

## RESEARCH STATEMENT

I am a full-stack roboticist focused on realizing safe and reliable real-world autonomy. I am particularly interested in **intelligently combining large-scale data-driven approaches with provably safe methods**. I enjoy working in multiple safety-critical domains like unmanned aerial vehicles, shared airspace autonomy and autonomous driving with applications in **human-robot interactions, robust planning, long-tail uncertainty quantification and motion prediction**.

## EDUCATION

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

Doctor of Philosophy in Robotics

Advisor: **Dr. Sebastian Scherer**

Pittsburgh, PA  
2020 – 2025 [Planned]

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

Master of Science in Robotics

Advisor: **Dr. Sebastian Scherer**

GPA: 4.04 / 4.00

Pittsburgh, PA  
Fall 2018 – Summer 2020

**Indian Institute of Technology Kanpur | Department Of Aerospace Engineering**

Masters and Bachelors of Technology (Integrated)

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

## RESEARCH EXPERIENCE

**Autonomous Vehicles Research Group**, NVIDIA Research

Director: **Dr. Marco Pavone**

Santa Clara, CA  
Summer 2024

- Worked on employing foundation models for improving out-of-distribution planning and prediction performance for self-driving vehicles.

**Autonomous Systems Research Group**, Microsoft Research

Director: **Dr. Ashish Kapoor**

Redmond, WA  
Summer 2022

- Developed techniques that enable uncertainty quantification for large pre-trained models using learned temporal variational representations.

**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.

**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.

## SKILLS & LICENSES

- **Licenses**: FAA Private Pilot Certificate Part 61, FAA Remote Pilot Certificate FAA Part 107
- **Languages**: English, Hindi, Marathi (Native), French (A1 Level Certification)

## AWARDS & RECOGNITION

- **2 A+ grades** for exceptional performance in courses at Carnegie Mellon University
- Carnegie Mellon University nomination for Microsoft Research PhD Fellowship
- **2 Academic Excellence Awards** at Indian Institute of Technology Kanpur
- Awarded the **IITK 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

## TEACHING EXPERIENCE

- **Instructor, 98-266: Private Pilot Ground School**, Carnegie Mellon University Spring+Fall 2024
- **TA, 16-833: Robot Localization and Mapping**, Robotics Institute, Carnegie Mellon University Spring 2021
- **TA, 16-384: Robot Kinematics and Dynamics**, Robotics Institute, Carnegie Mellon University Fall 2020
- **TA, AE361A: Aeromodel Design & Fabrication**, Department of Aerospace Engineering, IIT Kanpur Spring 2018

## LEADERSHIP AND MENTORING

◦ <b>Founding President</b> , The Flying Club, Carnegie Mellon University	2021 – 2022
◦ <b>Student Representative</b> , Robotics Institute, Graduate Student Assembly, Carnegie Mellon University	2020 – Now
◦ <b>President</b> , Society of Aerospace Engineers, IIT Kanpur	2016 – 2017
◦ <b>Student Representative</b> , 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 of Unmanned Aerial Vehicles**  
Master's Thesis, Tech. Report 2018

