design of Systems Lab. (RDSL) and validated the advancements using GPOPS-II

Aerocapture Trajectory Optimization for a Human Mars Flyby Mission Summer 2014
-Analyzed various options for aerocapture of a spaceship to a LEO upon return from Mars
-Presented a safe optimal aerocapture at Inspiration Mars International Student Design Competition 2014

High Mass Mars Exploration Using Slender Entry Vehicles Fall 2012-Fall 2013
-Devised a new innovative way of landing human-class payloads on the surface of Mars using high-lifting vehicles

-Optimization and analysis performed using GPOPS-II

Optimal Low Thrust LEO to GEO Circular Orbit Transfer Spring 2012
-Co-developed a MATLAB and R code for solving this ill-conditioned optimization problem
-Results published in a book by Professor Longuski named Optimal Control with Aerospace Applications

-Conducted office hours to teach 15 graduate students, graded their assignments, and proctored their exams

INTERNATIONAL RESEARCH EXPERIENCE

Visiting Researcher, Keio University and University of Tokyo, Japan Mar. 1, 2017-May 1, 2017
-Studied about the communications subsystem of a Vietnamese satellite called MicroDragon

Graduate Research Exchange Student, Keio University, Japan Dec. 16, 2013-Mar. 16, 2014
-Performed fault tree analysis of EDL phases of human-class Mars missions

Exchange Graduate Summer School Scholar, Beihang University, China Jul. 9, 2012-Jul. 17, 2012
-Studied about a micro-satellite project in a team of four students
-**Among top 18 international students** certified as *Excellent Student* at the end of the program

DEPARTMENTAL SERVICE

Aerospace Engineering Curriculum Committee August 2026-Present
-Developed course requirements and syllabus for few aerospace courses including orbital mechanics.

Aerospace Engineering Faculty Hiring Committee Spring 2026-Present
-Took remote interviews of several applicants and helped select the finalists for on-campus interviews

REVIEWER IN JOURNALS

Reviewer, Acta Astronautica Spring 2026-Present
-Helping review a paper on space and society, culture and education.

Reviewer, IEEE Transactions on Intelligent Transportation Systems Spring 2026-Present
-Reviewed a couple of papers on advanced transportation systems using artificial intelligence.

Reviewer, American Institute of Aeronautics & Astronautics SciTech Forum Summer 2024-Present
-Helping review papers in atmospheric flight mechanics (AFM) for AIAA SciTech conference

Reviewer, Advances in Space Research Fall 2022-Present
-Reviewed a paper on entry trajectory generation for Mars robotic and human missions

Reviewer, IEEE Transactions on Aerospace and Electronic Systems Spring 2022-Present
-Reviewed 6 papers on EDL on Mars and on spacecraft attitude reorientation control

Reviewer, Journal of Aircraft Spring 2022-Present
-Reviewed a paper on Entry, Descent, and Landing on Mars

Reviewer, Multidisciplinary Digital Publishing Institute (MDPI) Fall 2020-Present
-Reviewed few papers in Aerospace Engineering and Applied Sciences

JOURNAL ARTICLES

J1. Mall, K., Gadre, R., Wu, Y., Wang, Z., and DeLaurentis, D. A., "Trajectory Optimization of eVTOL Vehicles for Urban Air Mobility Using Uniform Trigonometrization Method," *IEEE Transactions on Intelligent Transportation Systems*.

J2. Vasiloff, K., Adesina, I., Wang, Z., **Mall, K.**, and DeLaurentis, D. A., "Trajectory Optimization for Orbit Transfers: Principles, Advances, Case Studies, and Outlook.," *Aerospace*, Vol 12. No. 12, pp. 1087.

J3. J. T. Hurley, **Mall, K.**, and Wang, Z., "Solving Complex Low Earth Orbit-to-Geostationary Earth Orbit Transfer Problems Using Uniform Trigonometrization Method," *Aerospace*, Vol 12. No. 11, pp. 960.

