

Muhammad Harish

Robotics Researcher

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ABOUT ME

Robotics Researcher focused on autonomous robotic systems, specializing in LiDAR-inertial SLAM, visual-inertial odometry, and motion planning for GPS-denied navigation. Developed and deployed full autonomy stacks on aerial and legged robots in real-world environments. Graduated Rank 1 of 180 (GPA 3.96/4.00), and received the ALMI National Thesis Award for research on reinforcement learning-based hexapod locomotion.

RESEARCH INTERESTS

LiDAR-Inertial SLAM & Sensor Fusion | Visual-Inertial Odometry | Autonomous Navigation in GPS-Denied Environments | Motion Planning & Obstacle Avoidance | Reinforcement Learning for Legged Locomotion | Embedded AI & Edge Computing for Robotics

TECHNICAL SKILLS

Robotics Frameworks: ROS1, ROS2, PX4, Linux (Ubuntu)

Planning & Control: Path-Planner, PID, RL, Inverse Kinematics

Embedded Systems: Jetson Orin/Xavier/Nano, Raspberry Pi

Localization & SLAM: LiDAR-Inertial SLAM, Visual-Inertial Odometry

Programming: Python, C++

Sensors: LiDAR, IMU, Stereo Camera, RTK GNSS

EDUCATION

Bachelor of Electrical Engineering — Control Systems, Robotics & AI

Sep 2021 – Aug 2025

Universitas Pertamina, Jakarta, Indonesia

- GPA: 3.96/4.00 — Summa Cum Laude | Rank 1 of 180 in Faculty of Engineering
- Thesis: "Integration of Kinematics and Reinforcement Learning for Hexapod Locomotion"
- Specialization: Control Systems, Robotics, Artificial Intelligence, Embedded Systems, Automation

RESEARCH EXPERIENCES

Robotics Researcher

Jun 2025 – Present

Lab Inovasi Nusantara — Jakarta, Indonesia

- Designed and deployed Skyline X490L autonomous inspection drone for GPS-denied environments, integrating Jetson Xavier NX, Pixhawk Cube, and Livox Mid-360 LiDAR in a spherical protective frame.
- Implemented full autonomy stack in ROS/Ubuntu: FAST-LIO2 (LiDAR-inertial SLAM), VINS-Fusion (VIO), and EGO-Planner (3D path planning and obstacle avoidance).

Robotics Engineer — R&D

Sep 2024 – Present

PT Prima Medika Laboratories (Pharos Group) — Jakarta, Indonesia

- Conducted R&D on robotic and autonomous systems for industrial pharmaceutical environments, focusing on perception, embedded control, and autonomous navigation.
- Designed semi-autonomous ASRS (Autonomous Storage & Retrieval System) with ROS-based LiDAR obstacle detection, path planning, and VFD-driven actuation.

Director — Robotics Student Activity Unit

Dec 2022 – Aug 2024

Universitas Pertamina

- Led 17 staff and 60 members across 15 annual programs; coached autonomous UAV and hexapod teams to national finals in KRTI and KRI (100+ competing universities).
- Managed full engineering cycles: hardware design, ROS integration, embedded firmware, and competition deployment for multiple robot platforms simultaneously.

SELECTED PROJECTS

Skyline X490L — Autonomous Industrial Inspection Drone

Jun 2025 – Present

- Designed and built a spherical-framed autonomous drone for GPS-denied environments (gold mining sites) integrating NVIDIA Jetson Xavier NX, Pixhawk Cube, and Livox Mid-360 for real-time 3D mapping.
- Implemented full autonomy stack in ROS/Ubuntu: FAST-LIO2 for LiDAR-inertial SLAM, VINS-Fusion for visual-inertial odometry (VIO), and EGO-Planner for real-time 3D path planning and obstacle avoidance.
- Awarded 2nd Place at National Drone Innovation Competition (KIDN) 2025 — Ministry of Industry & Indonesian Drone Association.
- Related Materials - [video](#).

