EASHWAR SATHYAMURTHY

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PROFESSIONAL SUMMARY

Ph.D. Candidate specializing in **Multi-Agent Systems, Optimization, Generative AI, and Robotics**. Possess unique expertise in **Embodied AI**, bridging the gap between high-level GenAI reasoning (VLMs) and low-level robotic control. Experienced in designing decentralized inference frameworks and optimization algorithms for autonomous fleets. Proven track record of deploying theoretical models on physical hardware (UAVs/UGVs) to solve complex, real-world constraints.

EDUCATION

Ph.D. in Mechanical Engineering (Focus: Multi-Robot Systems)
University of Maryland, College Park, MD
GPA: 3.81/4.0 | Jan 2022 – May 2026 (Expected)

M.S. in Systems Engineering (Robotics)
University of Maryland, College Park, MD
GPA: 3.81/4.0 | Jan 2021 – Dec 2021

Master of Engineering in Robotics
University of Maryland, College Park, MD
GPA: 3.67/4.0 | Aug 2019 – Dec 2020

B. Tech in Electronics and Communications
Jawaharlal Nehru Technological University, India
CGPA: 9/10 | Aug 2015 – May 2019

TECHNICAL SKILLS

- **Languages:** Python, C++, MATLAB, Java.
- **AI/ML & Robotics:** PyTorch, TensorFlow, Scikit-learn, ROS/ROS2, OpenCV, Gazebo, Unity, CUDA.
- **Certifications:** TensorFlow Developer (Google), Robotics Software Engineer Nanodegree (Udacity).

RESEARCH & PROFESSIONAL EXPERIENCE

UMD Crossfire Intern | Multi-modal Perception and System Design Engineer May 2024 – Present

- Built a YOLO-based RGB and thermal fire and smoke detection system for DJI Matrice 4TD drones, achieving high-precision early-stage wildfire detection while filtering false positives from sunlight, and artificial heat-sources in real-world aerial footage.
- Fine-tuned a **VLM (vLLM/LoRA)** to move beyond **CNN-based detection**, enabling semantic reasoning that distinguishes wildfires from campfires based on environmental context, reducing false-positive deployments
- Engineered an autonomous orchestration layer integrating VLMs with QGroundControl, enabling the drone to perform real-time visual reasoning and autonomously reroute for close look inspections.
- Designed a multi-drone fleet deployment (**DJI Dock 3 & Alta X**) featured in *IEEE Spectrum*, ensuring 100% coverage of **1,000 km² in 10 minutes** with an autonomous **8kg** water suppression payload.

Graduate Research Assistant | Design Decision Support Lab June 2021 – Present

- Led development of **SAGE**, a multi-agent inference framework (Python/Java) allowing autonomous robots to reason and navigate in uncertain environments with adversarial agents.
- Developed a metareasoning policy within **the SAGE multi-agent framework** that dynamically switches between A*, RRT, and Decision Tree planners based on three distinct modalities of environmental uncertainty.
- Engineered modified **Risk-Based A*** and **RRT** algorithms using **Probability Density Functions (PDF)** to navigate dynamic adversaries, reducing total computational effort and achieving shorter paths compared to single-planner baselines.

Doctoral Researcher, Autonomous Multi-Robot Systems June 2021 – Present

- Invented the MD-RPP-RRV framework for multi-robot routing with battery limits, recharging, multi-trip reuse, and multi-depot coordination, formulating it as a MILP and proving its NP-hard structure.
- Built scalable solvers (Simulated Annealing, Tabu Search, Genetic Algorithms) that reduced routing optimality gaps from 162% to <1% on benchmarks and improved real-world UAV route quality by up to 54% over heuristics.
- Designed a real-time, failure-aware autonomy layer using centralized and peer-to-peer auctions with a magnetic-field router and proved worst-case performance bounds through validation on 257 failure scenarios, achieving over 95% replanning speedup from hours to seconds while keeping solution quality within 8% of near-optimal.
- Developed a GNN framework that predicts hazardous road segments from real-time temperature, precipitation, humidity, and weather forecasts, and tightly integrated this learned risk model with routing to enable adaptive planning under continuously changing environmental conditions.

Autonomous Micro Aerial Vehicle (AMAV) Team Member Aug 2020 – May 2021

- Enhanced drone autonomy stack for the Vertical Flight Society competition, securing 2nd place (2021).

KEY PROJECTS

Mcity Autonomous Vehicle Challenge (Team Shreya) May 2024 – Aug 2024

- Implemented a novel **Model Predictive Controller (MPC)** for autonomous navigation, achieving 99.39% Traffic Rule Compliance.
- Secured 2nd highest Trajectory Completion score (93.33%) by optimizing path-following logic.

Decentralized Multi-Robot Disinfection System Apr 2022 – May 2022

- Developed a decentralized control system for six autonomous robots using an A-disk communication graph.
- Integrated trajectory planning and formation control, achieving 100% mission completion and a 25% increase in path efficiency.

PUBLICATIONS

- ***Sathyamurthy, E***., Herrmann, J. W., & Azarm, S. (2024). “Rescheduling after vehicle failures in the multi-depot rural postman problem with rechargeable and reusable vehicles,” in European Journal of Operational Research. (under review)
- ***E. Sathyamurthy***, J. W. Herrmann and S. Azarm, "Hybrid Metaheuristic Approaches for the Multi-Depot Rural Postman Problem with Rechargeable and Reusable Vehicles," in IEEE Access, vol. 12, pp. 86523-86540, 2024.
- ***Sathyamurthy, E***, Richardson, J, Herrmann, JW, & Raglin, A. "Metareasoning to Adapt Path Planning Decision Making for Different Modalities of Uncertainty." Proceedings of the ASME 2024 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference.
- ***Sathyamurthy, E***, Azarm, S, & Herrmann, JW. "Multi-Trip Algorithm for Multi-Depot Rural Postman Problem with Rechargeable Vehicles." Proceedings of the ASME 2024 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference.