

Prabin Kumar Rath

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EDUCATION

Arizona State University <i>Ph.D. in Computer Science, GPA 4.0/4, Advisor - Prof. Nakul Gopalan</i>	Aug. 2025 – May 2030 Tempe, Arizona
Arizona State University <i>M.S. in Robotics and AI (Thesis track), GPA 4.0/4</i>	Aug. 2022 – May 2024 Tempe, Arizona
National Institute of Technology Rourkela <i>B.Tech. in Computer Science and Engineering, GPA 8.91/10</i>	July 2016 – May 2020 Rourkela, India

SELECTED PUBLICATIONS

- [1] Kartikay Milind Pangaonkar*, **Prabin Kumar Rath***, Omkar Patil*. “*StageCraft: Execution Aware Mitigation of Distractor and Obstruction Failures in VLA Models.*” In International Conference on Intelligent Robots and Systems (IROS), 2026. [[Preprint](#)]
- [2] Omkar Patil, **Rath, Prabin Kumar**, Kartikay Milind Pangaonkar, Eric Rosen, and Nakul Gopalan. “*Factorizing Diffusion Policies for Observation Modality Prioritization.*” In International Conference on Robotics and Automation (ICRA), 2026. [[Preprint](#)]
- [3] **Rath, Prabin Kumar**, and Nakul Gopalan. “*XMOP: Whole-Body Control Policy for Zero-shot Cross-Embodiment Neural Motion Planning.*” In International Conference on Robotics and Automation (ICRA), 2025. [[Preprint](#)]
- [4] **Rath, Prabin Kumar**, Blake Harrison, Duo Lu, Yezhou Yang, Jeffrey Wishart, and Hongbin Yu. “*Evaluating Safety Metrics for Vulnerable Road Users at Urban Traffic Intersections Using High-Density Infrastructure LiDAR System.*” No. 2024-01-2641. SAE Technical Paper, 2024. [[Paper](#)]
- [5] **Kumar Rath, Prabin**, Alejandro Ramirez-Serrano, and Dilip Kumar Pratihari. “*Real-time moving object detection and removal from 3D pointcloud data for humanoid navigation in dense GPS-denied environments.*” Engineering Reports 2, no. 12 (2020): e12275. [[Paper](#)]
- [6] **Rath, Prabin Kumar**, Neelam Mahapatro, Prasanmit Nath, and Ratnakar Dash. “*Autonomous Chess Playing Robot.*” In International Conference on Robot and Human Interactive Communication (RO-MAN), 2019. [[Paper](#)]

RESEARCH EXPERIENCE

Language Grounding and Planning Lab <i>Arizona State University, Advisor - Prof. Nakul Gopalan</i>	May 2023 – Present Tempe, Arizona
• Vision-Language-Action (VLA) Models for Franka FR3 Robot (Fall 2025 – Present) * Extended the LeRobot backend to support Franka FR3 robot platform through ROS2 APIs. [Project] * Created a real-time teleoperation system with multiple control interfaces, including Meta Quest 3, FACTR whole-body leader-follower setup, and SpaceMouse. * Calibrated RealSense D435 and ZED 2 cameras to support controlled exposure and high-frequency pointcloud data collection. * Developed robust, and fault-tolerant robot teleoperation software for HRI user study experiments. * Curated a visual imitation dataset covering 10 household dexterous manipulation tasks. * Trained, deployed, and benchmarked multiple VLA and behavior cloning models, including $\pi_{0.5}$, SmolVLA, XVLA, Diffusion Policy, and ACT on the Franka FR3 robot, achieving 90%+ success rates on long-horizon manipulation tasks. • Pre-Execution Scene Intervention for Policy Improvement (Fall 2025 – Spring 2026) * Proposed a training-free policy improvement method for VLAs that leverages Vision-Language Model (VLM) in-context reasoning to modify environments and prevent anticipated policy failures. [Project] * Investigated prompting strategies for strict instruction following, spatial environment understanding, and low-hallucination failure reasoning in VLMs. * Introduced a prompt-driven workspace modification algorithm that uses few policy rollout videos to identify minimal environment interventions for improving task success rates. * Developed pick-and-place ROS2 controllers using differential-IK that interface with VLMs to execute environment modification actions.	

