

Prabin Kumar Rath

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EDUCATION

Arizona State University <i>M.S. in Robotics and AI, GPA 4.0, Advisor - Dr. Nakul Gopalan</i>	Aug. 2022 – May 2024 Tempe, AZ
National Institute of Technology Rourkela <i>B.Tech. in Computer Science and Engineering, GPA 8.91/10</i>	July 2016 – May 2020 Rourkela, India

RESEARCH EXPERIENCE

Language Grounding and Planning Lab <i>Arizona State University</i>	May 2023 – Present Tempe, AZ
<ul style="list-style-type: none">Designed a novel Transformer-Diffusion policy for generative neural motion planning, enabling zero-shot configuration space planning across 7 commercial robots in unseen real-world environments. [Preprint]Developed a differentiable collision model for robotic manipulators and leveraged its gradients for reactive collision avoidance, enhancing the safety of human-robot interactions.Created synthetic data generation pipelines with PyBullet, Coppeliassim, and NVIDIA Isaac-Sim simulators.Enabled real-time simulation of 1000+ robots for training Gym compatible RL policies with RGBD observations.	
Electric Vehicles and Intelligent Transportation Lab <i>Arizona State University</i>	Sept. 2022 – May 2024 Tempe, AZ
<ul style="list-style-type: none">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. [Paper]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.Developed novel Graph Neural Network 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 <i>University of Calgary</i>	May 2019 – July 2019 Calgary, Alberta
<ul style="list-style-type: none">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. [Paper]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 <i>Indian Institute of Technology Kharagpur</i>	Dec. 2018 – Jan. 2019 Kharagpur, India
<ul style="list-style-type: none">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.	

SELECTED PUBLICATIONS

- Rath, Prabin Kumar**, and Nakul Gopalan. “Whole-Body Neural Policy for Zero-Shot Cross-Embodiment Motion Planning.” In RSS 2024 Workshop on Embodiment-Aware Robot Learning. Full paper under review at ICRA 2025.
- 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.
- Kumar Rath, Prabin**, Alejandro Ramirez-Serrano, and Dilip Kumar Pratihara. “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.
- Rath, Prabin Kumar**, Neelam Mahapatro, Prasanmit Nath, and Ratnakar Dash. “Autonomous Chess Playing Robot.” In 28th IEEE International Conference on Robot and Human Interactive Communication (RO-MAN), pp. 1-6. IEEE, 2019.

PROJECTS

- Masked Trainable Embeddings for Efficient Task Learning** [Project] Fall 2023
- Incorporated trainable adapters into Action Chunking Transformer (ACT) policy for multi-task learning.
 - Improved few-shot learning performance of the baseline by **32%** using an online embedding masking strategy.
- Multi-Robot Swarm Pattern Formation from Hand-drawn Images** [Report] Fall 2023
- Developed controllers for a swarm of **16 e-puck** robots using the signed distance field of hand-drawn images.
 - Utilized Control Barrier Functions for collision avoidance and validated the control laws using CoppeliaSim.
- Stacking Cubes with Turtlebot Robotic Arm** [Project] Spring 2023
- Created a control and planning ROS MoveIt (IKFast, RRT*) package for stacking cubes and rigorously validated it through Gazebo simulations. Demonstrated a stacking success rate of **95%** in simulations and **78%** on hardware.
 - Trained a torque-controlled visual policy from RGBD observations using Soft Actor-Critic (SAC) algorithm in Gazebo. Policy achieved **73%** success rate in grabbing cubes placed at random locations.
- Preference Learning from Automatic Ranked Demonstrations** [Project] Spring 2023
- Implemented D-REX inverse reinforcement learning algorithm to train reward functions from suboptimal demonstrations using Luce-Shepard preference modeling.
 - Trained a PPO reinforcement learning policy using the learned reward function that outperformed the expert demonstrator policy by **233%**.
- Spatiotemporal Learning for Traffic Flow Prediction** [Project] Fall 2022
- Experimented with different CNN backbones (ResNet, VGG, EfficientNet, InceptionNet) for analyzing the spatio-temporal learning performance in traffic flow prediction.
 - Improved upon the STResNet baseline achieving an average grid **RMSE 17.9** on TaxiBJ and BikeNYC datasets.
- Monte-Carlo Tree Search Pacman Agent** [Project] Fall 2022
- Developed an AI agent for the Pacman game using the MCTS algorithm in Python. Merged reflex behavior and greedy A* search to achieve a win rate of **80%** on standard layouts.
 - Benchmarked against three conventional game-theory agents using statistical ANOVA Tukey HSD tests.
- Autonomous Underwater Vehicle (AUV)** [Project] Spring 2019
- Formulated OpenCV functions for reliable detection of underwater artifacts, thereby enabling autonomous execution of **8** different tasks under challenging lighting conditions and underwater glare.
 - Implemented state machines in C++ for autonomous execution of underwater exploration missions.
- Chess Playing Robot** [Paper] Spring 2018
- Developed image processing algorithms using OpenCV for human chess move detection from an overhead camera.
 - Designed UI in Qt C++ for real-time human robot interaction, enabling mid-game saving and resume features.
 - Created Arduino scripts for accurate positioning of CNC controller using feedback from IR sensors.

INDUSTRY EXPERIENCE

- Experian** June 2024 – Present
ML Ops Engineer Costa Mesa, CA
- 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 using 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.

Robotics and AI Paper Reviewing

- Conference: ICRA 2025, 2024 | RA-L 2023 | IROS 2023 | RO-MAN 2023
- Workshop: PRL@AAAI 2025 | PRL@ICAPS 2024

Teaching and Mentorship

- 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 lecture 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

- Recipient of **Gold Coin Award 2022** for engineering excellence at Wells Fargo, Hyderabad.
- **MITACS Globalink 2019** fellowship to pursue a 12 weeks 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.
- Third position out of 50 teams at **KSHITIJ 2017** Semi Autonomous Robotics competition, IIT-Kharagpur.
- Third position out of 10 teams at **MINARE 2017** Manual Robotics competition, NIT-Rourkela.

[[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

Cloud Technologies: AWS, Azure, Kubernetes, Docker

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

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. Yezhou Yang, Arizona State University (Master’s Thesis Committee Member) [yz.yang@asu.edu]

Prof. Ratnakar Das, NIT-Rourkela (Bachelor’s Project Advisor) [ratnakar@nitrkl.ac.in]

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

Prof. Alex Ramirez Serrano, University of Calgary (Internship Advisor) [aramirez@ucalgary.ca] [[Letter](#)]

Prof. Dilip Kumar Pratihar, IIT-Kharagpur (Internship Advisor) [dkpra@mech.iitkgp.ac.in] [[Letter](#)]