Rishie Raj

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Education

University of Maryland, College Park — College Park, MD
M.Eng. in Robotics; GPA: 4.0/4.0 — *Aug 2023 - May 2025*

Odisha University of Technology and Research — Bhubaneswar, India
B.Tech in Mechanical Engineering; GPA: 8.0/10.0 — *Aug 2014 - May 2018*

Relevant Coursework

- Multimodal Computer Vision
- Multimodal Foundation Models
- Numerical Optimization
- Deep Learning
- Robot Perception
- Robot Planning

Publications

1. **AURA: A Fine-Grained Benchmark and Decomposed Metric for Audio-Visual Reasoning**
   Siminfar Samakoush Galougah*, Rishie Raj*, Sanjoy Chowdhury, Sayan Nag, Ramani Duraiswami
   arXiv 2025

2. **FaSTA*: Fast-Slow Toolpath Agent with Subroutine Mining for Efficient Multi-turn Image Editing**
   Advait Gupta, Rishie Raj, Dang Nguyen, Tianyi Zhou
   arXiv 2025

Projects

Multi-modal Agent for Reference-Guided Image Editing — *Apr 2025*
- Developed an LLM-based agent that performs complex edits using indirect multi-modal cues without any training.
- Proposed a two-stage planning system that improves flexibility by decoupling reference analysis from execution.

Detecting AI-Generated Images in Zero-Shot Setting — *Dec 2024*
- Proposed a novel framework by adapting perplexity and cross-perplexity metrics from language to the image domain.
- Achieved robust, training-free detection across diverse generative models (e.g., Stable Diffusion, DALL·E, Emu3).

Project NavGuide: A Swarm Navigation Robot System for Warehouse Applications — *Dec 2024*
- Designed and implemented a multi-robot swarm system that uses RVO2 obstacle avoidance algorithm.
- The simulation was performed in Gazebo using a five TurtleBot3 swarm system in a warehouse environment.

Object Detection in Adverse Weather Conditions — *May 2024*
- Designed a CNN-based defogging network that predicts parameters for differentiable functions to enhance visibility.
- Integrated the model with YOLOv5 for real-time object detection, achieving improved mAP and robust performance.

Real Time Semantic Segmentation using Efficient Neural Network — *May 2024*
- Developed a lightweight CNN-based encoder-decoder architecture for real-time semantic segmentation.
- Achieved promising segmentation accuracy on test data while maintaining low computational cost.

Experience

UMD CS Dept. — College Park, MD
Volunteer Researcher — *Apr 2025 - Present*
- Volunteering in GAMMA Lab at UMD, working on audio-visual LLMs and multimodal agentic systems.
- Collaborating with Tianyi Lab at UMD, working on image editing agents.

Maruti Suzuki India Ltd. (MSIL) — Gurugram, India
Assistant Manager (Product Development-R&D) — *Dec 2018 - Apr 2021*
- Worked as project manager of Ertiga & all its variants, India's highest-selling MPV.
- Worked on Diesel BS-6/EURO-6 powertrain development (MSIL's 1st self-designed engine).
- Implemented a cost-saving proposal of ∼2,500 INR/vehicle through seat fabric change.
- Proposed a new layout for the ventilation system in the Weld shop to reduce wastage by ∼30%.
- Proposed changes in assembly processes to reduce wrong/misfitment chances by ∼50%.
- Presented a VA/VE proposal for design change in brake system layout for cost saving by ∼3 INR/vehicle.

Technical Skills

Languages: Python, C++
Tools: GitHub, GCP, Docker, ROS, RViz, MATLAB
Frameworks: PyTorch, TensorFlow, Keras
Concepts: Machine Learning, Deep Learning, Computer Vision, Natural Language Processing, Cloud Computing, Object-Oriented Programming, Software Development

Leadership / Extracurricular

- Won Star Performer of the division at *MSIL* ($\sim$150 employees) in Q2 of FY 2020-21.
- Was the budget coordinator for my entire division ($\sim$5 depts. & $\sim$30 products) for FY 2020-21.
- Represented my college OUTR in ECOKART 2016 and BAJA 2017 design competitions.
- Represented my college in RoboWars and RoboMaze competitions at IIT Kharagpur & NIT Rourkela.