### Papers

- [1] **RuleFuser: An Evidential Bayes Approach for Rule Injection in Imitation Learned Planners for Robustness under Distribution Shifts**  
Jay Patrikar, Sushant Veer\*, Apoorva Sharma\*, Marco Pavone & Sebastian Scherer 2024  
Robotics: Science and Systems 2024 Workshop
- [2] **Toward General-Purpose Robots via Foundation Models: A Survey and Meta-Analysis**  
Hu, Y., Xie, Q., Jain, V., Francis, J., Patrikar, J., Keetha, N., ... & Bisk, Y. 2024  
Preprint ArXiv
- [3] **FoundLoc: Vision-based Onboard Aerial Localization in the Wild**  
Y He, I Cisneros, N Keetha, J Patrikar, Ye Z, I Higgins, Y Hu, P Kapoor, S Scherer 2023  
Preprint ArXiv
- [4] **AmeliaTF: A Large Model and Dataset for Airport Surface Movement Forecasting**  
Jay Patrikar\*, Ingrid Navarro\*, Pablo Ortega-Kral\*, Haichuan Wang, Zelin Ye, Jong Hoon Park, Jean Oh & Sebastian Scherer 2024  
AIAA AVIATON 2024 {**Best Paper Award**}
- [5] **TartanAviation: Image, Speech, and ADS-B Trajectory Datasets for Terminal Airspace Operations**  
Jay Patrikar, Joao Dantas, Brady Moon, Milad Hamidi, Sourish Ghosh, Nikhil Keetha, Ian Higgins, Atharva Chandak, Takashi Yoneyama, & Sebastian Scherer 2024  
Preprint ArXiv
- [6] **Pegasus Simulator: An Isaac Sim Framework for Multiple Aerial Vehicles Simulation**  
Jacinto, M., Pinto, J., Patrikar, J., Keller, J., Cunha, R., Scherer, S., Pascoal, A. 2023  
International Conference on Unmanned Aircraft Systems 2024
- [7] **Learned Tree Search for Long-Horizon Social Robot Navigation in Shared Airspace**  
J Patrikar\*, Ingrid Navarro\*, J Dantas, R Bajjal, I Higgins, Jean Oh, S Scherer 2023  
IEEE Robotics and Automation Letters (RA-L)
- [8] **Follow The Rules: Online Signal Temporal Logic Tree Search for Guided Imitation Learning in Stochastic Domains**  
J Patrikar\*, Jasmine Aloor\*, Parv Kapoor, Jean Oh, S Scherer 2023  
International Conference on Robotics and Automation (ICRA)
- [9] **AirTrack: Onboard Deep Learning Framework for Long-Range Aircraft Detection and Tracking**  
Sourish Ghosh, J Patrikar, B Moon, Milad Hamdi, S Scherer 2023  
International Conference on Robotics and Automation (ICRA)
- [10] **Quantification of Viable Drone Flight Hours Due to Weather Conditions**  
A Sharma, J Patrikar, B Moon, C Samaras, S Scherer 2022  
Journal of Transport Findings
- [11] **Challenges in Close-Proximity Safe and Seamless Operation of Manned and Unmanned Aircraft in Shared Airspace**  
J Patrikar, et al. 2022  
International Conference on Robotics and Automation (ICRA)
- [12] **Predicting Like A Pilot: Dataset and Method to Predict Socially-Aware Aircraft Trajectories**  
J Patrikar, B Moon, Jean Oh, S Scherer 2022  
International Conference on Robotics and Automation (ICRA)
- [13] **CVaR-based Flight Energy Risk Assessment for Multirotor UAVs using a Deep Energy Model**  
J Patrikar\*, B Moon\*, A Choudhry\*, C Samaras, S Scherer 2021  
International Conference on Robotics and Automation (ICRA)
- [14] **Adaptive Tube Library for Safe Online Planning Under Unknown Tracking Performance**  
C Ho, J Patrikar, R Bonatti, S Scherer 2021  
Workshop, Robotics: Science and Systems

- [15] **In-flight positional and energy use dataset of package delivery quadcopter UAVs**  
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
- [16] **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
- [17] **Real-time Motion Planning of Curvature Continuous Trajectories for Urban UAV Operations in Wind**  
J Patrikar, V Dugar, V Arcot, S Scherer  
International Conference on Unmanned Aircraft Systems (ICUAS) 2020
- [18] **Nested Saturation Based Guidance Law for Unmanned Aerial Vehicles**  
J Patrikar, VR Makkapati, A Pattanaik, H Parwana, M Kothari  
Journal of Dynamic Systems, Measurement, and Control, ASME 2019
- [19] **Sequential Auto-Landing of Multiple UAVs using Control Constrained Path Following**  
J Patrikar, VR Makkapati, M Kothari  
AIAA Guidance, Navigation, and Control Conference 2019
- [20] **Convolutional Neural Network Based Sensors for Mobile Robot Relocalization**  
J Patrikar\*, H Sinha\*, EG Dhekane\*, G Pandey, M Kothari  
23rd International Conference on Methods & Models in Automation & Robotics 2018
- [21] **A novel fully quaternion based nonlinear attitude and position controller**  
H Parwana, J Patrikar, M Kothari  
AIAA Guidance, Navigation, and Control Conference 2018
- [22] **A Low-Cost Tilt-Augmented Quadrotor Helicopter : Modeling and Control**  
M Bhargavapuri, J Patrikar, SR Sahoo, M Kothari  
International Conference on Unmanned Aircraft Systems (ICUAS) 2018
- [23] **MARAAL: A Low Altitude Long Endurance Solar Powered UAV For Surveillance and Mapping Applications**  
VS Dwivedi, J Patrikar, A Addamane, AK Ghosh  
23rd International Conference on Methods & Models in Automation & Robotics 2018

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## PATENTS

- [1] **AmeliaTF: A Large Model and Dataset for Airport Surface Movement Forecasting.**  
Sebastian Scherer, Jean Oh, Jay Patrikar\*, Ingrid Navarro\*, Pablo Ortega-Kral\*, Haichuan Wang, Zelin Ye, & Jong Hoon Park  
CMU Intellectual Property Disclosure no. 2024-170 2024
- [2] **Using CVaR-based metrics for energy risk assessments of UAV flights.**  
Jay Patrikar, Brady Moon, Arnav Choudhry, Sebastian Scherer and Constantinos Samaras  
CMU Intellectual Property Disclosure no. 2021-326 2022
- [3] **Multi-camera visual detect & avoid system and detection algorithms.**  
Sebastian Scherer, Sourish Ghosh, Jay Patrikar and Brady Moon  
CMU Intellectual Property Disclosure no. 2021-113 2021
- [4] **Wind-Aware Planning for Last Mile Delivery**  
Sebastian Scherer, Jay Patrikar, Vishal Dugar, Vaibhav Arcot and Constantinos Samaras  
CMU Intellectual Property Disclosure no. 2020-071 2020