

Rajiv Bharadwaj

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Education

ETH Zurich, Master of Science in Robotics, Systems, and Control	Sep 2024 – Present
Interests: Reinforcement Learning for Controls, Optimization Methods, Vision Algorithms, Simulation, Aerial Robots	
Courses: Model Predictive Control, Computational Models of Motion, Convex Optimization, Robot Dynamics, Motion Planning, Vision Algorithms, Probabilistic AI	
University of Michigan, Ann Arbor, BSc. in Engineering - Computer Engineering; Music Minor summa cum laude	Sep 2018 - May 2022 GPA: 3.9/4.0
Honors: Dean's List for 7 semesters, James B. Angell Scholar 2020, 2021	
Clubs and Societies: Men's Glee Club, Michigan Student AI Lab, UM Autonomous Robotic Vehicle, Michigan Sahana	

Work Experience

Amazon.com	Seattle, WA, USA
Software Development Engineer - II	Oct '22 - Sep '24
– Designed and implemented fully managed systems, processing 50+ million records/day and improving job efficiency by 90% using Spark, Alster Deequ, and AWS Lambda.	
– Mentored a summer intern, resulting in improved backend system reliability. Oversaw project ideation, strategic planning, and performance evaluation to ensure an impactful outcome.	
– Led operational excellence initiatives to enhance best practices and reduce technical debt.	
– Served as Subject Matter Expert for Apache Spark-based ETL jobs, guiding system design and coding practices.	
Software Development Engineer Intern	May '21 – Aug '21
– Migrated legacy ETL jobs to a new Apache Spark framework, improving long-term operational stability.	
Analog Garage - Analog Devices Inc.	Boston, MA, USA
Systems & Applications Engineering Intern	May '20 - Sep '20
– Designed and implemented NoSQL-based ML data storage and an add/retrieve API in Python.	
University of Michigan IT Services	Ann Arbor, MI, USA
Application Development Intern	May '19 - May '21
– Delivered web and backend tools supporting university-wide networking infrastructure using Python, Django, and PostgreSQL.	

Research

Multi-task Reinforcement Learning for Multi-Contact Plans	May '25 - Sep '25
Semester Thesis, Robotic Systems Lab - Prof. Dr Marco Hutter	
– Designed and trained multi-task learning policies in Isaac Lab simulation environments using PPO and student-teacher distillation.	
– Defined research directions and evaluation metrics based on a literature review on multi-task reinforcement learning.	
– Implemented new Isaac Lab features for multi-task policy training, with potential for public release.	
– Authored and presented thesis to faculty, demonstrating multi-task distillation as a promising direction for multi-contact plans.	

Technologies: Isaac Lab, PyTorch, RSL RL

Wire Harnessing using Reachability-based Trajectory Design	Jan '22 - Jul '22
Undergraduate Research Assistant, ROAHM Lab - Prof. Dr. Ram Vasudevan	
– Implemented an RRT planner in Robosuite for Kinova Gen3 high-level planning.	
– Developed a Recursive Newton-Euler low-level controller to evaluate performance of a novel robust controller.	
– Conducted system identification to bridge the sim-to-real gap for robotic tasks.	

Technologies: Robosuite, MuJoCo, ROS 1, Python

Projects

Project CRATER - Mars Rover Project, ETH Zurich	Oct '25 - Present
Systems Architect	[🌐 website]
– Leading overall system architecture and cross-team integrations, collaborating with subteam leads.	
– Driving requirements gathering, interface definition, and design review processes to ensure coherent system design.	

Technologies: Full-stack Robotic System Architecture

Camera-based RL Drone Control
For [Vision Based Drone Flight](#), ETH Zurich

Sep '25
[video][report]

- Trained a reinforcement learning control policy for a drone to follow another drone using PPO.
- Designed reward functions based on tracking, bounding box estimation, smoothness, and safety constraints to achieve reliable camera-based tracking.
- Utilized a ROS C++ / Python software stack for training, simulation, and deployment.

Technologies: Python, C++, PyTorch, ROS 2, PPO

Imitation Learning using a Tendon-Actuated Hand
For [Real World Robotics](#), ETH Zurich

Fall '24
[report]

- Spearheaded high-level ROS 2 software architecture for a tendon-actuated hand, including hardware communication, joint kinematics, teleoperation, and data collection. Awarded "Most Intuitive Software Design".
- Modeled a custom rolling-contact joint hand in MuJoCo to verify software before hardware deployment.
- Developed a UI with fail-safes and visualization tools, increasing data collection rate by 15x and reducing hardware accidents.
- Trained an Action Chunking Transformer to grasp and sort objects by color, achieving accurate grasps despite color-based sorting limitations.

Technologies: Python, MuJoCo, ROS 2, Action Chunking Transformer

Vision Odometry Pipeline
For [Vision Algorithms for Mobile Robotics](#), ETH Zurich

Fall '24
[report][code]

- Implemented a monocular visual odometry pipeline using $2D \leftrightarrow 3D$ correspondences to estimate camera pose.
- Populated the pipeline with high-quality 2D keypoints and 3D landmarks to ensure stable operation.
- Achieved locally accurate pose estimation, noting scale ambiguity inherent to purely camera-based methods.

Technologies: Python, OpenCV, NumPy, Visual Odometry

Robotics Summer School
RobotX Initiative, ETH Zurich

Summer '25
[website]

- Participated in a 50-student Robotics Summer School, deploying autonomous software on wheeled robots for search-and-rescue missions.
- Completed hands-on tutorials on key robot modules: state estimation, SLAM, exploratory path planning, motion planning, and object detection.

Technologies: Python, SLAM, State Estimation, ROS 2

Skills

Programming: C++, Python, Java, Scala, MATLAB, Typescript, Javascript, Lua, C

Robotics Tools: Robot Operating System, NVIDIA Isaac Lab, MuJoCo, OpenCV, PyTorch, NumPy, Linux

Other Technical: AWS, Git, Slurm, STM32, Arduino, Raspberry Pi, Autodesk Eagle, OnShape CAD

Languages: English (native), German (conversational - B1), Hindi (native), Tamil (native), Gujarati (conversational)