

# Rajiv Bharadwaj

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## EDUCATION

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

## WORK EXPERIENCE

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

## RESEARCH

<b>Multi-task Reinforcement Learning for Multi-Contact Plans</b>	May '25 - Sep '25
Semester Thesis, <a href="#">Robotic Systems Lab - Prof. Dr Marco Hutter</a>	
– Designed and trained multi-task learning policies in <i>Isaac Lab</i> simulation environments using <b>PPO</b> and <b>student-teacher distillation</b> .	
– Defined research directions and evaluation metrics based on a literature review on multi-task reinforcement learning.	
– Implemented new <i>Isaac Lab</i> features for multi-task policy training, with potential for public release.	
– Authored and presented thesis to faculty, demonstrating <b>multi-task distillation as a promising direction for multi-contact plans</b> .	
<i>Technologies:</i> Isaac Lab, PyTorch, RSL RL	
<b>Wire Harnessing using Reachability-based Trajectory Design</b>	Jan '22 - Jul '22
Undergraduate Research Assistant, <a href="#">ROAHM Lab - Prof. Dr. Ram Vasudevan</a>	
– Implemented an <i>RRT planner</i> in <i>Robosuite</i> for <i>Kinova Gen3</i> high-level planning.	
– Developed a <i>Recursive Newton-Euler low-level controller</i> to evaluate performance of a novel robust controller.	
– Conducted system identification to bridge the <b>sim-to-real gap</b> for robotic tasks.	
<i>Technologies:</i> Robosuite, MuJoCo, ROS 1, Python	

## PROJECTS

<b>Project CRATER - Mars Rover Project, ETH Zurich</b>	Oct '25 - Present
Systems Architect	[🌐 <a href="#">website</a> ]
– Leading overall <b>system architecture and cross-team integrations</b> , collaborating with subteam leads.	
– Driving <i>requirements gathering, interface definition, and design review processes</i> to <b>ensure coherent system design</b> .	
<i>Technologies:</i> 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

Fall '24

For Real World Robotics, ETH Zurich

[ 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

Fall '24

For Vision Algorithms for Mobile Robotics, ETH Zurich

[ 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

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

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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)