RITHISH RAMAMOORTHY SATHYA

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PROFILE

MSc Robotics graduate of the University of Sheffield working on robot perception and scene understanding: persistent spatial-semantic scene representations built with foundation models, and sim-to-real transfer. Experience in ROS2, SLAM and state estimation, and in building complete robotic systems from hardware to perception.

Core strengths: simulation engineering, 3D Perception, multimodal AI training and ROS2 Framework.

EDUCATION

MSc Robotics - University of Sheffield, UK *Sep 2025 – Sep 2026*

Expected Grade: Distinction

- **Dissertation:** Sim-to-Real Transfer for Underwater Object Detection via Physics-Informed Domain Randomisation **(supervisor: Dr Jonathan M. Aitken).**
- **Relevant modules:** Mobile Robots & Autonomous Systems; Multi-Sensor & Decision Systems; Machine Vision; Data Modelling and Machine Intelligence; Manipulator Robotics; Mechatronics for Robotics.

BEng Mechatronics - Kumaraguru College of Technology, India *Aug 2021 – Apr 2025*

Grade: 7.9/10

- Relevant modules: Microcontrollers & Microprocessors; Sensors & Instrumentation; Robotic Manipulators; Control Systems

RELEVANT PROJECTS

SceneThread: persistent spatial scene understanding (research prototype, in development) 2026 – present

- Takes RGB-D video; uses **SAM 3** for object-centric perception and **SigLIP** for image-text embeddings and builds a persistent spatial-semantic representation of objects, locations and relations across observations, with a web 3D interface showing how the robot's understanding changes over time.
- Link: scenethread-lab.vercel.app

MSc dissertation: sim-to-real underwater object detection Jun – Sep 2026

- Diffusion-transformer image generation (**FLUX.2-dev**), annotation with **SAM 3**, monocular depth with **DAV2**, and domain randomisation based on Akkaynak-Treibitz equation, used to train **YOLO26x** detectors without real annotations.
- An earlier Unreal Engine 5 route is kept as a separate repository.
- Dissertation: msc-thesis-rithish.vercel.app Code: ImgGen_AI, Shallow_Seabed.

WorldForge: warehouse world-building and AMR simulation (prototype) 2026

- AI based workspace for editable 3D warehouse scenes, several robot configurations and mission start/goal selection; occupancy-based A* planning with collision-aware smoothing, executed in MuJoCo with measured trajectory distance, simulation time, contacts, clearance and goal error; scenario import/export and trajectory replay.
- Source: github.com/rithish007/WordForge.

ROS2 TurtleBot SLAM navigation Apr – May 2026

- ROS2 (Jazzy) package for a TurtleBot Waffle: real-time occupancy-grid SLAM from 2D LiDAR and D* Lite dynamic planning; built to navigate an arena within 90 seconds and tested in Gazebo and on the physical robot.

CUSUM fault detection for aircraft navigation Mar – May 2026

- Two-sided CUSUM monitoring of six IMU channels on a random-walk EKF estimating accelerometer and gyroscope bias faults; multi-objective optimisation over 200 Latin Hypercube samples reduced false alarms from 105 to 0 with comparable detection delay.

Autonomous mobile manipulator Oct – Dec 2025

- Designed in Fusion 360 and 3D printed; odometry-based localisation from ultrasonic sensors and wheel encoders, finite-state-machine task execution and a 2-DOF manipulator that marked a target on a board.

Bachelor thesis: 3D path planning in procedurally generated terrains Jan – Mar 2025

- Compared A*, RRT, RRT* and D* on Perlin-noise terrains under partial environmental knowledge, trading off computation, path optimality and adaptability.

Explainable AI for cancer cell classification Apr – May 2026

- ResNet18 and DenseNet121 classifiers on microscopy images, with Grad-CAM, Grad-CAM++, EigenCAM and ScoreCAM explanations (ScoreCAM performed best).

Level 2 Real Time Digital Twin for FDM Additive Manufacturing Anomaly Detection

- Built a real-time digital twin with two way Firebase data communication to detect process deviations as they occur.
- Implemented Random Forest (77%) and XGBoost (76%) classifiers for automated anomaly inspection.

- Developed a Unity 3D app for live state visualisation and bidirectional control.

Vision Assisted Delta Robot MVP

- Owned hardware bring up: wired and soldered the custom PCB linking a Jetson Nano to the stepper motor drivers and implemented the Python motor control layer.
- Integrated RGBD based object detection (93% accuracy) for pick and place.
- Managed cross functional delivery across perception, electronics, and control sub teams on a fixed commercial MVP timeline.

PUBLICATIONS (SCOPUS-INDEXED)

- Digital Twin based Real-Time Anomaly Detection for FDM Additive Manufacturing - Springer, ICAARS (2025, accepted)
- Integration of UAV Systems with Machine Learning for Wildlife Monitoring - IGI Global (2024)
- A Novel Adaptive Framework for Immersive Learning Using VR in Education - Wiley Scrivener (2024)
- Collaboration of Mixed Reality for Interactive Visualization of Ocean Mapping - IEEE Xplore (2023)
- Industry 5.0: Enhancing Human-Robot Collaboration through Collaborative Robots - A Review - IEEE Xplore (2023)
- Enhancing Human-Cobot Interaction with Mixed Reality: A Futuristic Review - IEEE Xplore (2023)

TECHNICAL SKILLS

- **Robotics & Perception:** ROS2, SLAM, Localisation, Sensor Fusion, 3D Scene Graph (3DSG)
- **Simulation & CAD:** Unreal Engine, Unity 3D, Fusion 360
- **Machine Vision:** PyTorch, Multimodal AI (LLM, VLM), Image Processing, Gen AI
- **Spatial Representation:** 3D Scene Graphs, depth back projection, temporal object association, point clouds.
- **Programming:** Python, C, C++, C#, Git, Linux
- **Agentic AI tools:** Local LLMs - Qwen, Nemotron 3
- **Embedded & Hardware:** embedded control, sensor & actuator interfacing, Jetson Nano, RPi
- **Languages:** English (C1)

WORK EXPERIENCE

Digital Innovation Zone Advisor - Siemens Excellence Centre, UK *Oct 2025 – May 2026*

- Operated an UR5e collaborative arm, in a Siemens standardised industry environment.
- Mentored students on cobot operation, CAD design using Siemens NX, and 3D printing.

Unity Developer (AR/AI Systems) - Schnell Energy Equipments, India *Jul 2024 – Mar 2025*

- Owned development of a real-time AR monitoring platform in Unity for real time streetlight monitoring.
- Built live sensor data pipelines and real time state visualisation.
- Integrated YOLOv8 semantic segmentation (92% accuracy) for streetlight monitoring.

Graduate Innovation Engineer - Forge Innovation & Ventures, India *Dec 2023 – Jun 2024*

- Selected as Innovation Fellow under a 100% scholarship; led a multidisciplinary team of 7 to deliver a vision assisted delta robot MVP for pick and place packaging automation.
- Delivered the MVP on a fixed deadline for live evaluation by external innovation experts at the incubator's Innovation Expo; without the control logic being finished in time, the MVP would not have shipped.

REFERENCES

- **Dr Jonathan M. Aitken** - School of Electrical and Electronic Engineering, University of Sheffield;
  MSc thesis supervisor. Email: jonathan.aitken@sheffield.ac.uk
- **Dr Lyudmila S. Mihaylova** - School of Electrical and Electronic Engineering, University of Sheffield;
  Professor of Machine Vision. Email: L.S.Mihaylova@sheffield.ac.uk

OTHERS

- Photographer and a Home Chef.