J4. Raz, A. K., **Mall, K.,** Nolan, S. M., Levin, W., Mia, A., Mockus, L., Ezra, K., Williams, K., and Parish, J., "Explainable AI and Robustness based Test and Evaluation of Reinforcement Learning," *IEEE Transactions on Aerospace and Electronic Systems,* May 20, 2024.

J5. Mall, K. and Taheri, E., "Three degree-of-freedom Reentry Trajectory Optimization for a Reusable Launch Vehicle Using an Advanced Indirect Method," *Journal of Spacecraft and Rockets,* Vol. 59, No. 5, 2022, pp. 1463-1474.

J6. Dachowicz, A., **Mall, K.,** Balasubramani, P., Maheshwari, A., Raz, A. K., Panchal, J. H. and DeLaurentis, D. A., "Mission Engineering and Design using Real-Time Strategy Games: An Explainable-AI Approach," *ASME Journal of Mechanical Design*, Vol. 144, No. 2, 2021, p. 021710.

J7. Mall, K., Taheri, E., and Prabhu, P., "Solving Singular Control Problems using Uniform Trigonometrization Method," *AIChE Journal*, Vol. 67, No. 6, 2021: e17209.

J8. Mall, K., Grant, M. J., and Taheri, E., "Uniform Trigonometrization Method for Optimal Control Problems with Control Bounds and State Path Constraints," *Journal of Spacecraft and Rockets*, Vol. 57, No. 5, 2020, pp. 995-1007.

J9. Mall, K., Grant, M. J., and Taheri, E., "Solving Complex Optimal Control Problems with Non-Linear Controls using Trigonometric Functions," *Optimal Control Application and Methods*, Vol. 42, No. 3, 2020, pp: 616-628.

J10. Mall, K. and Grant, M. J., "Epsilon-Trig Regularization Method for Bang-Bang Optimal Control Problems," *Journal of Optimization Theory and Applications*, Vol. 174, No. 2, 2017, pp. 500-517.

CONFERENCE PAPERS

C1. Mall, K., Dachowicz, A., Gadi, V., Panchal, J. H., and DeLaurentis, D. A., "Exploring Harmony in Mission Engineering via Explainable Complex Game Design," *INCOSE International Symposium*, Jun. 13-18, 2026, Yokohama, Japan [Selected].

C2. Duwadi, S., Hurley, J.T. and **Mall, K.,** "Trajectory Optimization with No-Fly Zones Using the Uniform Trigonometrization Indirect Method," *AIAA SciTech Forum* (p. 1690), Jan. 12-16, 2026, Orlando, FL.

C3. Sharma, A., **Mall, K.,** Chanana, P., and Hurley, J.T., "Time-Optimal Spacecraft Reorientation Using the Uniform Trigonometrization Indirect Method," *AIAA SciTech Forum* (p. 1693), Jan. 12-16, 2026, Orlando, FL.

C4. Anandhi, P., Richards, S., **Mall, K.,** Kesan, S., Mazzella, V., Rai, A. K., Gokul, V., Gariharan, Y., and Dingwall, Z., "Mission ShakthiSAT: A Low-Cost Lunar Transfer and Micro-Lander Architecture for Small Payloads" *76th International Astronautical Congress*, Sep. 29 - Oct. 3, 2025, Sydney, Australia.

C5. Kesan, S., **Mall, K.,** Prabhu, P., Pandey, A., and Narayanan, S., "Mission ShakthiSAT: A 108-Nation Collaborative STEM Initiative for Lunar Exploration" *76th International Astronautical Congress*, Sep. 29 - Oct. 3, 2025, Sydney, Australia.

C6. Melching, B. M., Carpenter, D. G., Tsutsui, W., Guariniello, C., **Mall, K.**, DeLaurentis, D., and Leifsson, L. T. (2025). "Talon-P: Decision-Tree-Driven Multi-Fidelity Testing for Engineering Cycle Time Reduction," *AIAA Aviation Forum and ASCEND 2025*, Jul. 21-25, 2025, Las Vegas, NV.

C7. Das Biswas, S., Gerardus, J., **Mall, K.**, DeLaurentis, D., Crossley, W. A., Patterson, M. D. and Sells, B. E., 2025. Initial Estimation of the Number of Urban Air Mobility Operations at Aerodromes to Assess Operational Limits," *AIAA Aviation Forum and ASCEND 2025*, Jul. 21-25, 2025, Las Vegas, NV.

