# Falak Mandali

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Hands-on experience in robotics and aerospace has shaped my passion for system modeling, optimization, and control design. I bring a strong foundation in bridging theoretical methods with hardware implementation, and I am eager to expand my skills in both high- and low-level control system design, while supporting cross-team integration and system development.

## EDUCATION:

**PURDUE UNIVERSITY,** West Lafayette, Indiana
**MS** in Mechanical Engineering  *Dec 2026*
**BS** in Aeronautical and Astronautical Engineering  *Dec 2024*

## RESEARCH EXPERIENCE:

**PURDUE UNIVERSITY,** West Lafayette, Indiana
**TERRAIN ROBOTICS ADVANCED CONTROL AND EXPERIMENTATION (TRACE) LAB**
**Graduate Research Assistant**  *Jan 2025 – present*
- Implemented an invariant extended Kalman filter (InEKF) on a bipedal humanoid robot for state estimation to facilitate robot control on a moving surface.
- Spearheaded perception module design for ball tracking using cameras and robot localization using motion capture technology, to provide observation with an accuracy of 2 cm for RL-driven locomotion control of a bipedal humanoid robot.

**FLIGHT DYNAMICS & CONTROLS LABORATORY**
**Undergraduate Research Assistant**  *Jan 2024 – Aug 2024*
- Created a vehicle model using data-driving modeling techniques and optimized its path while considering vehicle and physical constraints.
- Learnt ROS2 and Gazebo in Docker environment.

**JAIN RESEARCH LABORATORY**
**Undergraduate Research Assistant**  *Sept 2022 – Dec 2022*
**Summer Undergraduate Research Assistant**  *May 2022 – Aug 2022*
- Demonstrated effectiveness of the control co-design process in simultaneous optimization of geometric design of a phase-changing thermal energy storage (TES) device and its controller embedded in a thermal management system (TMS).
- Validated robustness of the proposed TES design with 52% higher phase-changing material by volume, in its ability to mitigate a transient heat load for longer without needing to be recharged.
- ITherm 2023 Best Poster Award in the System Level Thermal Management Track by IEEE.

## WORK EXPERIENCE:

**MAGLEV AERO Inc.,** Boston, Massachusetts
**Aeromechanical Engineering Intern**  *Jan 2023 – Aug 2023*
- Contributed to formulation of flight dynamics and simulation of an eVTOL in MATLAB.
- Optimized 13 design parameters of the propulsion system to reduce power consumption and weight.
- Established a connection between MATLAB and AWS to reduce optimization computation time to 2 hrs.
- Conducted scalability analysis of propulsion system to understand its performance with increasing size from a test hub of 600 mm diameter to the proposed full-scale hub of 2000 mm diameter.
- Supported workspace and test stand setup, performing electrical wiring and manufacturing tasks.

**PUBLICATIONS:**

*F. Mandali, M. Shanks and N. Jain, "Control Co-Design of a Thermal Management System with Integrated Latent Thermal Energy Storage and a Logic-based Controller," 2023 22nd IEEE ITherm, Orlando, FL, USA, 2023, pp. 1-10, doi: 10.1109/ITherm55368.2023.10177617.*

## TEACHING EXPERIENCE:
**SCHOOL OF MECHANICAL ENGINEERING,** Purdue University

**Graduate Teaching Assistant**                                                              *Jan 2025 – present*
- o Directed lab sessions focused on implementing classical control theory and analyzing stability of servos, wind tunnels, and wheeled robots using Simulink. (ME 37500)
- o Coached students on theoretical concepts of particle kinematics and kinetics. (ME 27400)
- o Facilitated course instruction by organizing help sessions, grading assignments, and validating course material.

**SCHOOL OF AERONAUTICS & ASTRONAUTICS,** Purdue University

**Undergraduate Teaching Assistant**                                                    *Jan 2024 – May 2024*
**Grader**                                                                                    *Aug 2024 – Dec 2024*
- o Assisted students in understanding concepts of classical control theory in AAE 364.
- o Organized help sessions, verified/created HW solutions, graded HWs/exams, and proctored exams.

**BECHTEL INNOVATION & DESIGN CENTER,** Purdue University

**Peer Mentor**                                                                             *Jan 2022 – Dec 2023*
- o Guided students in creating computer-aided design (CAD) and manufacturing (CAM) for their project.
- o Train students on CNC and manual machines for manufacturing metal components.

**SCHOOL OF ENGINEERING EDUCATION,** Purdue University

**Teaching Assistant**                                                                      *Aug 2021 – Dec 2021*
- o Tutored students on the fundamentals of coding and data analysis using Excel, Python, and MATLAB.
- o Assisted in class on HWs and projects, graded HWs, and created/reviewed exams.

## COMMUNITY ENGAGEMENT:
**OFFICE OF FUTURE ENGINEERS,** Purdue University

**Undergraduate Peer Counsellor**                                                       *May 2024 – Dec 2024*
- o Connecting with prospective students and families by providing comprehensive information on Purdue University's engineering program and sharing perspectives as a current undergraduate student.
- o Host and present daily engineering information sessions to 140+ prospective families.

**SCHOOL OF AERONAUTICS & ASTRONAUTICS,** Purdue University

**Undergraduate Ambassador**                                                            *Aug 2022 – Dec 2024*
- o Introducing the AAE curriculum and industry to first-year engineering students to assist with identifying their career interests.

**ENGINEERING PROJECTS IN COMMUNITY SERVICE,** Purdue University

**Undergraduate Project Manager and Archivist**                                        *Aug 2020 – May 2021*
- o Managed 3 design projects by organizing weekly meetings, coordinating resources, consulting with advisors, performing documentation, and ensuring strong communication with community partners.

## AWARDS:

- **ITherm 2023 Best Poster Award** in the System Level Thermal Management Track by IEEE.
- **Dorian DeMaio Scholarship** by School of Aeronautics & Astronautics at Purdue University.
- **Warren G Koerner Scholarship** by School of Aeronautics & Astronautics at Purdue University.
- **AAE Undergrad General Scholarship** by School of Aeronautics & Astronautics at Purdue University.
- **Outstanding Second-Year Student** by School of Aeronautics and Astronautics at Purdue University.
- **Outstanding First-Year Student & Community Engagement** by EPICS at Purdue University.
- **Dean's List & Semester Honors** by Purdue University every semester.

## SKILLS:

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| Python | C / C++ | Arduino | MATLAB | Simulink | ROS2 | LaTex |
| Gazebo | PX4 SITL | Ubuntu OS | AWS EC2 | Docker | GitHub | CAD & CAM |
| MS Office | MS Teams | OneDrive | Dropbox | Discord | Canva | Slack |