

SAURABH KUMAR

☎ (+91) 7765873646

✉ saurabh.k@aero.iitb.ac.in

🔍 Google Scholar

ABOUT

I am a postdoctoral fellow specializing in nonlinear guidance and control of autonomous systems, with expertise in constrained motion control, cooperative multi-vehicle systems, and provably safe control design. My research integrates rigorous theoretical analysis with algorithm development and validation for autonomous vehicles, with an emphasis on safety, robustness, and real-world feasibility.

EDUCATION

Doctor of Philosophy (Ph.D) in Aerospace EngineeringJuly 2021 -
March 2025

- Indian Institute of Technology Bombay
- Specialization: Dynamics and Control
- Supervisor: Prof. Shashi Ranjan Kumar
- Thesis Title: Guidance and Control for Constrained Motion of Unmanned Autonomous Vehicles

Master of Technology (M.Tech) in Electrical Engineering

July 2019 - July 2021

- National Institute of Technology Kurukshetra
- Specialization: Control System Engineering
- Thesis Title: Modeling and Control of Quanser 2-DoF Helicopter

Bachelor of Technology (B.Tech) in Electrical Engineering

June 2015 - June 2019

- National Institute of Technology Patna
- Thesis Title: Modeling and Control of Single-Phase Multilevel Inverter

RESEARCH EXPERIENCE

Indian Institute of Technology BombaySeptember 2025 -
Present

- Postdoctoral Fellow

Indian Institute of Technology BombayMarch - August
2025

- Project Research Scientist

PUBLICATIONS

REFERRED JOURNALS

- [J1] **Saurabh Kumar**, S. R. Kumar, and A. Sinha, [Three-dimensional Nonlinear Path-following Guidance with Bounded Input Constraints](#), *Journal of Guidance, Control, and Dynamics*, vol. 49, no. 1, pp. 198-215, 2026.
- [J2] **Saurabh Kumar**, S. R. Kumar, and A. Sinha, [Three-Dimensional Trajectory Tracking for Unmanned Aerial Vehicles with Constrained Motion](#) *Journal of Guidance, Control, and Dynamics*, vol. 49, no. 1, pp. 78-96, 2026.
- [J3] V. Kathiriya, **Saurabh Kumar**, and S. R. Kumar, [Path-Following Guidance for Unmanned Aerial Vehicle with Bounded Lateral Acceleration](#), *Aerospace Science and Technology*, Vol. 177, Part D, 2026, pp. 112883.
- [J4] **Saurabh Kumar**, and S. R. Kumar, [Robust Trajectory Tracking of Autonomous Aerial Vehicles with almost Global Finite-time Convergence](#), *Proceedings of the Institution of Mechanical Engineers, Part G: Journal of Aerospace Engineering*, Vol. 239, No. 8, 2025, pp. 792 - 817.
- [J5] S. Basnet, **Saurabh Kumar**, and S. R. Kumar, [Robust Exact-time Trajectory Tracking Control for Autonomous Surface Vessels](#), *IEEE Journal of Oceanic Engineering*, vol. 50, no. 2, pp. 1184-1195, April 2025.
- [J6] **Saurabh Kumar**, S. R. Kumar, and A. Sinha, [Three Dimensional Path Following Nonlinear Guidance for Unmanned Aerial Vehicles](#), *Journal of Guidance, Control, and Dynamics*, vol. 47, no. 6, pp. 1231-1240, 2024.
- [J7] **Saurabh Kumar**, A. Sinha, and S. R. Kumar, [Robust Path Following Guidance for an Autonomous Vehicle in the Presence of Wind](#), *Aerospace Science and Technology*, vol. 150, pp. 109225, 2024.

REFERRED JOURNALS: UNDER REVIEW

- [J8] **Saurabh Kumar**, S. R. Kumar, and A. Sinha, [Admissibility-Preserving Control for Strict-Feedback Nonlinear Systems with Asymmetric Actuator Constraints](#), *under review*, *International Journal of Robust and Nonlinear Control*.
- [J9] **Saurabh Kumar**, S. R. Kumar, and A. Sinha, Prescribed-Time Cooperative Geometric Guidance under Delay-Robust Information Structures for Pursuit-Evasion, *under revision*, *AIAA Journal of Aerospace Information Systems*.
- [J10] **Saurabh Kumar**, S. R. Kumar, and A. Sinha, "Equivalent-Agent Guidance for Cooperative UAV Payload Transportation", *under review*, *Aerospace Science and Technology*.