C8. Schmitt, R., **Mall, K.,** and DeLaurentis, D., "X-SMART: Explainable Space Mission Architectures for Research on Trade-offs" *75th International Astronautical Congress*, Oct. 14-18, 2024, Milan, Italy.

C9. Mall, K., Gerardus, J., Gadre, R., and DeLaurentis, D., "Trajectory Optimization of eVTOL Vehicles for Urban Air Mobility Using Indirect Methods," *34th Congress of ICAS*, Sep. 9-13, 2024, Florence, Italy.

C10. DeLaurentis, D. A., Edsel, A., Das Biswas, S., Gadre, R., Vashi, S., Kilbourne, M., **Mall, K.,** Crossley, W. A., Patterson, M. D., and Sells, B. E., "Exploring Ridesharing in Passenger Urban Air Mobility: A Comparative Analysis," *34th Congress of ICAS*, Sep. 9-13, 2024, Florence, Italy.

C11. Das Biswas, S., Edsel, A., Gadre, R., Kilbourne, M., Vashi, S., **Mall, K.,** DeLaurentis, D. A., Crossley, W. A., Patterson, M. D., and Sells, B. E., "Passenger Aggregation Network with Very Efficient Listing (PANVEL) Ride-Sharing Model for Advanced Air Mobility," *AIAA Aviation Forum and ASCEND 2025*, Jul. 29- Aug. 2, 2022, Las Vegas, NV.

C12. Vashi, S., Edsel, A., Kilbourne, M., Gadre, R., Das Biswas, S., **Mall, K.,** DeLaurentis, D. A., and Crossley, W. A., "Refined Analysis of CO2 Emission Operational Limits Impacting Urban Air Mobility," *AIAA Aviation Forum and ASCEND 2025*, Jul. 29- Aug. 2, 2022, Las Vegas, NV.

C13. Mall, K., Levin, W., and DeLaurentis, D. A., "Human-Class Mars Entry, Descent, and Landing Trajectory Optimization Using Indirect Methods," *IEEE Aerospace*, Mar. 5-12, 2022, Big Sky, MT.

C14. Mall, K., Awasthi, A., and DeLaurentis, D. A., "Explaining Optimal Trajectories Using Indirect Methods and Explainable AI," *AIAA SciTech Forum and Exposition*, Jan. 8-13, 2023, Orlando, FL.

C15. Tsutsui, W., Guariniello, C., **Mall, K.,** Patterson, F., Balestrini-Robinson, S., Panchal, J., and DeLaurentis, D. A., "Model-based Approach in Defense Portfolio Management: Data Preparation, Analysis, and Visualization of Decision Spaces," *Acquisition Research Program*, May 1, 2023, National Harbor, MD.

C16. Mall, K., Brown, A., Kuhn, M., Black, A., Pritchard, K., Whitaker, M., Rush, M., Guariniello, C., Porterfield, M., and DeLaurentis, D. A., "Using Analog Astronautics to Advance Human Mars Exploration," *AIAA ASCEND*, Oct. 23-25, 2023, Las Vegas, NV.

C17. Mall, K., Nolan, S., Levin, W., Risany, L., and DeLaurentis, D. A., "Using Uniform Trigonometrization Method for Aviation based Optimal Control Problems," *AIAA Aviation 2023 Forum*, Jun. 12-16, 2023, San Diego, CA.

C18. Chao, H., Mudumba, S., **Mall, K.,** and DeLaurentis, D. A., "Flight Trajectory Planning with Safe Landing Assurance under Contingent Event," *AIAA SciTech Forum and Exposition,* Jan. 23-27, 2023.

C19. Raz, A. K., Nolan, S. M., Levin, W., **Mall, K.,** Mia, A., Mockus, L., Ezra, K., and Williams, K., "Test and Evaluation of Reinforcement Learning via Robustness Testing and Explainable AI for High-Speed Aerospace Vehicles," *IEEE Aerospace*, Mar. 5-12, 2022, Big Sky, MT.

