

# Tushar Sial

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## EDUCATION

<b>Iowa State University, Ames</b> <i>Master of Science in Aerospace Engineering, GPA - 3.90/4</i>	August 2024 – Present Ames, Iowa
<b>Birla Institute of Technology and Science Pilani, Pilani Campus</b> <i>Bachelor of Engineering in Electrical and Electronics, CGPA - 7.95/10</i>	August 2019 – May 2023 Pilani, India

## RESEARCH INTERESTS

Astrodynamicics, Orbital Mechanics, Optimal Control, Dynamical Systems Theory, Stochastic systems, Guidance & Control of Aerial & Space systems, Space Trajectory Optimization, Autonomy, Robotics, Formal Methods.

## EXPERIENCE

<b>Halder Group: Stochastic Control &amp; Optimization</b> <i>Graduate Research Assistant</i>	Aug 2024 - Present ISU, Ames, Iowa
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- **Optimal Covariance Steering:**
  - Designed an Optimal Covariance Steering Algorithm in continuous time with Hilbert-Schmidt Terminal Cost for Linear Stochastic Systems over a finite time horizon.
  - Tested the algorithm on a close-proximity rendezvous scenario by modeling the relative motion of a service spacecraft to a target satellite in LEO using CW dynamics with stochastic disturbances. ([Github Link](#))
- **Computation Aware Algorithms for Cyber Physical Systems:**
  - Aided with design & testing of generative profiling algorithms for adaptive resource allocation and scheduling tasks on single and multicore real-time embedded systems. Collaboration between UCSC, ISU, and UPenn.

Contact: Dr. Abhishek Halder, Associate Professor, Department of Aerospace Engineering, ISU

<b>HDFC Bank: Digital Factory</b> <i>DevSecOps Engineer</i>	July 2023 – July 2024 Bengaluru, India
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- Designed, maintained & secured CI/CD pipelines using Jenkins, Groovy, Git, Kubernetes, and Docker.
- Implemented infrastructure-as-code principles using Terraform to ensure secure and compliant cloud environment.

Contact: Deepak Kumar Gupta, VP, DevSecOps Team, HDFC Bank

<b>Guidance, Control &amp; Decision Systems Lab (GCDSL)</b> <i>Research Intern</i>	June 2022 – June 2023 Bengaluru, India
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- Developed a Data-driven guidance algorithm for autonomous spacecraft rendezvous with non-cooperative satellite.
- Used Koopman operator and Extended Dynamic Mode Decomposition to lift the nonlinear spacecraft dynamics to a higher-dimensional linear space and implemented LQR control algorithm for the far-field rendezvous operation.
- Implemented an impact guidance-based approach for autonomous docking operation. ([Video](#)) ([Github Link](#))

Contact: Dr. Debasish Ghose, Professor, Department of Aerospace Engineering, IISc

## PROJECTS

<b>Coupled Trajectory-Power Subsystem Optimization</b>   <i>Dymos, OpenMDAO, Python</i>	Oct 2025 – Dec 2025
<ul style="list-style-type: none"><li>• Designed a multidisciplinary design optimization framework for coupled low-thrust trajectory and power subsystem design optimization for an orbit insertion maneuver around asteroid 16-Psyche using OpenMDAO and Dymos.</li><li>• Incorporated a high-fidelity power and propulsion model using an SPT-140 Hall thruster with solar array degradation, enabling realistic coupling between available power, thrust capability, and trajectory dynamics.</li><li>• Formulated and solved a time-optimal low-thrust control problem in Dymos &amp; OpenMDAO using IPOPT solver, achieving a <b>8.09%</b> reduction in mission time of flight over a trajectory-only baseline model. (<a href="#">Github Link</a>)</li></ul>	

<b>Space Trajectory Optimization</b>   <i>MATLAB</i>	March 2025 – May 2025
<ul style="list-style-type: none"><li>• Extended the three-stage approach (by Dr. Pierson and Dr. Kluever) for the design of Optimal low-thrust Earth-Moon trajectories by allowing variable thrust magnitude under Professor Ossama Abdelkhalik.</li><li>• Tested the proposed algorithm under the circular restricted three-body dynamics, which resulted in improved fuel efficiency and mission flexibility as compared to the original algorithm with fixed thrust. (<a href="#">Github Link</a>)</li></ul>	

