Prahlad Vivek

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Education

Columbia University **Aug 2024 – Dec 2025**
Master of Science in Mechanical Engineering (Robotics and Control) New York City, NY
Coursework: Introduction to Robotics, Modern Control Theory, Robot Learning, Reinforcement Learning, Probabilistic Robotics

Govt. Engineering College, Trivandrum **Aug 2019 – May 2023**
Bachelor of Technology in Mechanical Engineering Kerala, India

Skills

Languages & Framework: Python, ROS2, C++, Gazebo, RViz, Linux, MATLAB, Simulink, terminal/shell (bash), Git, LaTeX
Libraries: PyTorch, Pandas, SciPy, OpenCV, nltk, Matplotlib, NumPy
Domains: Reinforcement Learning, SLAM, State Estimation, MSC ADAMS, MuJoCo, NVIDIA Isaac Lab, SolidWorks

Academic/Research Projects

Cable-Driven Robot for Head Neck Characterization | *Mentored by: Dr. Sunil Agrawal* • Columbia University
- Designed and iterated a custom head-brace end-effector for a 7-DOF cable-driven rehabilitation robot; built 3D-printed prototypes, integrated with robot hardware, and validated fit, load, and cable routing.
- Performed human testing (≈ 20 subjects) using EMG-instrumented brace and VICON tracking; fused cable-encoder inverse kinematics with VICON pose information to analyze neck biomechanics and sensor correlations.

Probabilistic Robotics | *ROS2, SLAM, Python, C++, Gazebo, GitHub* • Columbia University
- Implemented SLAM and key state estimation algorithms including the Kalman Filter, EKF, and Particle Filter and tested them on a simulated mobile robot using ROS and Gazebo in this course.
- Implemented an unscented Kalman filter state-estimate for PID & admittance controller, matching baseline sensor-driven performance.

Imitation Learning for Manipulation | *Python, PyTorch, NumPy* • Columbia University
- Trained MLP, CVAE, and diffusion models to teach a simulated agent to push a T-shaped block to a fixed goal from varying start states, with diffusion achieving ≈ 95% success and producing smoother, more stable trajectories.
- Built PyTorch MLP and CNN (RGB images) policies to imitate expert behavior in a 2-D maze, reducing cross-entropy loss from 0.87 to 0.15 and achieving ≈ 99% roll-out success, demonstrating robust perception-to-control learning.

Work Experience

ASML | *Robotics Intern* *Wilton, CT*
Technologies: Python, MATLAB, Simulink May 2025 - Present
- Built a MATLAB/Simulink–based simulator for an in-vacuum SCARA robot (IVR), establishing a real-time communication channel between the SIM3 plant model and FPGA firmware (VHDL) to validate path-guarding algorithms in simulation before deployment.
- Saved 8+ hours of manual effort per testing cycle by coordinating with test engineers to build a MATLAB console that can effectively pull, extract, filter and plot robot diagnostic information from Calibration, Performance and Diagnostic (CPD) test files.

AI and Space Robotics Division, ISRO | *Research Intern* *Trivandrum, India*
Technologies: MATLAB, Simulink, SolidWorks, MSC ADAMS, Trajectory Optimization Nov 2022 - Jun 2023
- Developed a MATLAB–ADAMS co-simulation framework for probabilistic robustness testing, using Monte Carlo simulations to model stochastic disturbances and quantify docking success rates.
- Formulated the multi-satellite refueling problem in GEO as a combinatorial mission-planning optimization, a variant of the vehicle routing problem (VRP), with constraints on servicing-satellite fuel capacity and orbital dynamics and evaluated genetic algorithm-based solvers.

UST (Infinity Labs) | *Robotics Intern* *Trivandrum, India*
Technologies: ROS2, Python, C++, Fusion360, Robot Modeling, Gazebo, NVIDIA Isaac Gym Jun 2022 - Nov 2022
- Built a ROS2-based control and navigation stack for a mecanum-drive warehouse robot, integrating IMU, camera and Lidar fusion.
- Integrated ROS2 stack with kinematic models and URDF/Xacro descriptions to enable Gazebo and Isaac gym simulations.
- Evaluated the performance of planning algorithms and benchmarked Model Predictive Path Integral (MPPI) planning, outperforming Navfn and SMAC in generating smoother, more optimal paths under environmental uncertainties.

Technology and Business Incubation (TBI) Center | *Research Assistant* *Trivandrum, India*
Technologies: Python, OpenCV, PyTorch, NumPy, Jetson Xavier NX • Govt. Engineering College, Trivandrum Feb 2021 - May 2022
- Developed a two-phase Driver Drowsiness Detection Module with Autonomous Braking System for Road Vehicles using CNN models.
- Experimented with face-expression detection on a Jetson Xavier NX development board, training the model using images from Kaggle's Facial Expression Recognition (FER) dataset, achieving a 97% accuracy in detection.

Awards

Award for Technical Innovation, 2023 • Awarded by Southwest Research Institute (SwRI) for research on a CNN-based Driver Monitoring System to improve vehicular safety in ADAS system.

Research Fellowship, 2023 • Awarded by e-Mobility Division of State Government (Govt. of Kerala)