C20. DeLaurentis, D. A., Panchal, J. H., Raz, A. K., Balasubramani, P., Maheshwari, A., Dachowicz, A., and **Mall, K.,** "Toward Automated Game Balance: A Systematic Engineering Design Approach," *IEEE CoG*, Aug. 17-20, 2021 [Virtual, Peer Reviewed].

C21. Mall, K., Nolan, S., and DeLaurentis, D. A., "Solving Mixed State-Control Constraint Problems Using Uniform Trigonometrization Method," *AIAA SciTech Forum and Exposition*, Jan. 11-15 & 19-21, 2021 [Virtual].

C22. Antony, T., Grant, M. J., Sparapany, M., Nolan, S. M., Mansell, J., **Mall, K.,** Hannasch, D. A., and Heidrich, C. R., "Beluga: General Purpose Indirect Trajectory Optimization," 2021.

C23. Taheri, E and **Mall, K.,** "Entry Vehicle Trajectory Optimization Using Trigonometric-Based Regularization," *AIAA Astrodynamics Specialist Conference*, Aug. 9-12, 2020 [Virtual].

C24. Taheri, E. and **Mall, K.,** "Minimum-Fuel Low-Thrust Trajectory Optimization Using Trigonometric-Based Regularization," *AIAA Astrodynamics Specialist Conference*, Aug. 9-12, 2020 [Virtual].

C25. Mall, K. and Taheri, E., "Entry Trajectory Optimization for Mars Science Laboratory Class Missions Using Indirect Unified Trigonometrization Method," *The 2020 American Control Conference*, CO, Jul. 1-3, 2020 [Peer Reviewed].

C26. Mall, K. and Taheri, E., "Optimal Control of Wave Energy Converters Using Epsilon-Trig Regularization Method," *The 2020 American Control Conference*, CO, Jul. 1-3, 2020 [Peer Reviewed].
C27. Mall, K. and Taheri, E., "Unified Trigonometrization Method for Solving Optimal Control Problems in Atmospheric Flight Mechanics," *AIAA SciTech Forum*, Kissimmee, FL, Jan. 6-10, 2020.
C28. Mall, K. and Grant, M. J., "Trigonometrization of Optimal Control Problems with Mixed Constraints and Linear Controls," *AIAA SciTech Forum*, San Diego, CA, Jan. 7-11, 2019.
C29. Williams, J., **Mall, K.,** and Grant, M. J., "Trajectory Optimization using Indirect Methods and Parametric Scramjet Cycle Analysis," AIAA 2017-1180, *AIAA SciTech Forum*, Grapevine, TX, Jan. 9-13, 2017.
C30. Udani, J. P., **Mall, K.,** Grant, M. J., and Sun, D., "Optimal Flight Trajectory to Minimize Noise During Landing," AIAA 2017-1384, *AIAA SciTech Forum*, Grapevine, TX, Jan. 9-13, 2017.
C31. Mall, K. and Grant, M. J., "Trigonomerization of Optimal Control Problems with Bounded Controls," AIAA 2016-3244, *AIAA Atmospheric Flight Mechanics Conference*, Washington, D.C., Jun. 13-17, 2016.
C32. Mall, K. and Grant, M. J., "Epsilon-Trig Regularization Method for Bang-Bang Optimal Control Problems," AIAA 2016-3238, *AIAA Atmospheric Flight Mechanics Conference*, Washington, D.C., Jun. 13-17, 2016.
C33. Mall, K. and Grant, M. J., "High Mass Mars Exploration using Slender Entry Vehicles," AIAA 2016-0019, *AIAA Aerospace Sciences Meeting*, San Diego, CA, Jan. 4-8, 2016.
C34. Iino, S., **Mall, K.,** Ono, A., Stuart, J., Das, A., Moriyama, E., Ohgi, T., Gillin, N., Tanaka, K., Aida, Y., and Fagin, M., "International Student Design Competition for Inspiration Mars Mission Report Summary (Team Kanau)," *17th Annual International Mars Society Convention*, League City, TX, 2014.

