Kartik Anand **Pant**

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Education

Purdue University — *West Lafayette, USA*

PH.D. IN AERONAUTICAL AND ASTRONAUTICAL ENGINEERING — *Aug. 2023 - Present*

- Thesis topic: *Distributed and Resilient Control of Multi-Robot Systems*. Advisors: Dr. Inseok Hwang and Dr. James Goppert

M.S. IN AERONAUTICAL AND ASTRONAUTICAL ENGINEERING — *Aug. 2021 - Aug. 2023*

- Major: Autonomy and Control, Minor: Robotics, GPA : 4/4.

Indian Institue of Technology (BHU), Varanasi — *Varanasi, India*

B.TECH. IN ELECTRONICS ENGINEERING — *July 2014 - May 2018*

- GPA : 9.21/10.

Awards & Honors

2026-27	**Hugh W. and Edna M. Donnan Fellowship,** Purdue University (Top 3 Applicants)	*West Lafayette, USA*
2021-23	**Chintakindi L. (C.L.) & Sita C. Amba-Rao Fellowship,** Purdue University (Only 1 Applicant)	*West Lafayette, USA*
2014-18	**Merit-cum-Means Scholarship,** IIT (BHU) Varanasi (Top 10 %)	*Varanasi, India*

Funding & Grants

2025	**Conference on Decision and Control (CDC) Student Travel Grant,** IEEE Conference on Decision and Control (CDC), 2025.	*Rio de Janeiro, Brazil*
2025	**ERAU-NASA-NSF Aerospace Cybersecurity Student Travel Grant,** ERAU-NASA-NSF Aerospace Cybersecurity Workshop, 2025.	*Prescott, USA*
2025	**American Control Conference (ACC) Student Travel Grant,** American Control Conference (ACC), 2025.	*Denver, USA*
2024	**Purdue Graduate Student Government (PGSG) Travel Grant,** IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2024.	*West Lafayette, USA*

Professional Experience

Toyota Research Institute of North America (TRINA) — *Ann Arbor, MI, USA*

GRADUATE RESEARCH INTERN, FUTURE RESEARCH DEPARTMENT (FRD) — *June 2025 - Aug. 2025*

- Engineered high-reliability, real-time flight control system (FCS) software and its hardware interface for a tethered-kite system, ensuring system stability and performance for wind energy harvesting and data relay applications [link].
- Implemented low-level, embedded APIs in C/C++ for time-critical data acquisition and control, interfacing with sensors (IMU, GNSS, air-speed) and control surface actuators.
- Designed a real-time 3D system visualization and telemetry tool to validate trajectory planning and control algorithms, demonstrating full-stack system understanding from hardware to interface.
- Published two technical reports and submitted a conference paper.

Indian Space Research Organisation (ISRO), Govt. of India — *Thiruvananthapuram, India*

SCIENTIST/ENGINEER 'SC', VIKRAM SARABHAI SPACE CENTER (VSSC) — *July 2018 - Aug. 2021*

- Worked as a Checkout Design Engineer. Contributed to the development of Control Electronics (CE) packages for the Flex Nozzle Control (FNC) and Fin Tip Control (FTC) of GSLV, GSLV MkIII, PSLV and SSLV launch vehicles.
- Collaborated with the *State Space Agency of Ukraine* for conducting engine qualification tests of the in-house semi-cryogenic engine.
- Designed and developed an embedded controller for a hydraulic damper-based prosthetic limb, a spin-off in conjunction with the *Ministry of Social Justice and Empowerment*. Collaborated with the *National Institute of Locomotor Disabilities* (NILD) for walking trials on amputees.

Wipro Technologies — *Bengaluru, India*

SOFTWARE INTERN, WIPRO DIGITAL — *Apr. 2017 – Jun. 2017*

- Developed a real-time online bidding interface for web and mobile applications using Adobe Experience Manager.

Publications

Journal:

1. M. K. Condie, A. E. Woodbury, Li-Yu Lin, **K. A. Pant**, M. Walker, and J. M. Goppert **"Approximate Log-linear Dynamics for Thrusting Spacecraft on $SE_2(3)$ "**, AIAA Journal of Guidance, Control, and Dynamics (JGCD), 2026 (Submitted).
2. **K. A. Pant**, J. Kim, J. M. Goppert and I. Hwang **"Energy-Constrained Resilient Multi-Robot Coverage Control"**, IEEE Transactions of Control Systems Technology (IEEE-TCST), 2025 (Under Second Review).
3. V. Vijay, **K. A. Pant**, M. Cho, I. Hwang, **"A Dynamically Weighted ADMM Framework for Byzantine Resilience"**, IEEE Control Systems Letters (L-CSS), 2025. [paper]
4. Y. Guo, **K. A. Pant**, and I. Hwang **"Physics-informed Anomaly Detection for Unmanned Aerial Vehicles."**, IEEE Robotics and Automation Letters (IEEE-RAL), 2025. [paper]
5. L. Y. Lin, **K. A. Pant**, B. Perseghetti, J. M. Goppert **"A Closed-form Matrix Exponential for $SE_n(3)$ with Applications to Strapdown Inertial Navigation"**, IEEE Control Systems Letters (L-CSS), 2025. [paper]
6. **K. A. Pant**, V. Vijay, M. Cho, I. Hwang, **"On Enhancing Structural Resilience of Multirobot Coverage Control with Bearing Rigidity"**, IEEE Transactions on Control of Networked Systems (IEEE TCNS), 2025. [paper]
7. **K. A. Pant**, S. Khan, I. Hwang, **"Adversarial Sensor Attacks Against Uncertain Cyber-Physical Systems: A Dynamic Output Feedback Approach"**, IEEE Control Systems Letters (L-CSS), 2024. [paper]
8. V. Vijay, **K. A. Pant**, M. Cho, Y. Guo, J. M. Goppert, I. Hwang, **"Range-based Multi-Robot Integrity Monitoring Against Cyberattacks and Faults: An Anchor-Free Approach"**, IEEE Robotics and Automation Letters (RA-L), 2024. [paper]
9. S. Khan, **K. A. Pant**, I. Hwang, **"Synthesis of Robust State Estimation Algorithms under Unknown Sensor Inputs"**, IEEE Control Systems Letters (L-CSS), 2023. [paper]

Conference:

1. J. Choi, **K. A. Pant**, Y. Nam, H. Hallman, R. K. Nune, I. Hwang, **"Signal Temporal Logic Verification and Synthesis Using Deep Reachability Analysis and Layered Control Architecture"**, International Conference on Neuro-Symbolic Systems (NeuS), 2026, University of Southern California, Los Angeles. USA. (Submitted)
2. J. R. Kinerson, J. Kim, **K. A. Pant**, K. S. Sommer-Kohrt, J. M. Goppert, D. Sun, **"Locally Optimal UAV Surveillance Evasion via Sampling and Nonlinear Programming"**, International Conference on Unmanned Aerial Systems (ICUAS), 2026, Corfu, Greece. (Submitted)
3. **K. A. Pant**, Y. Zhu, X. Deng, C. Zhao, T. Nam, I. Hwang (2026). **"KITELab: A Low-cost Mobile Iron bird for Test and Evaluation of Tethered-Kite Systems"**. International Airborne Wind Energy Conference (AWEC), 2026, University of Porto, Portugal. (Submitted)
4. J. Kim, **K. A. Pant**, K. S. Sommer-Kohrt, J. R. Kinerson, J. M. Goppert, **"A Surveillance Evasion Framework for Counter-UAS Missions: an Attacker-Centric Perspective"**, International Conference on Control, Automation and Systems (ICCAS), 2025, Incheon, South Korea. [paper]
5. **K. A. Pant**, Li-Yu Lin, W. Sribunma, S. Brunswicker, J. M. Goppert, I. Hwang, **"SAFE-TAXI: A Hierarchical Multi-UAS Safe Auto-Taxiing Framework with Runtime Safety Assurance and Conflict Resolution"**, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2025, Hangzhou, China. (Accepted/Retracted) [arXiv]
6. D. Yeke, **K. A. Pant**, M. O. Ozmen, H. Kim J. Goppert, I. Hwang, A. Bianchi, Z. B. Celik **"Automated Discovery of Semantic Attacks in Multi-Robot Navigation Systems"**, USENIX Security Symposium 2025, Seattle, WA, USA. (Acceptance rate: 17.1%)
7. **K. A. Pant**, Li-Yu Lin, J. Kim, W. Sribunma, J. M. Goppert, I. Hwang, **"MIXED-SENSE: A mixed reality sensor emulation framework for test and evaluation of UAVs against false data injection attacks"**, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2024, Abu Dhabi, UAE. [paper]
8. W. Sribunma, Li-Yu Lin, **K. A. Pant**, C. Deng, J. M. Goppert, S. Brunswicker, J. Roberts, **"Mixed-Reality Testbed for Autonomous Fixed-Wing UAVs Human-Autonomy Teaming"**, IEEE International Conference on Assured Autonomy (ICAA) 2024, Vanderbilt University, Nashville, TN, USA. [paper]
9. **K. A. Pant**, L. Y. Lin, J. M. Goppert, I. Hwang, **"Towards robust state estimation in matrix Lie groups"**, Workshop on Geometric Representations, ICRA 2023, London, UK. [paper]
10. **K. A. Pant**, Z. Yang, J. M. Goppert, I. Hwang, **"An Open-Source Gazebo Plugin for GNSS Multipath Signal Emulation in Virtual Urban Canyons."**, AIAA Sci-Tech Forum 2023, National Harbor, MD, USA. [paper]

