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 — Sep 2018 - May 2022
summa cum laude — 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 Sep '25
For Vision Based Drone Flight, ETH Zurich

- 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 Fall '24
For Real World Robotics, ETH Zurich

- 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 Fall '24
For Vision Algorithms for Mobile Robotics, ETH Zurich [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 Summer '25
RobotX Initiative, ETH Zurich [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)