JOURNALS: UNDER PREPARATION

- [J11] **Saurabh Kumar**, S. R. Kumar, and A. Sinha, "A Class of Strict-time Stable Systems."
- [J12] **Saurabh Kumar** and S. R. Kumar, "Autopilot Design for Interceptors with Safety Guarantees."
- [J13] **Saurabh Kumar**, S. R. Kumar, and A. Sinha, "Two-Loop Guidance and Control for Autonomous Path-following."

PEER REVIEWED CONFERENCES: PUBLISHED/ACCEPTED

- [C1] M. Kidron, **Saurabh Kumar**, and S. R. Kumar, Leader-Follower Cooperative Integrated Guidance and Control for Impact-Time Constrained Interception, *Proceedings of the AIAA Guidance, Navigation and Control Conference (AIAA SciTech Forum)*, Orlando, Florida, USA, 2027 (Accepted for publication).
- [C2] P. Jashwanth, **Saurabh Kumar**, and S. R. Kumar, Exact Time Convergent Impact Time Constrained Guidance, *Proceedings of the AIAA Guidance, Navigation and Control Conference (AIAA SciTech Forum)*, Orlando, Florida, USA, 2027 (Accepted for publication).
- [C3] **Saurabh Kumar**, R. V. Nanavati, and S. R. Kumar, [Asymmetric Input Constrained Range-to-go based Impact Time Guidance](#), *Proceedings of the European Control Conference (ECC)*, Reykjavík, Iceland, July 7–10, 2026, pp. 2623-2624.
- [C4] V. Kathiriya, **Saurabh Kumar**, R. V. Nanavati, S. R. Kumar, and H. Arya, [Sliding Mode Control based LOS-Stabilization of a 2-DOF Gimbal](#), *Proceedings of the European Control Conference (ECC)*, Reykjavík, Iceland, July 7–10, 2026, pp. 907-912.
- [C5] M. Kidron, **Saurabh Kumar**, and S. R. Kumar, [Integrated Guidance and Control for Impact-Time-Constrained Target Interception](#), *Proceedings of the European Control Conference (ECC)*, Reykjavík, Iceland, July 7–10, 2026, pp. 449-454.
- [C6] P. Jashwanth, **Saurabh Kumar**, and S. R. Kumar, [True-Proportional Navigation based Exact-Time Convergent Impact Time Guidance](#), *Proceedings of the Variable Structure Systems and Sliding Mode Control (VSS)*, Exeter, UK, July 27–30, 2026, pp. 400-405.
- [C7] V. Kathiriya, **Saurabh Kumar**, and S. R. Kumar, Planar Path-Following Guidance for Unmanned Aerial Vehicle with Bounded Control, *Asian Control Conference (ASCC)*, Bali, Indonesia, 2026, **Best paper finalist**.
- [C8] **Saurabh Kumar**, A. Sinha, S. R. Kumar, [Path Following Guidance with Bounded Control](#), *Proceedings of the AIAA Guidance, Navigation and Control Conference (AIAA SciTech Forum)*, Orlando, Florida, USA, January 12–16, 2026.
- [C9] V. Kathiriya, **Saurabh Kumar**, and S. R. Kumar, [Impact Angle and Input Constrained Guidance Against Stationary Targets](#), *Proceedings of the Eleventh Indian Control Conference (ICC)*, Bangalore, India, December 18-20, 2025, pp. 117-122.
- [C10] M. Kidron, **Saurabh Kumar**, and S. R. Kumar, [Exact-Time Convergent Impact Time Guidance Against Moving Targets](#), *Proceedings of the Eleventh Indian Control Conference (ICC)*, Bangalore, India, December 18–20, pp. 123–128.
- [C11] **Saurabh Kumar**, S. R. Kumar, and A. Sinha, [Range-only Geometric Guidance for Enclosing Moving Targets](#), *Proceedings of the AIAA Guidance, Navigation and Control Conference (AIAA SciTech Forum)*, Orlando, Florida, USA, January 6–10, 2025.
- [C12] **Saurabh Kumar**, S. R. Kumar, and A. Sinha, [Robust Nonlinear Control for Exact-time Stability of a Quadrotor UAV under Uncertainties](#), *Proceedings of the AIAA Guidance, Navigation and Control Conference (AIAA SciTech Forum)*, Orlando, Florida, USA, January 8–12, 2024.