Posters:

1. **K. A. Pant**, V. Vijay, M. Cho, I. Hwang, **"Resilient Multi-Robot Coverage Control Under Stealthy Cyberattacks"**, ERAU-NASA-NSF Aerospace Cybersecurity Workshop, 2025, Embry Riddle University, Prescott, AZ.
2. **K. A. Pant**, V. Vijay, M. Cho, I. Hwang, **"Resilient Multi-Robot Coverage Control Under Stealthy Cyberattacks"**, CERIAS Annual Security Symposium, 2025, Purdue Univeristy, West Lafayette, IN.
3. Y. Guo, **K. A. Pant**, S. Hwang, V. Vijay, J. M. Goppert, I. Hwang **"RESiLIENT: A Neural Symbolic Resilient Threat-Response Framework for Large-Scale Hierarchical Swarms"**, GENZERO Workshop, 2024, Technology Innovation Institute (TII), Abu Dhabi, UAE.
4. **K. A. Pant**, Li-Yu Lin, W. Sribunma, S. Brunswicker, J. M. Goppert, I. Hwang **"MIXED-SENSE: A mixed reality sensor emulation framework for Cybersecurity"**, CERIAS Annual Security Symposium, 2024, Purdue University, West Lafayette, IN.
5. **K. A. Pant**, Z. Yang, J. M Goppert, I. Hwang **"An Open-Source Mixed-Reality Simulation Environment for Unmanned Aerial Systems (UAS) Cybersecurity"**, CERIAS Annual Security Symposium, 2023, Purdue University, West Lafayette, IN.

Research Experience

Flight Dynamics and Control/Hybrid Systems Lab (FD&C/HSL), Purdue University *West Lafayette, U.S.A*

Research Assistant, Advisor: Dr. Inseok Hwang *Aug. 2021 - Present*

- Developed a high-fidelity 3D virtual urban canyon environment in Gazebo for efficient control-theoretic cyber-attack detection and mitigation.
- Designed sophisticated GNSS spoofing attacks on UAVs and developed efficient mitigation strategies against stealthy cyber-attacks.
- Designed a *resilient* distributed multi-robot systems (MRSs) motion planning algorithm for area coverage with guaranteed network fault tolerance and recovery in the presence of cyberattacks, using real-time inter-robot communication and sensing.

Purdue UAS Test and Research Facility (PURT), Purdue University *West Lafayette, U.S.A*

Research Assistant, Advisor: Dr. James Goppert *Aug. 2021 - Present*

- Assisted in the management and technical operations of the *world's largest indoor Motion Capture* facility. [link].
- Developed a *Mixed Reality* sensor emulation framework for the vulnerability analysis of UAVs against unknown threats and cyberattacks.
- Developed a *distributed* auto-taxiing framework for fixed-wing multi-UAS avoiding intersection conflicts and ensuring safety from unplanned taxiway incursions.

Cognitive Robot Autonomy and Learning (CoRAL) Lab, Purdue University *West Lafayette, U.S.A*

Research Assistant, Advisor: Dr. Ahmed Qureshi *Oct. 2021 - Aug. 2022*

- Worked on visual navigation in a cluttered home environment for object rearrangement task using deep reinforcement learning.
- Designed a path-planning algorithm for robotic manipulators operating in a narrow passage cabinet environment.

Ubiquitous Computing Lab, IIT (BHU) Varanasi *Varanasi, India*

Research Intern, Advisor: Prof. Hari Prabhat Gupta *April 2016 - July. 2016*

- Devised a Monocular SLAM-based algorithm for UAV path planning.
- Developed a scoring mechanism to determine the best stereo pairs for visual odometry and the generation of a global map of the environment.

Teaching

GTA	**AAE 568 - Applied Optimal Control and Estimation**, Spring2025, Spring 2026	*Purdue University*
Head TA	**AAE 364 - Control Systems Analysis**, Fall 2025	*Purdue University*

Advising and Mentorship

PhD Micah K. Condie (PhD at Purdue), Kylie S. Sommer-Kohrt (PhD at Purdue).

Masters Vishnu Vijay (Master's →PhD at Purdue), Jaehyeok Kim (Master's →PhD at Purdue), Joseph Kinerson (PMRI).

Review Service

Journals and Letters:

- IEEE Transactions on Control of Networked Systems (TCNS)
- IEEE Control Systems Letters (LCSS)
- IEEE Transactions on Industrial Informatics (TII)
- IEEE Transactions on Internet of Things (TIoT)
- IEEE Access

Conferences and Workshops:

- American Control Conference (ACC)
- Conference on Robot Learning (CoRL)
- American Institute of Aeronautics and Astronautics Sci-Tech (AIAA Sci-Tech)