- * Demonstrated successful VLA model deployment under distractor and obstruction settings, achieving absolute success rate gains of 23% for $\pi_{0.5}$ and 54% for SmolVLA.
- **Improving Robustness of Diffusion Policies using Modality Prioritization** (Fall 2024 – Spring 2025)
 - * Studied **prioritization of sensor modalities** in diffusion policies to improve robustness against visual distractors, camera occlusions, and appearance changes. [ICRA 2026, [Project](#)]
 - * Formulated theoretical analyses of factorized **diffusion and flow-matching** policies to explain the effectiveness of modality prioritization.
 - * Improved Diffusion Policy deployment success rates under significant visual disruptions, outperforming standard diffusion policies by an absolute 15% in simulation and 40% in real-world tasks.
- **Cross-Embodiment Generalization in Neural Motion Planning** (Fall 2023 - Spring 2024)
 - * Designed a novel behavior cloning (BC) policy architecture for neural motion planning, enabling **zero-shot configuration-space generalization** across **7** commercial robots with 70% average planning success. [ICRA 2025, [Project](#)]
 - * Introduced a pointcloud-based semantic segmentation method for detecting collision points on robot surfaces, achieving cross-embodiment sim-to-real generalization with 76.6% **IoU** and 90.3% **recall** across 7 robots.
 - * Created procedural data generation pipelines in PyBullet for training Diffusion and Transformer BC policies.
 - * Demonstrated sim-to-real motion planning from pointclouds on **Franka FR3** and **Rethink Sawyer** robots, achieving a 72% average planning success rate in cluttered environments.

Electric Vehicles and Intelligent Transportation Lab

Sept. 2022 – May 2024

Arizona State University, Advisor - [Prof. Hongbin Yu](#)

Tempe, Arizona

- Analyzed safety envelope and time to collision metrics between vehicles and pedestrians, enabling **real-time reporting of AV induced unsafe situations** at urban traffic intersections. [[Project](#)]
- Integrated pretrained vision models for 3D object detection, and Kalman filter for 7-DoF bounding box tracking on real-world LiDAR pointcloud data achieving 83.6% **mAP** and 87.4% **MOTA** respectively.
- Adopted Graph Neural Networks and Pointnet models for object boundary prediction and 3D bounding box regression on unseen LiDAR data, achieving **10 fps** inference speed with **Hesai OT128 sensor**.

Unmanned Vehicles Robotarium Lab

May 2019 – July 2019

University of Calgary, Advisor - [Prof. Alex Ramirez-Serrano](#) [[Letter](#)]

Calgary, Alberta

- Devised a Detection and Tracking of Moving Objects (DATMO) algorithm for collision-free navigation in cluttered and GPS-denied environments. Achieved detection accuracy of **91.42%** for unseen moving objects. [[Project](#)]
- Worked with **Velodyne VLP-16** LiDAR and **Intel T-265** tracking camera to setup indoor robot navigation.
- Collected, organized and published three indoor pointcloud datasets for DATMO benchmarking.
- Implemented C++ scripts for real-time pointcloud processing and validated its performance on KITTI dataset.

Soft Computing Lab

Dec. 2018 – Jan. 2019

IIT Kharagpur, Advisor - [Prof. Dilip Kumar Pratihar](#) [[Letter](#)]

Kharagpur, India

- Developed a real-time remote teleoperation system for bipedal exoskeleton, enabling precise mimicry of human leg motion. Evaluated effectiveness for rehabilitation through experiments with **18 human subjects**. [[Project](#)]
- Utilized ESP8266 Wi-Fi, and MPU9250 9-axis IMU for closed loop PID control on a Raspberry Pi computer.
- Implemented the control algorithm using C++ and validated its effectiveness using gait pattern analysis.