- [C13] **Saurabh Kumar**, S. R. Kumar, and A. Sinha, [Generic Path-following Guidance for an Autonomous Vehicle](#), *Proceedings of the AIAA Guidance, Navigation and Control Conference (AIAA SciTech Forum)*, Orlando, Florida, USA, January 8–12, 2024.
- [C14] S. Basnet, **Saurabh Kumar**, and S. R. Kumar, [Nonlinear Cooperative Strategy for Active Aircraft Defense with Exact-time Convergence](#), *Proceedings of the Ninth Indian Control Conference (ICC)*, Madras, India, December 18–20, 2023.
- [C15] **Saurabh Kumar**, S. R. Kumar, and A. Sinha, [Robust Path-following Guidance for an Unmanned Vehicle](#), *Proceedings of the AIAA Guidance, Navigation and Control Conference (AIAA SciTech Forum)*, Maryland, USA, January 23-27, 2023, pp. 212-217.
- [C16] **Saurabh Kumar**, and S. R. Kumar, [Exponential Reaching Law based Robust Trajectory Tracking for Unmanned Aerial Vehicles](#), *Proceedings of the Eighth Indian Control Conference (ICC)*, Madras, India, December 14-16, 2022, pp. 302-307.
- [C17] **Saurabh Kumar**, S. R. Kumar, and A. Sinha, [Separate Guidance and Control Design for Autonomous Path following](#), *Proceedings of the IFAC Symposium on Automatic Control in Aerospace (ACA)*, Mumbai, India, November 21-25, 2022.
- [C18] **Saurabh Kumar**, and S. R. Kumar, [Finite-Time Convergent Robust Trajectory Tracking for Unmanned Aerial Vehicles](#), *Proceedings of the International Conference on Unmanned Aircraft Systems (ICUAS)*, Dubrovnik, Croatia, June 21-24, 2022, pp. 1166-1175.
- [C19] **Saurabh Kumar**, and S. R. Kumar, [Barrier Lyapunov-based Nonlinear Trajectory Following for Unmanned Aerial Vehicles with Constrained Motion](#), *Proceedings of the International Conference on Unmanned Aircraft Systems (ICUAS)*, Dubrovnik, Croatia, June 21-24, 2022, pp. 1146-1155.
- [C20] **Saurabh Kumar**, and L. Dewan, [Set-point Tracking of Quanser AERO using SMC in the presence of Uncertainties](#), *Proceedings of the International Conference on Intelligent Computing and Control Systems (ICICCS)*, Madurai, India, May 06-08, 2021, pp. 1595-1601.

BOOK CHAPTERS

- [B1] **Saurabh Kumar**, and L. Dewan, [A Comparative Analysis of LQR and SMC for Quanser AERO](#), *Control and Measurement Applications for Smart Grid*, Springer Nature, January 2022.

