

Midhun Rajeev

Robotics & Embedded Systems Engineer

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Mechatronics engineer with 5+ years of hands-on experience building and validating robotic and embedded systems on real hardware. Practical background in ROS-based autonomous navigation, sensor fusion and vision-based object tracking, combined with Python/C++ software engineering, data-driven modelling and statistical evaluation of experimental results. Completing an M.Eng. in Mechatronic and Cyber-Physical Systems at Deggendorf Institute of Technology in September 2026, with the goal of moving into applied robotics research and a subsequent doctorate.

Education

M.Eng. Mechatronic and Cyber-Physical Systems

May 2023 – September 2026

Deggendorf Institute of Technology (THD), Bavaria, Germany

- Focus areas: advanced robotics, autonomous systems, embedded systems, software development, networking, cyber-physical systems, functional safety

B.Tech. Mechanical Engineering

Aug 2015 – Sep 2019

APJ Abdul Kalam Technological University, Kerala, India

Robotics & Research Projects

Autonomous Object-Tracking Mobile Robot (ROS)

Academic project

- Designed and implemented a full ROS navigation and tracking stack for real-time autonomous operation on a differential-drive platform
- Developed sensor-fusion pipeline combining depth camera and ultrasonic range data for robust environmental perception
- Integrated a YOLO deep-learning detector for object detection and classification; tuned the tracking control loop for stable following behaviour
- Verified performance across varied indoor scenarios and lighting conditions, iterating on parameters from measured tracking error
- *ROS, Python, C++, YOLO, OpenCV, sensor fusion, Linux*

Data-Driven Process Modelling for Precision Machining

Research project

- Built regression models (XGBoost, Random Forest, artificial neural networks) to predict surface quality from process parameters
- Planned the experimental campaign using a structured L18 design of experiments; performed statistical evaluation, error analysis and model comparison
- *Python, scikit-learn, XGBoost, pandas, matplotlib, DoE, statistical analysis*

Pipe-Climbing Inspection Robot

Academic project

- Developed an autonomous climbing robot for industrial pipe inspection, able to traverse vertical and horizontal runs across varying diameters and materials
- Designed the adaptive gripping mechanism and multi-directional locomotion strategy; implemented the embedded control firmware and a real-time mobile control interface
- *ESP32, C++, mechanism design, Wi-Fi communication, Android app*

Autonomous UV-C Disinfection Robot for Hospitals

Academic project

- Built a compact mobile robot for automated room disinfection with real-time navigation, UV-C dosing control and interlock-based safety measures
- *ESP32-CAM, Arduino Nano, sensor integration, embedded C++, mobile app control*

Compound Cycloidal Gearbox – Parametric Design Study

Personal research project

- Derived and implemented the eccentric/cycloidal disc geometry as a fully parametric model, covering split-shaft layout, ring-pin construction and bearing integration
- Relevant to high-ratio, low-backlash actuation for robotic manipulator joints
- *Parametric CAD scripting (Lua), mechanism kinematics, mathematical modelling*

Vision-Based Defect Inspection in Mixed Reality

Personal research project

- Trained and deployed a YOLOv8 detector for on-device visual defect detection through a head-mounted passthrough camera
- Built a PyQt5 tool for training-image capture, labelling and dataset curation; handled model conversion and runtime inference integration
- *YOLOv8, Python, PyTorch, Unity, PyQt5, dataset engineering*

Professional Experience

Working Student – Embedded Software Engineer

ITronic GmbH, Stuttgart, Germany

Mar 2024 – Oct 2025

- Developed and maintained firmware for embedded devices in C, C++ and Lua across the full cycle, from requirements analysis through implementation to deployment
- Supported real-time system development with particular focus on timing constraints, interrupt handling and deterministic behaviour
- Designed fully automated calibration systems for embedded devices, cutting manual calibration effort by 80%
- Carried out systematic testing and debugging on real hardware using oscilloscopes, logic analysers and JTAG debuggers
- Integrated software with hardware subsystems to meet performance and reliability targets; documented firmware specifications and maintained the codebase under Git

Hardware Engineer

Protocod Embedded Solutions, India

Apr 2020 – Oct 2022

- Developed embedded systems on ESP, STM32, Raspberry Pi and Arduino platforms, from schematic and PCB layout through firmware to validation
- Designed and implemented communication interfaces including SPI, I2C, UART and CAN, plus Wi-Fi, Bluetooth and LoRa wireless links
- Built automated test frameworks in Python and LabVIEW for hardware validation, and used Python, C/C++ and MATLAB for firmware, data analysis and system programming
- Implemented power-management strategies for battery-operated devices; produced schematics, BOMs and technical documentation

Technical Skills

Robotics & middleware	ROS / ROS 2, TurtleBot3, navigation & motion planning, sensor fusion, mobile robot kinematics
Programming	Python, C++, C, Lua, MATLAB; Linux, Bash
AI / ML & perception	YOLO / YOLOv8, OpenCV, PyTorch, scikit-learn, XGBoost, Random Forest, ANN
Modelling & analysis	Control and regulation fundamentals, system modelling, FFT / PSD signal analysis, design of experiments, statistical evaluation
Software engineering	Git version control, modular design, code review, automated testing, technical documentation, $\LaTeX$
Hardware & lab	STM32, ESP32, Raspberry Pi, Arduino; SPI, I2C, UART, CAN; oscilloscopes, logic analysers, JTAG
CAD & simulation	SolidWorks, AutoCAD, Ansys, Altium Designer, Proteus, LabVIEW; PyQt5 simulation & tooling GUIs

Languages & Personal Details

Languages

English (C1) | German (A2, actively improving) | Malayalam (native)