INDUSTRY EXPERIENCE

Experian

June 2024 – May 2025

MLOps Engineer

Costa Mesa, California

- Developed scalable workflows for ML model life cycle management, created inference orchestration platforms adhering to millisecond latency response SLAs serving **300+** enterprise clients. [[Product](#)]
- Created asynchronous regression infrastructure with a Record-Replay mechanism, ensuring backward compatibility and robust software deployment, thereby reducing unprecedented production failures by **37%**.
- Automated excel file parsing and generated **200k** edge-cases for analyzing Experian consumer credit records.
- Enabled multi-layered identity verification and fraud prevention features using OTP, KIQ, and document checks.
- Deployed containerized Fast API microservices on AWS Fargate with Elasticsearch, AWS S3, Docker, and Jenkins.

Wells Fargo

Aug. 2020 – July 2022

Software Engineer

Hyderabad, India

- Architected multi-threaded Rest API modules in Python to interface with Azure Cognitive Services and optimized average response time by **75%**, while delivering **4x** throughput.
- Engineered OCR pipelines for table layout detection and extraction of customer data from scanned bonds and contracts, resulting in a **400 hours/week** reduction of manual labor.
- Designed configurable and robust regular expression modules for numerical data extraction from **2.4 million** handwritten forms and documents.
- Utilized xUnit to ensure consistent backward compatibility with **95%** code coverage over multiple releases.

ACADEMIC SERVICE

Robotics and AI Paper Reviewing

- Conference: CoRL 2026 | ICRA 2026, 2025, 2024 | RA-L 2026, 2023 | IROS 2026, 2023 | RO-MAN 2023
- Served as session chair for the Autonomous Vehicles track at ICRA 2025

Teaching and Mentorship

- Teaching assistant for undergraduate course “*CSE 310: Data Structures and Algorithms*” under **Prof. Nakul Gopalan**, Arizona State University (Fall 2025). Delivered recitation lectures, conducted exams and supported students by clarifying doubts during office hours.
- Project Mentor for graduate course “*Connected and Automated Vehicles*” under **Prof. Jeffery Wishart**, Arizona State University (Fall 2023). Conducted class meetings, guiding student groups to successful project completion.
- Delivered a seminar talk on topic “*Application of LiDAR Detection and Tracking in Quantifiable Safety Metrics Analysis*”, Arizona State University (Fall 2023). [[Slides](#)]
- Served as a Grader for undergraduate course “*Emerging Technology in Automotives and Transportation*” under **Prof. Hongbin Yu**, Arizona State University (Fall 2022).
- Taught the basics of robot design and Arduino programming to freshmen students at NIT-Rourkela. Mentored a group of five students to build a line-following robot (Fall 2017).

ACHIEVEMENTS

- Received **University Graduate Fellowship** in Spring 2026 for excellent research progress and strong academic work. (Award amount \$4,500)
- Recipient of **Gold Coin Award 2022** for engineering excellence at Wells Fargo, Hyderabad.
- **MITACS Globalink 2019** fellowship for 12 weeks fully-funded research internship at the University of Calgary.
- First position out of 15 teams at National AUV competition organized by NIOT, **SAVe 2019**, IIT-Madras, Chennai.
- Second position out of 27 teams at International AUV competition by IEEE-OES, **SAUVC 2018**, Singapore.
- Received India’s top 10 innovative project award for Chess Playing Robot at **Quest Ingenium 2018**, Bangalore.

[[Certificates Folder](#)]

SKILLS AND INTERESTS

Interests: Robot Learning, 3D Perception, and Software Engineering

Programming Languages: Python, C/C++, MATLAB, C#, TypeScript, Java, Shell

Robot Simulators: Gazebo, CoppeliaSim, PyBullet, Nvidia IsaacSim, ManiSkill

Cloud Technologies: AWS, Azure, Kubernetes, Docker

Tools and Frameworks: PyTorch, TensorFlow, ROS/ROS2, OpenCV, Open3D, Angular, Linux, Git, AI Copilot

REFERENCES

Prof. Nakul Gopalan, Arizona State University (Master’s Thesis Advisor) [nakul.gopalan@asu.edu]

Prof. Hongbin Yu, Arizona State University (Master’s Thesis Co-Advisor) [hongbin.yu@asu.edu]

Prof. Suchismita Chinara, NIT-Rourkela (Bachelor’s Advisor) [suchismita@nitrkl.ac.in]