FUNDED RESEARCH PROJECTS

- [P1] Trajectory Tracking of Multi-copters in Constrained Space Duration: 1 year
 - Team Members: **Saurabh Kumar**, S. R. Kumar, and H. Arya
 - Funding Agency: Ministry of Electronics and Information Technology, Government of India
- [P2] Robust Guidance Scheme for Fixed-wing UAV Duration: 1 year
 - Team Members: **Saurabh Kumar**, S. R. Kumar, and H. Arya
 - Funding Agency: Ministry of Electronics and Information Technology, Government of India
- [P3] Navigation of UAV Through Arbitrary Openings Duration: 1 year
 - Team Members: V. Karthickeyan, **Saurabh Kumar**, S. R. Kumar, and H. Arya
 - Funding Agency: Ministry of Electronics and Information Technology, Government of India
- [P4] Convoy Monitoring Schemes Consisting of Heterogeneous Vehicles Duration: 1 year
 - Team Members: **Saurabh Kumar**, S. R. Kumar, and H. Arya
 - Funding Agency: Ministry of Electronics and Information Technology, Government of India
- [P5] Object Transportation Using Cooperative Unmanned Aerial Vehicles Duration: 1 year
 - Team Members: **Saurabh Kumar**, S. R. Kumar, H. Arya, S. Singh, R. M. K. Verma, P. Surve, A. Samrat, V. Karthickeyan, and A. Antony
 - Funding Agency: Ministry of Electronics and Information Technology, Government of India
- [P6] Obstacle Avoidance for a UAV Using Collision Cone Approach Duration: 1 year
 - Team Members: P. Surve, S. R. Kumar, H. Arya, R. Gupta, S. Singh, **Saurabh Kumar**, and R. M. K. Verma
 - Funding Agency: Ministry of Electronics and Information Technology, Government of India
- [P7] Convoy Monitoring Schemes for Various Autonomous Vehicles Duration: 1 year
 - Team Members: D. Mukherjee, S. R. Kumar, H. Arya, S. Singh, A. K. Dubey, S. T. Raybhagi, and **Saurabh Kumar**
 - Funding Agency: Ministry of Electronics and Information Technology, Government of India

- [P8] 3D Nonlinear Path Following Guidance with Limited Control Authority Duration: 1 year
 – Team Members: **Saurabh Kumar**, S. R. Kumar, H. Arya, S. Singh, S. Barman, R.M.K. Verma, and A. Iyer
 – Funding Agency: Ministry of Electronics and Information Technology, Government of India
- [P9] Designing of a UAV Capable to Maneuver in Constrained Environment Duration: 1 year
 – Team Members: H. Arya, S. R. Kumar, P. Hemali, P. Chavan, R. M. K. Verma, A. Iyer, and **Saurabh Kumar**
 – Funding Agency: Ministry of Electronics and Information Technology, Government of India
- [P10] Control of Fully Actuated Quadrotor for Enhanced Precision Trajectory Tracking Duration: 1 year
 – Team Members: H. Arya, S.R. Kumar, D. Phadke, R. M. K. Verma, A. Iyer, and **Saurabh Kumar**
 – Funding Agency: Ministry of Electronics and Information Technology, Government of India

TEACHING/MENTORING EXPERIENCE

TEACHING EXPERIENCE

- Teaching Assistant**, Indian Institute of Technology Bombay 2021 - 2025
- AE 695 : State Space Methods for Flight Vehicles, Fall 2025, [35 students]
 - AE 686 : Guidance of Aerospace Vehicles, Spring 2025, [50 students]
 - AE 775 : System Modeling, Dynamics and Control, Fall 2023 and 2024, [30 students]
 - AE 308 : Control Theory, Fall 2023 and 2024 [90 students]
 - AE 700 : Guidance and Control of Autonomous Vehicles, Spring 2023 and 2024, [85 students]
 - AE 641 : Introduction to Navigation and Guidance, Fall 2022, [30 students]
 - AE 410 : Navigation and Guidance, Fall 2022, [85 students]
 - AE 305 : Flight Mechanics – II, Spring 2022, [80 students]
 - AE 717 : Aircraft Flight Dynamics, Spring 2022, [30 students]

MENTORING EXPERIENCE

- M. Kidron 2024 -
- Master's Student, AE, IIT Bombay
 - Thesis Title: Guidance Design with Terminal Constraints
- Vinay Kathiriya 2024 -
- Undergraduate Student, AE, IIT Bombay
 - Thesis Title: Controller Design for Gimbal System
- Punyamurthy Jashwanth 2024 -
- Master's Student, AE, IIT Bombay
 - Thesis Title: Guidance Design for Autonomous Vehicles
- Susan Basnet 2022-2023
- Master's Student, AE, IIT Bombay
 - Thesis Title: Trajectory Tracking Controller for Autonomous Surface Vessels
- Milind Kharwade 2022-2023
- Dual-degree Student, AE, IIT Bombay
 - Thesis Title: Terminal-Time Constrained Interception using Exact-Time Sliding Mode Control
- Chandra Prakash Saini 2022-2023
- Dual-degree Student, AE, IIT Bombay
 - Thesis Title: Sliding Mode Based Design for Delivery and Object Tracking using UAV System

