RAGHAV THAKAR

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EDUCATION

Oregon State University Corvallis, OR, USA
Ph.D. in Robotics, CGPA: 3.73/4.00, Advisor: Dr Kagan Tumer September 2023 — Present

- Prospective Dissertation Theme: Distributed artificial intelligence for autonomous agents to coordinate in a multi-agent system in environments with multiple objectives, with rewards that are sparse.
- Keywords: Multi-agent reinforcement learning, multi-objective reinforcement learning, reward shaping, robot control, multi-agent credit assignment, evolutionary algorithms, distributed intelligence.

Manipal Institute of Technology Manipal, KA, India
Bachelor of Technology (B.Tech.) in Computer Science and Engineering, CGPA: 9.00/10 July 2019 — April 2023

- Minor Specialisation in Computational Mathematics

EXPERIENCE

Research Intern January 2023 — April 2023
MOON Lab, IISER Bhopal. Advisor: Dr Sujit PB Bhopal, MP, India

- Developed a COLREGS-compliant multi-agent path planning and collision avoidance strategy for Unmanned Surface Vehicles (USVs) based on the Conflict-Based Search algorithm.
- Deployed the navigation pipeline on an ArduPilot/Pixhawk stack, implementing custom waypoint-generation logic to translate global plans into executable autonomous trajectories.
- Architected a mixed-reality testbed that integrated physical hardware with virtual agents via a UDP communication system (Ubiquiti Rocket M5) and performed real-time multi-agent field trials.
- **In parallel:** Participated in the 2023 MBZIRC Grand Maritime Challenge; implemented a multi-agent coverage algorithm for autonomous patrolling by drones and finished 12th out of 300+ teams globally. [Team Luna]

MITACS Globalink Research Intern May 2022 — July 2022
MARS Lab, Ontario Tech University. Advisor: Dr Scott Nokleby Oshawa, ON, Canada

- Designed and implemented a hybrid navigation framework for an autonomous wheelchair, combining RRT* for global planning with Artificial Potential Fields for local obstacle avoidance.
- Integrated an Intel RealSense depth camera and 2D LiDAR for real-time environment mapping, obstacle detection, and robot localisation.
- Validated the full autonomy stack on a TurtleBot platform in cluttered indoor environments.

Robotics Research Intern June 2021 — September 2021
Advanced Technology Division, Aerospace Engineers Pvt. Ltd. Bengaluru, KA, India

- Developed Hardware-In-The-Loop (HITL) simulations to facilitate the safe testing and validation of drone swarm coordination algorithms.
- Created automated pre-flight diagnostic scripts and unified mission start-up programmes to streamline system readiness and efficiently launch field missions.
- Integrated an on-board camera system for live target tracking within the MAVROS/PX4 ecosystem for Pixhawk flight controllers.

PUBLICATIONS

- **Raghav Thakar**, Gaurav Dixit, Kagan Tumer. *Post Hoc Extraction of Pareto Fronts for Continuous Control.* Under review / In process of uploading to arXiv.org. [Paper]
- **Raghav Thakar**, Gaurav Dixit, Siddarth Viswanathan, Kagan Tumer. *Multiagent Credit Assignment for Multi-Objective Coordination.* GECCO 2025. [Paper]
- Everardo Gonzalez, **Raghav Thakar**, Kagan Tumer. *Indirect Credit Without a Heuristic for Coevolving Agents.* GECCO 2025 - Late-Breaking Abstract. [Paper]
- **Raghav Thakar**, Kagan Tumer. *The Specificity vs. Expense Trade-Off of Multiagent Credit.* GECCO 2025 - Student Workshop. [Paper]
- **Raghav Thakar**, Gaurav Dixit, Kagan Tumer. *Multi-Objective Credit Assignment for Multiagent Systems.* ECAI 2024 - MODeM Workshop. [Paper]

PROJECTS

Evolutionary Reinforcement Learning for Multi-Objective Multi-Agent Coordination [Project page] 2024

- Combined evolutionary optimisation with multi-agent reinforcement learning to learn a Pareto front of multi-agent joint-policies that span trade-offs across conflicting coordination objectives.

An End-to-End System to Leverage VLMs for Robot Pathfinding [Project page] 2025
- Developed a complete ROS 2 system to integrate a Vision-Language Model (VLM) into the planning stack of an autonomous agent to perform complex pathfinding and improve with feedback.

Optimal Transitions to Distribute Heterogeneous Robots Across Tasks [Project Page] 2022
- Computed the optimal transition probabilities for heterogenous robots to switch tasks in a Markov chain to satisfy task requirements in the steady state by formulating and solving an Integer Programming Problem.

Formation and Navigation for a Drone Team [Project Page] 2022
- Devised a formation control system from a distributed systems perspective by leveraging the Token Ring algorithm and validated the approach through simulation of a drone team using MAVROS, PX4-Autopilot, and Gazebo.

AWARDS AND RECOGNITION

Best Poster and Presentation, OSU AI Week 2025
- Awarded at the AWS-sponsored 'Lightning Talk' session among 15+ participants.

MITACS Globalink Research Internship 2022
- Awarded a fully funded scholarship by MITACS Canada for a summer research internship on autonomous wheelchair navigation for children with motor disorders at Ontario Tech University.

Development Grant, Swadeshi Microprocessor Challenge 2021
- Received a grant of Rs 100,000 (approx $1500) from the Govt. of India to develop a novel hardware prototype using the then under-development indigenous 'Shakti' microprocessor; finished in the top 100 of 3,000+ teams nationally.

TECHNICAL SKILLS

- **Languages:** Python (PyTorch, NumPy, Pandas, Google OR Tools), C++, Bash, LaTeX
- **Robotics & Frameworks:** ROS, ROS 2, PX4/ArduPilot, MAVROS, Gazebo, RViz, MuJoCo
- **AI & Machine Learning:** Multi-Agent Reinforcement Learning, Multi-Objective Optimisation, Evolutionary Algorithms, Path Planning, Reward Shaping, Experiment Tracking (Weights & Biases), Mixed Integer Linear Programming
- **Hardware & Tools:** Pixhawk/Jetson/Raspberry Pi, Git, Linux

GRADUATE COURSEWORK

ROB 538: Multiagent Systems, ROB 537: Learning-Based Control, AI 533: Intelligent Agents and Decision-Making, CS 514: Algorithms, ROB 599: Robot Software Frameworks, ROB 571: Robotics and Society, ME 517: Optimisation in Design.