



KEVIN PAULOSE

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Education

University of Pennsylvania

Master of Science in Engineering, Robotics

Coursework: Learning and Control for Adaptive and Reactive Robots, Learning in Robotics, F1/10 Autonomous Racing Cars, Linear Systems Theory, Control and Optimization in Robotics, Design of Mechatronics Systems

May 2025

Philadelphia, PA

Indian Institute of Technology, Bhubaneswar

Bachelor of Technology, Mechanical Engineering (Robotics)

May 2023

Bhubaneswar, India

Technical Experience

xLab: Safe Autonomous Systems Lab (GRASP Lab)

December 2024 - Present

Robotics Researcher

Philadelphia, PA

- RL4Racing: Developing a PPO-based reinforcement learning policy and high-fidelity simulation environment in Isaac Lab for the F1Tenth platform, enabling sim-to-real transfer, control, and robust motion planning across varying elevation and surfaces.

The Autware Foundation, TIER IV

May - November 2024

Autonomous Systems Engineer

Philadelphia, PA

- Led the US deployment of the EVE Autonomy platform with Yamaha and Tier IV, showcasing advanced ADAS features like Pedestrian Detection, Automatic Emergency Braking (AEB), and Lane Follow using ROS2-based SLAM and localization.
- Constructed a detailed map of Pennovation, and an Extended Kalman Filter localizer to fuse data from 3 Livox Horizons, a Velodyne VLP-16, and RTK (Fixposition AG) for precise localization, and implemented a hybrid A* planner for navigation.

MITACS Globalink Research

May - Aug 2022

Research Intern at Laboratoire de Robotique et Systèmes Autonomes, Université du Québec en Outaouais

Quebec, Canada

- Engineered a Holybro X500 V2 drone mounted with RPLiDAR A1m8, Occipital Structure Core camera, CUAUV V5+ Autopilot running PX4, and Neo V3 Pro GPS for real-time flight tests to validate obstacle avoidance algorithms.
- Developed and optimized a deadlock-free indoor obstacle avoidance algorithm for a 6-DOF quadcopter in unknown environments using Nagumo's invariance theorem and Bouligand tangent cones, achieving an 86% success rate in flight tests.

Competitions

SICK \$10K Challenge | Warehouse Automation, Autonomous Mobile Robot, LiDAR, Cameras

September 2024 - April 2025

- Secured 3rd place by engineering an AI-powered Autonomous Mobile Robot (AMR) equipped with 3D LiDAR (MultiScan100), stereo vision via Basler cameras, and ROS2 integration, with Isaac Sim-based simulation for autonomous SLAM, inventory OCR, and space optimization. Designed a modular system architecture enabling real-time autonomy and warehouse-agnostic, RaaS-aligned deployment. Won multiple innovation and entrepreneurship grants from the Wharton School of Business.

SICK Solution Hackathon, Germany | ROS2, Cobots, LLM, LAM, Robotic Arms

October 2024

- Developed T2A (Thought-to-Action) framework using a Language Action Model to translate human intent into real-time robotic actions. Enabled intent-driven control with UR5e robot arm and SICK Visionary 3D camera for precise scene analysis and improved safety with SICK End-of-Arm-Safeguard (EOAS), ensuring seamless human-robot collaboration in dynamic environments.

Bots & Bento Competition, ICRA 2024, Japan | ROS2, Gazebo, AprilTags, Stereo cameras, Mechatronics, KLTs

May 2024

- Led a 3-day robotics hackathon as the only U.S. team, building an autonomous robot with Gazebo and Olive Robotics hardware, achieving 85% accuracy locating and stacking bento boxes using a custom localization system with odometry and AprilTags.

Projects

L-MPPI | MPPI, Iterative Learning Control, JAX, CUDA

September 2024 - March 2025

- Formulated a Real-Time Iterative Learning Model Predictive Path Integral (L-MPPI) controller for autonomous racing, optimizing lap times with systematic constraint management in GPU-accelerated simulations.
- Implemented a state-constrained, penalty-based optimization in L-MPPI, ensuring safe and efficient navigation, validated through hardware experiments and multi-track benchmarking.

F1Tenth Autonomous Racing Cars | C++, Python, ROS2 Foxy, Hokuyo LiDAR, Jetson Xavier NX

January - May 2024

- Developed high-performance control and motion planning for a 1:10 scale F1 car using ROS2, integrating RRT* for path planning, pure pursuit for steering, and MPC for optimized trajectory, achieving podium finishes in racing competitions.

Pick and Place with 7-DOF Franka Emika Panda Arm | ROS, Gazebo, Inverse Kinematics

Sep - Dec 2023

- Developed an E2E pipeline for the arm using ROS and Gazebo, integrating geometric inverse kinematics for precise manipulation.
- Implemented bidirectional RRT for motion planning, achieving efficient pick-and-place operations for static and dynamic objects.

Grand Theft Autonomous - Mobile Robot Competition | ESP32, Arduino, Sensors, Embedded C, Opamps

Sep - Dec 2023

- Manufactured a 4-wheel autonomous mobile robot using ESP32 S2 as an access point, TB6612FNG motor drivers and ATmega32u4, IR phototransistor-opamp frequency detection circuit
- Enhanced remote control capabilities with UDP, ESP-NOW, CAN protocols, optimizing performance of the mobile robot.

Adaptive Control in UAVs & High Performance Aircrafts | MATLAB, Simulink, Control Systems

Jul 2022 - May 2023

- Engineered a guidance algorithm for a 6-DOF Flying Wing UAV using L1 adaptive control with integrated LQR-based safe landing strategies, achieving 92% accuracy in reactive collision avoidance and enhancing system performance through Simulink and ROS.

Technical Skills

Programming: Python, C++, C, MATLAB, Arduino, JAX, PyTorch

Software: ROS, ROS2, Gazebo, IsaacSim, IsaacLab, Simulink, PX4, QGroundControl, RViz, Linux, Windows

Hardware: NVIDIA Jetson, ATmega32u4, ESP32, LiDAR (Velodyne, SICK, Livox), IMU, INS, Stereo Cameras, F1Tenth