

Tushar Sial

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EDUCATION

Iowa State University, Ames

Master of Science in Aerospace Engineering, GPA - 3.92/4

August 2024 – Present

Ames, Iowa

Birla Institute of Technology and Science Pilani, Pilani Campus

Bachelor of Engineering in Electrical and Electronics, CGPA - 7.95/10

August 2019 – May 2023

Pilani, India

RESEARCH INTERESTS

Astrodynamics, Orbital Mechanics, Space Trajectory Optimization, Spacecraft Guidance & Control, Stochastic Control & Optimization, Optimal Control, Space Robotics, Autonomy, MDO, Formal Methods.

EXPERIENCE

Halder Group: Stochastic Control & Optimization

Graduate Research Assistant

Aug 2024 - Present

ISU, Ames, Iowa

• Optimal Covariance Control:

- Designing 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 Clohessy–Wiltshire dynamics with stochastic disturbances.

• 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

HDFC Bank: Digital Factory

DevSecOps Engineer

July 2023 – July 2024

Bengaluru, India

- 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

Guidance, Control & Decision Systems Lab (GCDSL)

Research Intern

June 2022 – June 2023

Bengaluru, India

- 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

Space Trajectory Optimization | MATLAB

March 2025 – May 2025

- Extended the three-stage approach (by Dr. Pierson and Dr. Kluever) for design of Optimal low-thrust Earth-Moon trajectories by allowing variable thrust magnitude under Professor Ossama Abdelkhalik.
- Tested the performance of the proposed algorithm under the circular restricted three-body dynamics which resulted in enhanced fuel efficiency and mission flexibility as compared to the original algorithm with fixed-thrust.

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](#))

Autonomous Cleaning Bot | *WeBots, Python, ROS, Gazebo* Oct 2021 – Dec 2021

- Developed autonomous navigation algorithms for a cleaning mobile robot in unknown dynamic environments.
- Worked on sensor fusion and wheel odometry for localization and state estimation using LiDAR, GPS & IMU.
- Employed Bugs 0 algorithm for the mobile robot's path planning and obstacle avoidance. ([Design Report](#))

Autonomous Delivery Quadcopter | *ROS, Python, Gazebo* Aug 2020 – Dec 2020

- Developed guidance & navigation algorithms for a simulated quadrotor capable of autonomous package delivery.
- Implemented pyzbar library-based CV algorithm for QR tag detection on delivery packages. ([Video](#)) ([Github Link](#))

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)

PROFESSIONAL ACTIVITIES

Journal Manuscript Reviewer (4)

- *System and Control Letters*. (3)
- *ASME Journal of Dynamic Systems, Measurement, and Control*. (1)

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.
- Worked on the design and assembly of the electrical powertrain package of an electric vehicle.

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: CVX, Numpy, Pandas, OpenCV

Embedded: Embedded C, Arduino, STM32Cube, Raspberry Pi

Others: Linux, CI/CD, Git, Docker, Kubernetes, Terraform, Spin, NuXmv, Isabelle

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.

Demonstration Head | *Department of Physics, BITS Pilani* May 2020 – April 2021

- Responsible for designing functional demonstrations in APOGEE i.e. the college's annual technical fest.

LANGUAGES

English (*Full Professional Proficiency*), Hindi (*Full Professional Proficiency*)