**Mars Rover Team** | *MATLAB, Simulink, ROS, Gazebo, Fusion 360, Arduino, Raspberry Pi* Jan 2021 – Jan 2022

- Co-founded **CRISS Robotics** (Consortium for Research in Space Systems), a student research technical team at BITS Pilani consisting of 60+ members for designing and manufacturing an all-terrain 6-wheeled Mars Rover.
- Designed the high-level Electrical Architecture of the Mars rover capable of Autonomous traversal, Equipment servicing using a 6-DOF Robotic Manipulator, and life detection using a Science module.
- CRISS qualified for the International Rover Challenge in 2022 finals at Chennai among 16 international teams, followed by winning the International Rover Design Challenge in 2023. ([IRC Report](#)) ([IRDC Report](#))

**Powertrain of a Formula Styled Electric Vehicle** | *Fusion 360, MATLAB, Simulink* Aug 2019 – March 2022

- Member of formula student team **Inspired Karters Electric** at BITS Pilani comprising 40+ members for designing and manufacturing an electric formula car for National and International Formula Student events.
- Modelled car's powertrain using Simulink & Simscape for optimizing control parameters & system efficiency.
- Worked on the assembly & packaging of the Electrical components of the car. ([CAD Video](#)) ([Design Report](#))

**Flight Stabilizing Controllers for Agile Fixed-Wing UAV** | *MATLAB, Simulink* Aug 2021 – March 2022

- Designed flight stabilizing control algorithms for an agile fixed-wing UAV using MATLAB & Simulink.
- Designed a wind observer to incorporate environmental disturbances (like wind shears, wind gusts, and atmospheric disturbances) to make the controllers robust and, thus, improve flight capability. ([Video](#)) ([Github Link](#))

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**PUBLICATIONS****Journal Publications**

- A. Eisenklam, R. Gifford, G.A. Bondar, Y. Cai, **T. Sial**, L.T.X. Phan, A. Halder. Rasco: Resource Allocation and Scheduling Co-design for DAG Applications on Multicore. *ACM Transactions on Embedded Computing Systems*, 2025. doi: [10.1145/3761814](https://doi.org/10.1145/3761814)

**Conference Publications**

- G.A. Bondar, A. Eisenklam, Y. Cai, R. Gifford, **T. Sial**, L.T.X. Phan, A. Halder. Generative Profiling for Soft Real-Time Systems and its Applications to Resource Allocation. *IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS)*, 2026. (To appear)

**Papers Under Review/ Revision**

- **T. Sial**, A. Halder. Fixed Horizon Linear Quadratic Covariance Steering in Continuous Time with Hilbert-Schmidt Terminal Cost. *IEEE Transactions on Automatic Control*. (Under Review) arXiv: [2510.21944](https://arxiv.org/abs/2510.21944)

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**PROFESSIONAL ACTIVITIES****Journal Manuscript Reviewer (7)**

- *System and Control Letters*. (6)
- *ASME Journal of Dynamic Systems, Measurement, and Control*. (1)

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**AWARDS AND HONOURS****AUGSD Project Funds**

Sept 2021

- Awarded Rs 25,000 for developing an adaptive drive control system for a Mars Rover prototype at BITS Pilani.

**3rd Edition of National Engineering Olympiad (NEO)**

July 2020

- Achieved an All India Rank 19 in the 1st Year Engineering Category.

**4th Annual Formula Student Electric Vehicle (FSEV) Concept Challenge | Formula Bharat**

April 2020

- Achieved overall first position across India in the event.

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**TECHNICAL SKILLS****Frameworks:** Robotic Operating Software (ROS), OpenMDAO**Software Simulation:** Simulink, Simscape, Ansys STK, GMAT, Gazebo, RobotStudio**Design:** Fusion 360, Solidworks, EagleCAD, LTSpice**Programming Languages:** MATLAB, Python, C++, C, Java, Go**Libraries:** Dymos, CVX, Numpy, Pandas, OpenCV**Embedded:** Embedded C, Arduino, STM32Cube, Raspberry Pi**Others:** Linux, CI/CD, Git, Docker, Kubernetes, Terraform, Spin, NuXmv, Isabelle

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**POSITION OF RESPONSIBILITY****Powertrain Head** | *Inspired Karters Formula Student, BITS Pilani*

March, 2021 – March 2022

- Responsible for designing and integrating the Electric Powertrain of a formula student electric vehicle.