

Jay Patrikar

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EDUCATION

Carnegie Mellon University | School Of Computer Science (Robotics Institute)

Doctor of Philosophy in Robotics

Advisor: **Dr. Sebastian Scherer**

Pittsburgh, PA

Fall 2020 – Summer 2026¹

Carnegie Mellon University | School Of Computer Science (Robotics Institute)

Master of Science in Robotics

Advisor: **Dr. Sebastian Scherer**

GPA: 4.08 / 4.00

Pittsburgh, PA

Fall 2018 – Summer 2020

Indian Institute of Technology Kanpur | Department Of Aerospace Engineering

Masters and Bachelors of Technology (Intergrated)

Advisor: **Dr. Mangal Kothari**

CPI (PG) : 10.0/10.0, CPI (UG): 8.6/10.0

Minors : Controls Systems (EE) and English Literature (Humanities)

Kanpur, India

Fall 2013 – Summer 2018

Selected Courses: Planning and Decision-making in Robotics, Deep Reinforcement Learning, Computer Vision, Introduction to Machine Learning (PhD), Flight Mechanics, Robot Localization and Mapping¹

RESEARCH EXPERIENCE

AirLab, Carnegie Mellon University

Director: **Dr. Sebastian Scherer**

Pittsburgh, PA

2018 – Now

- Formulated a real-time kinodynamic learning-based path planning algorithm with curvature-rate constraints using a two-point boundary value problem formulation to enable safe navigation in urban spaces.
- Extended the algorithm to explicitly include the effects of spatially non-uniform wind fields.

Intelligent Guidance & Control Laboratory, Indian Institute of Technology Kanpur

Director: **Dr. Mangal Kothari**

Kanpur, India

2016 – 2018

- Developed and flight tested a novel guidance law for 3D path following of fixed-wing Unmanned Aerial Vehicles using input-based nested saturation techniques to improve the stability characteristics.
- Extended the proposed law to spline-based trajectories for sequential landing of multiple fixed wing UAVs.

Unmanned Aerial Vehicles Laboratory, Indian Institute of Technology Kanpur

Director: **Dr. A.K.Ghosh**

Kanpur, India

2015 – 2017

- Designed and tested autopilot systems for fixed wing and rotary UAVs with applications in surveillance and target-tracking.
- Research areas: Flight Mechanics, RTOS, Systems Integration, System Identification, Flight Parameter Estimation, Vision-based tracking

National Aerothermochemistry and Hypersonics Laboratory, Texas A&M University

Director: **Dr. R Bowersox**

College Station, TX

Summer 2016

- Studied Boundary Layer Transition on Elliptic cone geometries in Hypersonic flow using thermal flow visualization.
 - Aided the construction of the now operational hypersonic expansion tunnel (HXT) for high enthalpy research.
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AWARDS & RECOGNITION

- **2 A+ grades** for exceptional performance in courses at Carnegie Mellon University
 - **2 Academic Excellence Awards** (for distinctive academic performance in years 2016-17 and 2017-18) at Indian Institute of Technology Kanpur
 - Awarded the **Summer Undergraduate Research Grant for Excellence (SURGE)** for Summer 2015
 - **4 A+ grades** for exceptional performance in courses at Indian Institute of Technology Kanpur
 - **All India Rank 2219** (amongst 13,00,000 students) in IIT-Joint Entrance Examination 2013
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SKILLS & LICENSES

Languages: English, Hindi, Marathi (Native), French (A1 Level Certification)

Computer Languages: C++, Python, SQL

Tools and Libs: OMPL, ROS, PX4, PostGres, PostGIS, Redis, TensorFlow

Licenses: Remote Pilot Certificate FAA Part 107, Student Pilot Certificate Part 61

¹ Planned

SELECTED PROJECTS

Improving Last-mile Autonomous Delivery in Urban Areas

Pittsburgh, PA

US Department of Energy PI: Dr. Constantine Samaras

2019

- Carried out a flight data collection campaign to collect energy consumption data for a drone-based system to train a first-principle physics-based energy model.
- Areas: First principles modeling, Autonomous path planning, Energy Sciences

Development of a Preflight Path Planning Tool for General Aviation Pilots

Pittsburgh, PA

Near Earth Autonomy Inc., PI: Dr. Sebastian Scherer

2019

- Developed a multi-objective risk-aware graph-based pre-flight planner for VFR (Visual-Flight Rules) cross-country flights
- Areas: Cloud Computing, GIS, Database Management, Graph-based planning, risk modelling

