Ritvik Mahajan

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Interests

Robotics, Control Theory, Machine Learning

Education

- **KTH Royal Institute of Technology** — Stockholm, Sweden
  Master's in Systems, Control and Robotics; GPA: 4.58/5 — *2024 - Present*
  - **Courses:** Machine Learning, Reinforcement Learning, Hybrid and Embedded Control Systems
- **Indian Institute of Technology Roorkee** — Roorkee, India
  Bachelor of Technology (with Honors) - Electrical Engineering; CGPA: 8.686/10 — *2020 - 2024*

Experience

- **Research Assistant** — March 2025 - Present
  Netcon Group, DCS division, EECS KTH, Sweden
  Supervisors: Prof. Karl Henrik Johansson, Dr. Aneesh Raghavan
  - Working on algorithm development for robust Collaborative SLAM using kernel methods
- **Research Assistant** — August 2024 - February 2025
  Netcon Group, DCS division, EECS KTH, Sweden
  Supervisors: Prof. Karl Henrik Johansson, Dr. Aneesh Raghavan, Dr. Elis Stefansson
  - Investigated the use of LLMs to identify simple and cost-effective paths in robotic path planning problems
  - Developed pipelines using the OpenAI API to evaluate LLMs' accuracy in compressing long data sequences
- **Summer Research Internship** — May 2023 - August 2023
  Queen's University, Canada — *Report*
  - Developed a mixed-reality testbed for autonomous driving experiments
  - Implemented a mixed-reality platoon with a combination of virtual and physical Quanser QCars
  - Studied and tested the effects of time delays, vehicle dynamics, and communication policies on String Stability
- **Summer Research Internship** — May 2022 - July 2022
  Indian Institute of Science, Bangalore — *Video*
  - Implemented a DDPG-based multi-agent intersection management algorithm through sequential optimization
  - Developed a centralized control and communication pipeline for a stream of mobile robots

Projects

- **Multi-Objective Control** — September 2023 - April 2024
  Bachelor Thesis Project — *Report*
  - Implemented multi-objective reinforcement learning algorithms for approximating the Pareto front and control
  - Implemented an HJ Reachability-based approach to recover the Pareto Front for a nonlinear dynamical system
- **Lane Change for Vehicular Platoons** — January 2023 - April 2023
  Indian Institute of Technology Roorkee — *Report*
  - Developed a CACC-based longitudinal controller for autonomous vehicle platoons in Simulink
  - Implemented a safe decision-making planner for lane change and tested the control and planning algorithms in CARLA
- **Event-Triggered Control using Reinforcement Learning** — October 2022 - March 2023
  Indian Institute of Science, Bangalore
  - Developed a DDPG-based event-triggered controller with stability guarantees for LTI systems using early triggering
  - Implemented classical methods like relative thresholding and Lyapunov-based event-triggered control for linear systems
- **UAV-assisted UGV Navigation** — March 2022
  Inter-IIT Tech Meet 10.0 — *Github and Report*
  - Designed mapping and navigation algorithms for mountainous environments for a UAV using ArduPilot in ROS.
  - Developed controllers for assisted autonomous navigation of a UGV on snow-covered roads through OpenCV and ROS.
- **Control and Navigation of Mars Rover** — December 2021 - April 2022
  Team Robocon, IIT Roorkee — *Video*
  - Developed vision-based autonomous navigation algorithms for a 4-wheeled rover with a depth camera using OpenCV.
  - Designed a GPS-based autonomous mobile-follower differential-drive robot using NodeMCU and Blynk mobile app.
  - Designed a gesture-controlled bot and implemented algorithms for mapping in indoor environments using RTAB-map.
- **Control and Navigation of a self-balancing bike** — October 2021
  Inter-IIT Tech Symphony 2021 — *Github and Report*
  - Modeled the dynamics of a flywheel-based bike and designed a PID controller for self-balancing in ROS
  - Developed algorithms for GPS and LiDAR-based autonomous navigation in unmapped static environments in Gazebo

Skills

- **Programming Languages**: Python, MATLAB, C++
- **Machine Learning and Robotics**: Pytorch, ROS, OpenCV, Ardupilot, Arduino, Mbed, Raspberry Pi
- **Simulation and Design Tools**: Simulink, Gazebo, CARLA, NI Multisim, LTspice, Altium

Achievements

- **Awarded the KTH Scholarship 2024 for the MSc in Systems, Control and Robotics program**
- **Awarded Bronze medal in DRDO's UAV-guided UGV Navigation Challenge at Inter-IIT Tech Meet 2022**
- **Awarded CHANAKYA Research Fellowship by Technology Innovation Hub, IIT Roorkee (2022)**
- **Secured 1st position in Programobot at Inter-IIT Tech Symphony 2021**
- **Secured 1st position in Business Plan Presentation at Formula Bharat Virtuals 2021**

Positions of Responsibilities

- **Research Lead for Team Robocon, IIT Roorkee** 2022-2023 Season
- **Undergraduate Teaching Assistant for Network Theory** Spring semester, 2022
- **Undergraduate Teaching Assistant for Mathematics 1** Autumn semester, 2022

Test Scores

GRE General Test: 334/340
Quantitative Reasoning: 170/170
Verbal Reasoning: 164/170
Analytical Writing: 4.5/6

TOEFL iBT: 118/120
Reading: 30/30 Speaking: 30/30
Listening: 29/30 Writing: 29/30