

Harsh Mahesheka

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EDUCATION

- Indian Institute of Technology (BHU)** Varanasi, India
• *Bachelor and Masters of Technology - Electrical Engineering; GPA: 9.54* July 2020 - June 2025
with minor in Computer Science and Engineering

PUBLICATIONS

- Daniel Honkeramp*, Harsh Mahesheka***, Jan Ole von Hartz, Tim Welschehold, Abhinav Valada
Zero-Cost Whole-Body Teleoperation for Mobile Manipulation
Submitted to IEEE Robotics and Automation Letters (RA-L) *Equal Contribution
- Harsh Mahesheka**, Zhixian Xie, Zhaoran Wang, Wanxin Jin
Language-Model-Assisted Bi-Level Programming for Reward Learning from Internet Videos
Accepted at Workshop on Language and Robot Learning at CORL 2024

SKILLS AND INTERESTS

- Areas of Interests:** Deep Reinforcement Learning, Robotics, Computer Vision
- Languages & Libraries:** Python, MATLAB, C++, CMake, Tensorflow, Pytorch, Stable Baselines, RLlib
- Tools and Simulators:** Robotic Operating System, Moveit, Gazebo, Isaac Sim, Isaac Gym, PyBullet, Carla

RESEARCH EXPERIENCE

- Intelligent Robotics and Interactive Systems Lab, Arizona State University** Remote
• *Research Internship Under Dr. Wanxin Jin and Dr. Zhaoran Wang* April 2024 - Present
 - **Goal:** Learn biological motions from in-wild videos without extensive data preparation.
 - Developed a hierarchical **VLM-LLM** architecture for **inverse reinforcement learning** from videos by generating reward functions. The framework uses a high-level VLM (Gemini 1.5) to analyze expert and learner videos, providing feedback that a low-level LLM (GPT-4o) uses to update the reward function.
 - Implemented and tested the framework in **Isaac Gym**, training simulated robots (Ant, Humanoid, ANYmal) with **PPO** to perform complex biological motions like jumping, running and splitting.
- Robot Learning Lab, University of Freiburg** Freiburg, Germany
• *DAAD-WISE Research Internship Under Dr. Abhinav Valada* May 2023 - September 2024
 - **Goal:** Develop a low-cost and intuitive teleoperation system for mobile manipulation
 - The teleoperation method produces whole-body motions for mobile manipulation by delegating the base motions to a **reinforcement learning agent**, leaving the operator to focus on end-effector motions.
 - Trained the reinforcement learning policy using **A2C** algorithm in **Isaac Sim** to generate whole-body motions and achieved **zero-shot Sim2Real** transfer on **PR2**, **HSR** robots.
 - Demonstrated precise, intuitive, and **40%** faster task completion compared to existing methods.
- Robotics Research Center, IIIT Hyderabad** Hyderabad, India
• *Research Internship Under Dr. K. Madhava Krishna* May 2022 - December 2022
 - **Goal:** Develop a global planner to reduce localisation drift by avoiding featureless areas
 - Designed and implemented a **reinforcement learning-based global planner**, trained to intelligently navigate through environments by actively avoiding areas that could cause localization drift.
 - Developed a modular platform for training and validating reinforcement learning models for global planners, integrated with **ROS** and **Gazebo** for real-time performance assessment and tuning.

INDUSTRIAL EXPERIENCE

- Hindustan Unilever Limited** Mumbai, India
• *ULIP Technical Intern* May 2024 - June 2024
 - **Energy Optimizer:** Used machine learning and data analytics to develop a tool to serve as an end-to-end solution for **optimising parameters** to enhance factory **energy efficiency**.
 - **Energy By Design:** Benchmarked various process parameters and machine specifications across factories to generate energy insights worth **3.5 crores**.