Development of UAV Dynamics Model and Study of Control Effectiveness

Hyderabad, India

Centre for High Energy Systems and Sciences (CHESS) PI: Dr. Mangal Kothari

2018

- Designed a full system dynamics simulator for fixed-wing UAVs and performed ablation studies to characterise control surface effectiveness.
- Areas: 6-DOF Simulations, Control Ablation Studies

Development of a Autonomous Payload Delivery System

Delhi, India

Delhivery Couriers Pvt Ltd PI: Dr. A.K. Ghosh

2017

- Prototyped and flight tested a multi-rotor platform to deliver a 1kg package over a distance of 3km.
- Areas: Systems integration, Flight Testing, Product design

Development of a High Altitude Surveillance Platform

Bangalore, India

TATA Advanced Systems Pvt Ltd PI: Dr. A.K. Ghosh

2016

- Carried out system identification of a high-altitude fixed wing platform for surveillance operations at > 4500m MSL.
- Areas: High Altitude Flight Mechanics, Design Optimization, Parameter Estimation, UAV Operations Management

LEADERSHIP AND MENTORING

◦ **Head Teaching Assistant**, Robotics Institute, Carnegie Mellon University

Fall 2020

◦ **Teaching Assistant**, Department of Aerospace Engineering, IIT Kanpur

Spring 2018

◦ **President**, Society of Aerospace Engineers, IIT Kanpur

2016 – 2017

◦ **Elected Student Representative**, Departmental Undergraduate Committee, IIT Kanpur

2015 – 2016

PUBLICATIONS

Thesis

- [1] **Wind-Field Estimation and Curvature Continuous Path Planning for Low Altitude Urban Aerial Mobility**

Master's Thesis, Tech. Report, CMU-RI-TR-20-30

2020

- [2] **A 3D Guidance Law for Path Following**

Master's Thesis, Tech. Report

2018

Papers

- [3] **CVaR-based Flight Energy Risk Assessment for Multirotor UAVs using a Deep Energy Model¹**

*J Patrikar**, *B Moon**, *A Choudhry**, *C Samaras*, *S Scherer*

International Conference on Intelligence and Safety for Robotics

2021

- [4] **Adaptive Tube Library for Safe Online Planning Under Unknown Tracking Performance²**

C Ho, *J Patrikar*, *R Bonatti*, *S Scherer*

International Symposium on Experimental Robotics (ISER)

2020

- [5] **In-flight positional and energy use dataset of package delivery quadcopter UAVs²**

T Rodrigues, *J Patrikar*, *A Choudhry*, *J Feldgoise*, *V Arcot*, *A Gahlaut*, *S Lau*, *B Moon*, *B Wagner*,

S Matthews, *S Scherer*, *C Samaras*

Nature Scientific Data

2020

- [6] **Wind and the City: Utilizing UAV-Based In-Situ Measurements for Estimating Urban Wind Fields**

J Patrikar, *B Moon*, *S Scherer*

International Conference on Intelligent Robots and Systems (IROS)

2020

² Submitted

- [7] **Real-time Motion Planning of Curvature Continuous Trajectories for Urban UAV Operations in Wind**
J Patrikar, V Dugar, V Arcot, S Scherer 2020
International Conference on Unmanned Aircraft Systems (ICUAS)
- [8] **Nested Saturation Based Guidance Law for Unmanned Aerial Vehicles**
J Patrikar, VR Makkapati, A Pattanaik, H Parwana, M Kothari 2019
Journal of Dynamic Systems, Measurement, and Control, ASME
- [9] **Sequential Auto-Landing of Multiple UAVs using Control Constrained Path Following**
J Patrikar, VR Makkapati, M Kothari 2019
AIAA Guidance, Navigation, and Control Conference
- [10] **Convolutional Neural Network Based Sensors for Mobile Robot Relocalization**
J Patrikar, H Sinha*, EG Dhekane*, G Pandey, M Kothari* 2018
23rd International Conference on Methods & Models in Automation & Robotics
- [11] **A novel fully quaternion based nonlinear attitude and position controller**
H Parwana, J Patrikar, M Kothari 2018
AIAA Guidance, Navigation, and Control Conference
- [12] **A Low-Cost Tilt-Augmented Quadrotor Helicopter : Modeling and Control**
M Bhargavapuri, J Patrikar, SR Sahoo, M Kothari 2018
International Conference on Unmanned Aircraft Systems (ICUAS)
- [13] **MARAAL: A Low Altitude Long Endurance Solar Powered UAV For Surveillance and Mapping Applications**
VS Dwivedi, J Patrikar, A Addamane, AK Ghosh 2018
23rd International Conference on Methods & Models in Automation & Robotics
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