Tanay Kumar

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Profile

Ph.D. student seeking Summer 2026 internship in Guidance, Navigation, and Control pertaining to aerospace robotics, autonomy, multi-agent systems and experimental validation of flight hardware and flight control software.

Education

Texas A&M University — College Station, TX
Ph.D. in Aerospace Engineering (GPA: 3.75/4.0) — *Aug 2024 – 2028 (Expected)*
Research Focus: Modular Robotics, Optimization, Robust and Fault Tolerance Control

Manipal Institute of Technology — Manipal, India
Bachelor of Technology in Electronics and Communication Engineering (GPA: 3.64/4.0) — *Jul 2018 – Jul 2022*
Minor specialization: Control Systems

Work Experience

Dept. of Aerospace Engineering, Texas A&M University — College Station, USA
Graduate Teaching Assistant (**Skills:** MATLAB, Python) — *Aug 2024 – Present*

- *Introduction to Aerospace Computation*(Spring 2025): Taught lab sessions and selected lectures, designed assignments, graded exams, and provided academic support through office hours.
- *Active Control for Aerospace Vehicles*(Fall 2024): Designed assignments, graded exams, provided academic support through office hours, and guided student projects.

Dept. of Aerospace Engineering, IIT Bombay — Mumbai, India
Visiting Researcher (**Skills:** FPGA Design, Verilog, Vivado, SDR) — *Aug 2023 – Jul 2024*

- Worked on developing satellite-based navigation system for precision guidance of high-spin projectiles.
- Facilitated research collaboration between the Indian Army, IIT Kanpur, IIT Madras, and SVNIT Surat.

Intelligent Guidance and Control Lab (IGCL), IIT Kanpur — Kanpur, India
Research Assistant (**Skills:** MATLAB, Simulink, PX4, Pixhawk Series, ROS, Gazebo) — *Jul 2022 – Jul 2024*

- Contributed to the development of a low-cost, FPGA-based IRNSS receiver.
- Designed $\mathcal{H}_\infty$ robust controller for biplane tailsitter UAV and validated performance through SITL simulations.
- Conducted wind tunnel experiments for developing flight dynamics model of quadrotor biplane tailsitter UAV.

Undergraduate Research Intern (**Skills:** MATLAB, Simulink, Pixhawk Series) — *Jan 2022 – May 2022*

- Developed a robust controller for a quadrotor UAV to handle disturbances and system uncertainties.

National Technical Research Organization, Aviation Base — Dehradun, India
UAV Controls and Autopilot Systems Intern (**Skills:** Pixhawk Series, UAV Pilot) — *Aug 2021 – Nov 2021*

- Assisted in forensic analysis of malicious UAVs and proposed the development of anti-drone systems.
- Supervised the fabrication, maintenance, sensor integration, and autopilot system design of reconnaissance UAVs.

AeroMIT (University's official aeromodelling and aerial robotics student team) — Manipal, India
Advanced Drone Research Head (**Skills:** Pixhawk Series, UAV Pilot, LTspice) — *Mar 2020 – May 2021*

- Led and coordinated the team, overseeing project execution and technical operations.
- Represented and managed the team at prestigious national and international competitions.

Advanced Drone Research Member (**Skills:** Pixhawk, UAV Pilot, AutoCAD) — *May 2019 – Feb 2020*

- Engineered a versatile tilt-rotor UAV with onboard ML algorithms for enhanced autonomy and multi-mission capability.
- Designed and fabricated custom UAVs, securing top positions in national and international competitions.
- Delivered technical presentations and led hands-on UAV workshops to promote aerial robotics.

Publications

- **Kumar, T.**, and Bhattacharya, R., " Sparse Actuation for LPV Systems with Full-State Feedback in $\mathcal{H}_2/\mathcal{H}_\infty$ Framework" Manuscript accepted for publication. https://doi.org/10.48550/arXiv.2410.01118
- Shubham, **Kumar, T.**, and Kothari, M., "SDR-Based NavIC and GPS Receiver." In AIAA SciTech 2025 Forum, p. 2552. 2025. https://arc.aiaa.org/doi/abs/10.2514/6.2025-2552
- **Kumar, T.**, Kothari, M., and Bhattacharya, R., "$\mathcal{H}_\infty$ Robust Control of a Quadrotor Biplane Tailsitter UAV." In AIAA SciTech 2024 Forum, p. 0318. 2024. https://arc.aiaa.org/doi/abs/10.2514/6.2024-0318
- **Kumar, T.**, and Kothari, M., "Insights to the Forensic Investigation of a Custom Built UAV", 2023 doi.org/10.48550/arXiv.2308.14494

Fellowships and Scholarships

- **Aero Graduate Excellence Fellowship Award** for Fall 2025 by the Dept. of Aerospace Engineering, TAMU.

