EASHWAR SATHYAMURTHY

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Biography

Doctoral candidate with extensive research experience in optimization, machine learning, decision-making, and systems engineering. Holds a double Master's degree specializing in Robotics. Proficient in designing advanced algorithms for autonomous vehicles, seamlessly integrating path planning, computer vision, and control systems. Collaborated with industry partners on research projects, demonstrating a strong commitment to collaboration and delivering impactful results.

Education

Ph.D. in Mechanical Engineering — College Park, MD
University of Maryland — Jan 2022 - Present

- GPA 3.65/4.0
- Recipient of Dean's Scholarship and Alex Mehr Graduate Fellowship 2023.

Master of Science in Systems Engineering in Robotics — College Park, MD
University of Maryland — Jan 2020 - Dec 2021

- GPA 3.81/4.0

Professional Master of Engineering in Robotics — College Park, MD
University of Maryland — Aug 2019 - Dec 2020

- GPA 3.669/4.0

Publications

- *Journal Articles:*
  - **Sathyamurthy, E.**, Herrmann, J. W., & Azarm, S. (2024). Rescheduling after vehicle failures in the multi-depot rural postman problem with rechargeable and reusable vehicles. ***arXiv*** preprint arXiv:2411.04073.
  - **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, doi: 10.1109/ACCESS.2024.3414331
- *Conference Papers:*
  - **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***. https://doi.org/10.1115/DETC2024-143564
  - **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***. https://doi.org/10.1115/DETC2024-139963

Experience

UMD Crossfire Intern

May 2024 – Present Maryland, USA

- **Designed system architecture** by calculating the optimal number of drones needed for efficient wildfire detection and suppression over a 1,000 km^2 area within 10 minutes.
- **Developed custom real-time fire detection algorithms** using Gaussian Mixture Models with OpenCV, integrating RGB and thermal camera inputs to improve accuracy and reduce false positives, outperforming off-the-shelf PyTorch YOLO model.
- **Performed geospatial mapping** by converting camera coordinates to geographical coordinates for, wildfire area and centroid calculation for precise suppressant deployment.

Graduate Research Assistant
June 2021 – Present Maryland, USA

- Developed a UAV routing algorithm that outperformed existing heuristics in solution quality (100% of instances) and speed (85% of cases) for collecting visual data on icy roads under real-time wind conditions to prevent accidents. Funded by Maryland Industrial Partnerships (MIPS) and SpringGem company.
- Enhanced UGV navigation efficiency by updating the Army Research Lab's autonomy stack in ROS and Unity. Implemented a metareasoning policy ROS node in C++ that dynamically switches path-planning strategies, improving navigation in obstacle-heavy environments.
- Led the development of SAGE, a multi-agent inference framework in Python and Java which simulated autonomous robots as agents to communicate and navigate uncertain environments with adversarial agents, enhancing mission success rates in complex scenarios.

Graduate Teaching Assistant
Jan 2023 – Present Maryland, USA

- ENME361 Vibrations, Controls, and Optimization.

Aug 2022 – Dec 2022 Maryland, USA

- ENME426 Production Management course.

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

- Integrated Intel RealSense T265 tracking camera on the drone to obtain higher localization accuracy, reliability, lower variance, and higher feedback rates.
- Performed Computational Fluid Dynamics Analysis on Drone using SimScale CAD simulation software.
- Tested autonomy by performing autonomous drone waypoint mission using QGroundControl mission planning software and Pixhawk 4 autopilot.
- Placed second in Vertical Flight Society (VFS) design built competition 2021 as a part of AMAV.

Certifications

- TensorFlow Developer Certification – Google — Jan 2024
- Robotics: Kinematics and Mathematical Foundations – EdX — Aug 2019
- Robotics Software Engineer Nanodegree – Udacity — May 2019
- Machine Learning Stanford - Course Era — Jan 2019

Technical Skills

- **Programming Languages:** Python, C++, MATLAB, and Java.
- **Testing Frameworks:** PyTest and unittest.
- **CI/CD:** GitHub Actions and Jenkins.
- **Containerization:** Docker
- **Cloud Platforms:** AWS and Google Cloud.
- **ML Frameworks:** TensorFlow, PyTorch, and Scikit-learn.
- **Operating Systems:** ROS, Windows and Linux.

Projects

Project: Mcity Autonomous Vehicle Challenge – Team Shreya (5th Place)
May – Aug 2024 Maryland, USA

- Designed and implemented a novel Model Predictive Controller (MPC) for autonomous navigation, achieving 99.39% Traffic Rule Compliance (top 3) and a Comfort score of 82.92%, ensuring smooth and efficient trajectory planning.

- Secured a 93.33% Trajectory Completion score (2nd highest overall), demonstrating robust path-following capabilities and near-complete mission success in a competitive environment.
- Analyzed competition metrics, identifying strategies to enhance the Safety score (26.83) and improve total performance in future iterations.

Project: **Autonomous Multi-Robot Disinfection Mission**

Apr – May 2022 Maryland, USA

Developed decentralized controllers enabling six autonomous robots to collaboratively disinfect a hospital environment, ensuring collision-free navigation and maintaining connectivity through a Δ-disk communication graph.

Optimized trajectory planning and formation control, achieving seamless transitions between sub-missions (e.g., waypoint navigation, room disinfection, refueling) in both MATLAB simulations and Robotarium experiments.

- Demonstrated high reliability in real-world simulations, achieving full mission completion without collisions and enhancing path efficiency by 25% through fine-tuned formation graphs and control laws.

Project: **Agile Robotics for Industrial Automation Competition (ARIAC)**

Aug – Dec 2020 Maryland, USA

- Maneuvered 15-DOF gantry robot in a Gazebo simulator using ROS to accomplish all the agility challenges.
- Implemented dynamic preset location functionality to automate the picking function of the robot.
- Implemented a generic path planning algorithm to avoid obstacles and find the shortest path for picking and placing parts in AGV.

Project: **Semantic Segmentation using Convolutional Neural Networks**

May – Aug 2020 Maryland, USA

- Developed and implemented U-net, SegNet, ResNet, and ICNet architectures in Python using the TensorFlow library.
- Performed semantic segmentation on the 2018 Science Bowl dataset containing nuclei images and model obtained an accuracy of 96.4%.
- Modified architectures for multi-class semantic segmentation and obtained the highest mean Intersection of Union accuracy of 53.29% with the Cityscapes dataset with 29 classes.

Project: **Path planning for Aerial Robots**

Mar-May 2020 Maryland, USA

- Developed RRT and RRT* algorithms in Python for efficient, collision-free navigation, visualized in 2D and 3D environments using Pygame and Matplotlib.
- Enhanced algorithms with dynamic obstacle avoidance, enabling real-time adaptability in complex scenarios.
- Validated robustness in environments with static and dynamic obstacles, demonstrating applicability for autonomous aerial systems in search-and-rescue and delivery.