CONTRIBUTIONS IN BOOKS

B1. DeLaurentis, D. A., Moolchandani, K., and Guariniello, C., "Robust Portfolio Optimization," pp: 123- 130. in "System of Systems Modeling and Analysis," *CRC Press*, 2023.
B2. Edelman, P. J. and Mall, K., "Optimal Low-Thrust LEO to GEO Circular Orbit Transfer," book appendix C in "Optimal Control with Aerospace Applications," *Springer*, 2014.

OUTREACH PUBLICATION

O1. Mall, K., "The Mars Society, Indiana Chapter," essay in "What We're Passionate About: An Anthology of Essays Written by America's Young Leaders and Activists," *Z Publishing*, Jul. 20, 2017.

POSTER PRESENTATIONS

P1. Duwadi, S., Hurley, J. T., and Mall, K., "Trajectory Optimization with No-Fly Zones Using the Uniform Trigonometrization Indirect Method," in INCOSE, University of South Alabama, Nov. 17, 2025.

P2. Sharma, A., Mall, K., Chanana, P., and Hurley, J. T., "Time-Optimal Spacecraft Reorientation Using the Uniform Trigonometrization Indirect Method," in INCOSE, University of South Alabama, Nov. 17, 2025.

P3. Mall, K. and Grant, M. J., "High Mass Mars Exploration using Slender Entry Vehicles," in AAE Research Symposium Series, Purdue University, Apr. 2014.
P4. Mall, K. and Grant, M. J., "High Mass Mars Exploration using Slender Entry Vehicles," in Gordon Research Conferences: Atmospheric Reentry Physics, Feb. 2013.

CERTIFICATIONS

MATLAB for Data Processing and Visualization, MATLAB Programming Techniques, and MATLAB Fundamentals (Issued by Mathworks, Inc. in 2018); **Machine Learning** (Issued by Stanford University at Coursera); **Kinematics: Describing the Motions of Spacecraft** (Issued by University of Colorado Boulder at Coursera)

PROGRAMMING PROJECTS

Runge Kutta 4 Solution for a Hypersonic Initial Value Problem Feb. 2019
- Used C/C++, Python, and Cython to solve a complicated hypersonics problem and compared the computation speeds

Pharmacy Data Engineering Project Jul. 2018
- Used standard Python libraries to sort 1 GB data of prescribed pharmacy drugs

INVITED TALKS AND OUTREACH PRESENTATIONS

I1. Mall, K., "Expanding Human Footprints in Space," Tamil Nadu Engineering College Faculty Welfare Association, Dec. 8, 2023 [Virtual].

I2. Mall, K., "Emergence in Interplanetary Habitats," International Space Technology Convention 2025, Dec. 4, 2025 [Virtual].

I3. Mall, K., "Humans to Mars: Challenges and Solutions," National Aviation and Space Day, Innova World, India, Aug. 23, 2025 [Virtual].

I4. Mall, K., "Journey of a Rocket Boy from a Small Indian Town to Neil Armstrong's University," Ozone Villa Co-operative Housing Society, Nov. 4, 2023 [Virtual].
I5. Mall, K., "Humans Mars Missions: Challenges and Solutions," Kreativity League, ABL Education, Oct. 10, 2023 [Virtual].
I6. Mall, K., "Humans to Mars: Challenges and Solutions," Aryabhatta Institute of Mathematics and Sciences, Apr. 12, 2021 [Virtual].
I7. Mall, K., "Humans to Mars: Challenges and Solutions," JSS Academy of Technical Education Noida, Jun. 29, 2020 [Virtual].
I8. Mall, K., "Importance of Human Spaceflight and Mars Missions," Space Kidz India, May 16, 2017 [Virtual].
I9. Mall. K., "Entry, descent, and landing for Human Mars Missions," The 19th Mars Society Annual Convention, Washington D. C., Sep. 22, 2016.
I10. Mall, K., "Q & A on Aerospace Engineering," with 2nd grade students from St. Anthony School, Milwaukee, Wisconsin, Feb. 29, 2016 [Virtual].

ENTREPRENEURSHIP AND LEADERSHIP ROLES

Commander and Analog Astronaut, Purdue Redusters (Crew 272) Jan. 1, 2023-Jan. 14, 2023
Executive Officer and Analog Astronaut, Boilers2Mars (Crew 186) Dec. 29, 2017-Jan. 13, 2018
-Initiated a team of 7 students from Purdue University for an analog astronaut mission at Mars Desert Research Station (MDRS), Hanksville, Utah in 2018
-Selected and commanded MDRS Crew 286 in January 2023
-Successfully returned to the habitat as a lost astronaut using Yagi-Uda system in a simulated Martian storm scenario
-Conducted a human-factors study on the conditioning of a Martian crew using yoga and meditation

President and Co-Founder, The Mars Society Purdue Chapter Spring 2016-Summer 2017
-Initiated and presided over the chapter to connect all those interested in Mars exploration at Purdue University
-Co-mentored a team from Purdue University in 2016 that won **third position** internationally and first position in the **US** in a human Mars flyby mission student **international competition**

Student Advisor, Mars Academy USA Mar. 2017-Nov. 2017
-Developed and conducted an experiential learning based analog astronaut event called *Future Immersion: "Education on Mars"* at Singularity University, San Francisco

Co-Founder and Propulsion Lead, Purdue Society of Automotive Engineers Aero Team Fall 2015-Fall 2016
-Managed five students to design the power plant for the aircraft in order to lift a maximum weight
-Played a critical role in selecting the propeller, motor, battery, and ESC for the RC aircraft by using University of Illinois Urbana-Champaign's propeller database

Co-Project Manager, Team Kanau (Inspiration Mars Competition) Spring 2014
-Initiated a team collaboration between Purdue and Keio Universities (Japan) to design a free return Mars flyby mission for a student competition organized by The Mars Society and Inspiration Mars Foundation
-Performed systems design, aerocapture analysis, logo and website design
-Team won **first prize against 37 other teams from around the globe**

Project Engineer and Co-Founder, Purdue Moonbuggy/Marsbuggy Team Summer 2012- Fall 2014
-Initiated the debut project of Purdue University (West Lafayette campus) for the NASA Moonbuggy/Marsbuggy Race
-Delegated various engineering tasks to the sub-systems lead and designed the tires using SolidWorks

Activity Head, Purdue Space Day 2012, 2013 Spring 2012-Fall 2013
-Led a team of 10 students from Purdue University in teaching 8th grade students from local elementary schools of Lafayette, Indiana on how to make a water rocket with a recovery mechanism using a parachute

Member, Purdue Leadership Forum Fall 2011-Spring 2012
-Certified as a global leader by Ex-President of Purdue University, Dr. France Cordova

President and Co-Founder, The Quasar Aerospace Club Fall 2008- Spring 2010
-Organized on-campus workshops and competitions on water rockets with parachutes, boomerangs, and gliders
-Instructed a team that secured first position at Techkriti 2009, IIT Kanpur

ADDITIONAL SKILLS

Webmaster: Purdue AIAA, Sigma Gamma Tau, Purdue CubeSat, and Team Kanau (Inspiration Mars Competition)
Student Pilot: 70.0 flight hours completed in Piper Warrior and Cessna Skyhawk at Purdue Aviation LLC
Remote Pilot License: Issued by Federal Aviation Authority to operate commercial drones for Mars analog mission
Technical Amateur Radio License: Issued by Federal Communications Commission with a call sign KD9WGO

ADDITIONAL POSITIONS

Member, Purdue High Altitude Balloon Team Spring 2012

-Worked on fabrication of a vehicle system comprising of a balloon, payload, and a parachute as per the norms of a competition organized at University of Evansville

-The team won **first prize** in the competition

Member, Purdue CubeSat Spring 2012-Summer 2012

-Carried out administrative tasks and conducted research work on antenna deployment mechanism

Student Panelist, Space Forum Spring 2012

-Co-represented Purdue AIAA to evaluate Lockheed Martin's project named *Stepping Stones*

-Submitted the evaluation report to the NASA human spaceflight director, William Gerstenmaier