Technical Skills

Tools and Software: MATLAB, Simulink, PX4, Vivado IDE, Arduino IDE, Visual Studio, ROS, LTspice, AutoCAD.
Languages: Python, C/C++, Verilog, HTML.
Hardware: Xilinx FPGA, Effinix FPGA, Pixhawk series, SDR(ADALM-PLUTO, HackRF One, RTL-SDR).
Other Skills: Linux, FPGA Design, SITL, HIL, Gazebo, UAV Pilot, MAVROS.

Projects

FPGA Based GNSS Receiver Development | *IGCL, IIT Kanpur* *Sep 2022 – Jul 2024*

- Developed a highly configurable GNSS receiver for precise navigation of aerospace systems, ensuring robust signal acquisition under extreme dynamics.
- Optimized FPGA resource usage through custom signal processing algorithms for real-time satellite tracking.
- Explored high-level hardware design alternatives to Verilog to accelerate development and improve prototyping.

$\mathcal{H}_\infty$ Control of Biplane Quadrotor Tailsitter UAV | *IGCL, IIT Kanpur* *May 2022 – Feb 2023*

- Designed an $\mathcal{H}_\infty$ robust controller for a novel VTOL UAV to achieve stabilization with guaranteed performance under high disturbances and uncertainties.
- Validated and implemented the controller using SITL simulations in Gazebo and deployed it on Pixhawk (PX4) via MATLAB/Simulink.

Drone for COVID-19 Pandemic | *AeroMIT* *Apr 2020*

- Built an autonomous UAV for medical aid delivery, supporting a 1.5 kg payload over an 8 km range.

Autonomous Tiltrotor | *AeroMIT* *Oct 2019 – Apr 2020*

- Designed a tilt-rotor UAV integrating onboard ML for autonomy and support for diverse mission profiles.
- Analyzed flight dynamics for controller synthesis and led hardware selection and system integration for the build.

Relevant Coursework

Graduate: Spacecraft Dynamics, Design of Advanced Flight Control Systems, Aerospace Graduate Math
Undergraduate: Signals and Systems, Linear Control Theory, Digital Control Systems, Systems Identification, Nonlinear Control Systems, Robust Control.

Awards and Honors

- Secured **2nd place** in AeroDes competition during Techkriti 2021 at IIT Kanpur.
- Secured **2nd place** in Technical Presentation and **5th** in Design Report at SAE AeroDesign Knowledge Event 2021.
- **Second best Indian team** at the BRICS Future Skills Aerial Robotics Competition 2020.
- Secured **4th place** Overall and **1st place** in Technical Presentation at Lockheed Martin SAE AeroDesign East 2020.
- Secured **3rd place** in Boeing National Aeromodelling Competition and **2nd place** in Airbus Drone Challenge during TechFest 2019 at IIT Bombay.
- Taekwondo Dan-1 black belt holder.
- Won three gold, one silver, and two bronze medals across categories in the Taekwondo district championships.

Professional Society Memberships

- Student Member, IEEE
- Student Member, AIAA

Extracurricular and Volunteer Activities

- Member of Aerospace Engineering Graduate Student Organization with an aim to enrich the experience of graduate students in the department.
- Participated in the plantation drive on World Environment Day 2023.
- Participated in a 5km marathon aiming to spread awareness against sexual harassment in 2022.
- Conducted a workshop at a local public school to promote higher education in 2021.
- Rendered excellent service for providing all the required support to a freshman under the Student Buddy Program 2019, an initiative to facilitate the holistic development of freshmen.
- Event Head of SkyRush, National UAV design competition at TechTava 2019 (MIT Manipal's annual technical fest).
- Organising volunteer for Manipal Marathon 2019, one of India's largest student-organised marathons.
- Represented the institute contingent in the Indian Republic Day parade 2019.
- Volunteered for multiple clean-up drives in 2018.

Work Authorization

Legally authorized to work in USA on OPT, F-1 Visa Holder.

References

Available upon request.