VLSAM Drone — Vision-LiDAR SLAM for GPS-Denied Navigation

Jan 2026 – Present

- Research drone with Raspberry Pi 5 + Intel RealSense D435 (stereo+depth); deployed VINS-Fusion for robust visual-inertial SLAM in GPS-denied environments.
- Integrated ROS2 with PX4 flight control on custom 3D-printed 5-inch frame; onboard sensor logging for offline mapping and analysis.
- Related Materials - [video](#).

Skyrone V2 — Autonomous Pick and Place VTOL for Search & Rescue (KRTI 2025)

Feb 2023 – Sep 2025

- Led the design, integration, and testing of a ROS-based autonomous pick and place VTOL drone with computer vision and flight control systems for the KRTI, a national aerial robotics competition organized by the Ministry of Education
- Equipped with Livox Mid-360 LiDAR, FAST-LIO2 odometry, EGO-Planner path planning, and YOLOv11 vision pipeline; 20+ min flight endurance.
- Related Materials - [video1](#), [video2](#), [video3](#).

RETRO-BOT — Hexapod Rescue Robot with Reinforcement Learning

Dec 2022 – Aug 2024

- Developed 6-DOF autonomous hexapod combining inverse kinematics, PPO/SAC/TD3 RL gait control, and YOLOv5 victim detection on NVIDIA Jetson.
- Achieved 2nd Place at KRI 2024 KRSRI Division — National Robotics Competition, Ministry of Education.
- Related Materials - [video](#).

HONOURS & AWARDS

1st Place – National Thesis Award – Indonesian Academy of Young Scientists (ALMI)

Dec 2025

Awarded for an outstanding undergraduate thesis on integrating kinematic constraints with reinforcement learning for stable and adaptive hexapod robot locomotion in complex environments.

2nd Place – National Drone Innovation Competition (KIDN) – Ministry of Industry & Indonesian Drone Association

Dec 2025

Awarded for developing Skyline X490L industrial LiDAR mapping drone with advanced autonomous capabilities for industrial inspection in GPS-denied environments.

1st Place – Most Outstanding Student 2024 – Universitas Pertamina

Feb 2024

Recognized as the top student among 15 faculties for academic excellence (GPA 3.96/4.00), leadership, and contribution to research and innovation.

1st Place – National UAV Competition KRTI — VTOL Division – Ministry of Education and Research, Indonesia

Sep 2024

[Team Leader] Led the autonomous VTOL drone team to national finals among 100+ universities. Architected the ROS-based navigation stack integrating PX4 flight control with computer vision for precision landing and target recognition.

2nd Place – National Robotics Competition KRI — KRSRI Division – Ministry of Education and Research, Indonesia

Aug 2024

[Team Leader] National finalist in the Search and Rescue division. Led a multidisciplinary team to design a hexapod robot with ML-based victim detection and autonomous gait control for irregular terrain traversal.

1st Place – National IT & Innovation Competition GEMASTIK – Ministry of Education and Research, Indonesia

Sep 2023

[Team Leader] Led the team to national victory with RoadSense, a deep learning-based road damage detection system using optimized YOLOv5 and RealSense depth camera for real-time infrastructure analysis. Over 300 competing teams.

1st Place – National Paper Competition BARONAS – Institut Teknologi Sepuluh Nopember (ITS)

Mar 2023

[Team Leader] Developed ROAD-MAP, an IoT and edge computing-based road condition mapping system integrating deep learning for damage assessment. Awarded best technical paper.

1st Place – Airlangga Innovation Competition – Universitas Airlangga

Oct 2022

[Team Leader] Created Trafo, an AI-driven trash classification system using computer vision for sustainable waste management.

Registered IP – 5 Intellectual Properties (HAKI) – Ministry of Law and Human Rights, Indonesia

2022–2024

Five granted innovations: RoadSense (road damage detection), IRIS (AI Shrimp Counter), EMA (Smart Energy Monitor), MAP-Road (road mapping), and WeCan-See (AI Visual Assistance) — covering IoT, AI, and robotic sensing applications.

PUBLICATIONS

[2025] M. Harish. "Implementation of Reinforcement Learning on a Hexapod Robot." Undergraduate Final Thesis, [Repository Pertamina University](#).

CERTIFICATIONS & LANGUAGE

TOEFL ITP: Score 583 — Universitas Pertamina, February 2025

Indonesian: Native

English: Professional working proficiency