PRESENTATIONS/INVITED TALKS

- Generalization of Path Following Problem: A Guidance Perspective, ASSETS, Bangalore, India, 2025.
- Range-only Geometric Guidance for Enclosing Moving Targets, AIAA SciTech Forum, Orlando, Florida, USA, 2025.
- Three-Dimensional Nonlinear Path-Following Guidance for UAVs, CyPhySS, Bangalore, India, 2024.
- Robust Nonlinear Control for Exact-time Stability of a Quadrotor UAV under Uncertainties, AIAA SciTech Forum, Orlando, Florida, USA, 2024.
- Generic Path-following Guidance for an Autonomous Vehicle, AIAA SciTech Forum, Orlando, Florida, USA, 2024.

- Nonlinear Cooperative Strategy for Active Aircraft Defense with Exact-time Convergence, ICC, Madras, India, 2023.
- Robust Path-following Guidance for an Unmanned Vehicle, AIAA SciTech Forum, Maryland, USA, 2023.
- Exponential Reaching Law-based Robust Trajectory Tracking for Unmanned Aerial Vehicles, ICC, Madras, India, 2022.
- Separate Guidance and Control Design for Autonomous Path following, ACA, Mumbai, India, 2022.
- Finite-Time Convergent Robust Trajectory Tracking for Unmanned Aerial Vehicles, ICUAS, Dubrovnik, Croatia, 2022.
- Barrier Lyapunov-based Nonlinear Trajectory Following for Unmanned Aerial Vehicles with Constrained Motion, ICUAS, Dubrovnik, Croatia, 2022.
- Set-point Tracking of Quanser AERO using SMC in the Presence of Uncertainties, ICICCS, Madurai, India, 2021.

TECHNICAL SKILLS

Scientific Computing MATLAB/Simulink, Python
 Robotics & Simulation ROS/ROS2, Gazebo, QGC
 Tools Git/GitHub, L^AT_EX
 Languages English (proficient), Hindi (native)

FELLOWSHIPS & HONORS

NAIK AND RASTOGI AWARD FOR EXCELLENCE IN PH.D. RESEARCH	August 2026
• Indian Institute of Technology Bombay, India	
MHRD POSTGRADUATE FELLOWSHIP FOR PH.D.	July 2021- March 2025
• Ministry of Human Resource Development, India	
MHRD POSTGRADUATE FELLOWSHIP FOR M.TECH.	July 2019 - June 2021
• Ministry of Human Resource Development, India	
ICC STUDENT SUPPORT	Dec 2023
• Indian Control Conference and IEEE-CSS	
ICC STUDENT SUPPORT	Dec 2022
• Indian Control Conference and IEEE-CSS	

PROFESSIONAL SERVICES

REVIEWER OF REFERRED JOURNALS (SELECTED)

- AIAA Journal of Guidance, Control, and Dynamics
- Automatica
- IEEE Control Systems Letters
- IEEE Transactions on Aerospace and Electronic Systems
- IEEE Transactions on Network Science and Engineering
- IEEE Transactions on Automation Science and Engineering
- IEEE Transactions on Industrial Cyber-Physical Systems
- IEEE Transactions on Vehicular Technology
- Aerospace Science and Technology
- Asian Journal of Control
- International Journal of Control
- European Journal of Control
- Proceedings of the Institution of Mechanical Engineers Part G: Journal of Aerospace Engineering
- Journal of Vibration and Control
- ISA Transactions
- Journal of Intelligent & Robotic Systems
- Optimization and Engineering
- Nonlinear Dynamics
- International Journal of Robust and Nonlinear Control
- International Journal of Adaptive Control and Signal Processing

REVIEWER OF PEER-REVIEWED CONFERENCES (SELECTED)

- AIAA SciTech Forum
- American Control Conference (ACC)
- Control and Decision Conference (CDC)
- European Control Conference (ECC)
- Conference on Control Technology and Applications (CCTA)
- International Conference on Unmanned Aircraft Systems (ICUAS)
- Asian Control Conference (ASCC)
- Indian Control Conference (ICC)
- IFAC Symposium on Automatic Control in Aerospace (ACA)
- International Conference on Emerging Technology in Autonomous Aerial Vehicles (ETA AV)