- **Google Summer of Code - Project Mesa** Remote
Student Developer May 2024 - September 2024
 - **Mesa RL**: Enhanced the Mesa agent-based modelling framework for **Multi-Agent Reinforcement Learning** by creating wrappers and functions for seamless integration with reinforcement learning libraries like **RLlib** and **Stable Baselines**. Created **tutorials** and **documentation** for getting started.
- **Google Summer of Code - Open Robotics** Remote
Student Developer May 2022 - September 2022
 - **Package Creation Tool**: Created a command line tool using **embedded Ruby** for helping new users get started with **Gazebo** by generating custom template packages.
 - **CMake Macros**: Created macros for installing and sourcing worlds, models, plugins, etc., in Gazebo.

PROJECTS

- **Multi-Purpose Household Bot (Supervised by Dr. Shyam Kamal):** [Link]
 - **Goal**: Design a Compact Ground Robot to perform household tasks like Cleaning and child care.
 - Designed a **CAD** model and integrated ROS packages for **Exploration, Navigation, and Coverage**.
 - Used **Computer Vision** for tasks like threat detection and child following for child care in households.
 - Developed prototype with **Jetson Nano** and **STM Microcontroller** and **Intel Realsense**.
- **Centralized Multi-Agent Pick Up and Delivery System (Flipkart Grid 3.0):** [Link]
 - **Goal**: Develop a Multi-Agent Pick Up and Delivery system to automate warehouses.
 - Designed and fabricated a swarm of Omnidirectional ROS-based mobile robots with centralized control.
 - Implemented **Conflict-Based Search** for Global Planning and **PID tracking** for Local Planning.
 - Localized bots using **Kalman filter-based sensor fusion** of overhead camera and odometry data.
- **Autonomous Wheelchair (Supervised by Dr. K. Madhav Krishna):** [Link]
 - **Goal**: Develop an autonomous interactive robotic wheelchair for assisting disabled people
 - Used **RTAB** libraries for mapping and localization using **3-D point cloud** from Intel Realsense.
 - Detected and modelled human movement with **Time Elastic Band (TEB)** Planner for path planning.
 - Build a **mobile app** and used **NLP** to enable voice-based commands for navigation.

RELEVANT COURSE WORK

- **CSO-101** Computer Programming **CSE-458** Soft Computing, **CSE-241** Artificial Intelligence, **ME-314** Mechatronics, **EE-211** Linear Control Systems, **EE-313** Modern Control Engineering, **EE-414** Optimal and Adaptive Control, **EE-404** Operations Research, **CSO-323** Graph Theory and Applications,
- **Deep Learning Specialization** by Andrew Ng on Coursera, **Reinforcement Learning Specialization** by the University of Alberta on Coursera, **ROS Specialization** by Anis Koubaa on Udemy

ACHIEVEMENTS

- Among **Top-15 students** selected from 400 applicants nationwide for **IUSSTF-Viterbi Scholarship 2023**.
- Awarded **DAAD-WISE Scholarship 2023** to pursue a Research Internship in German Public Institutes.
- Got selected to present my project to a global audience at the **G20 Global Summit 2023**.
- Stood first in **Robotics Conclave**, third in **Labyrinth** (ROS-based maze solver), and first in **Scientist of Utopia** (Astronomy-based Hackathon) at Technex (Annual Technical Fest of IIT BHU).
- Among **Top-10** winners in **National Robotics Competition** for developing innovative household robots.
- Cleared Tabs in multiple International Debates, including being **ranked 3rd** out of 60+ teams in TIB-JUDO.

SERVICES AND LEADERSHIP

- **Secretary** of **Robotics Club, IIT BHU**.
- **Mentor** at **RoboReG** (Robotics Research Group at IIT BHU).
- **Debating Lead** at **Literary Club, IIT BHU**.
- **Teaching Assistant** for **Dr. Shyam Kamal**, for the course **EE-561** (Modern Control Theory)
- **Reviewer** at **LangRob Workshop** at Conference of Robot Learning, 2024.