Mohammed

Robotics Engineer

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Summary

- Robotics engineer building autonomous ground robots and drones in ROS 2 and simulation. Tuned Nav2 for a client robot to 30 of 30 benchmark runs, built multi-robot Gazebo simulation for up to 8 robots, and flew PX4 offboard laps that repeat within 6 cm.

Experience

Upwork (remote), Freelance Robotics Engineer — June 2025 – present, 1 year 6 months

- Unitree L2 LiDAR SLAM (solo): selected and integrated the SLAM stack for the client's solid-state LiDAR (Point-LIO odometry with a GTSAM pose-graph back-end), set up its UDP driver and IMU, and handed over in Docker.
- Jetacker Nav2 tuning (solo): built the simulation and Nav2 stack as about 20 Docker containers and tuned planners, costmaps and obstacle avoidance with a structured method to 30 of 30 runs on the walls map and 26 of 30 with obstacles; patched a `use_sim_time` deadlock in `robot_localization` from source; reported an integrity problem in the client's data.
- SkyHunter multi-robot UGV simulation (team; my parts: simulation, communication, localization and navigation): built the Gazebo simulation from the robot's CAD (STEP) files, with LiDAR, IMU, GPS and gimbal cameras and spawning of up to 8 robots; set up EKF localization, GPS in the local frame with `navsat_transform`, Nav2 and a 27-frame TF tree; wrote the communication package, a failover state machine across WiFi, LTE and LoRa with measured latency.
- erthbot thermal inspection (team): built the UI of a deployed solar-panel thermal inspection system.
- SLAM tutoring (1-on-1): pose-graph optimization, factor graphs and LiDAR-inertial odometry.

Addis Ababa University, Part-time Lecturer, Robotics — Ethiopia, Sept 2026 – present, 3 months

- Introduction to Robotics and Intelligent Systems (fourth-year BSc Software Engineering): lectures and weekly labs, from robot motion and control and sensing to Kalman filtering, localization and mapping, and path planning, run on a simulated mobile robot in ROS 2 and Gazebo.
- Robotics and Intelligent Systems (MSc in Artificial Intelligence), lab assistant: ROS 2 labs on simulation, perception, sensor fusion and SLAM, and robot arm motion planning with MoveIt 2.
- Lab material published on GitHub.

Samara University, Assistant Lecturer, Electrical and Computer Engineering — Ethiopia, Nov 2021 – present, 5 years 1 month

- Teach undergraduate courses in C++ programming, Python, operating systems, relational database systems and VLSI design.

High-School STEM Program, Samara University, Instructor and Coordinator — Ethiopia, Nov 2021 – Nov 2023, 2 years 1 month

- Coordinated and taught a weekend STEM program across two cohorts: Arduino, electronics, programming, 3D printing and wheeled robots, ending in team capstone projects.
- Mentored student teams that won 1st place at a national innovation competition (2023).

Elamiso Consulting, Co-Founder (part-time) — Ethiopia
- Software and IT consultancy: ERP implementation on Odoo and software deployment. — Jan 2020 – Dec 2023, 4 years

ICT Business Application Development, Samara University, Software Developer — Ethiopia
- Developed the university's business applications in Java and Spring Boot (microservices, PostgreSQL). — Nov 2018 – Oct 2021, 3 years

Projects

MSc thesis: robust pose-graph optimization — in progress

C++17, GTSAM, g2o
- Correlation-aware robust pose-graph optimization; baseline campaign of robust back-ends (GNC, DCS, Switchable Constraints) with my own precision, recall, ATE and RPE evaluator.

PX4 track pacing drone

PX4 SITL, ROS 2, MAVROS, Gazebo Harmonic, Python
- A drone that flies a configured route lap after lap: offboard flight node with a state machine, track geometry with velocity and acceleration feed-forward, and a Gazebo world generated from the same geometry. Laps 2 and 3 within 6 cm of each other (PX4 flight log). Video on YouTube.

Mengabot multi-robot simulation

ROS 2, Gazebo Harmonic
- A modular multi-robot ground platform in simulation, reusable for any ground robot, running up to 8 robots. Video on YouTube.

Mengabot camera perception

C++, ONNX Runtime, ROS 2, Gazebo Harmonic
- YOLOv8 detection, ByteTrack tracking and a Kalman-filter target estimator with lead point. On a 0.275 m target crossing at 0.5 m/s, 5 m away: detected in 194 of 194 images, tracked in 133 of 137 messages, position median error 0.19 m, velocity 0.49 m/s against 0.5, against simulation ground truth.

Education

MSc **Addis Ababa University**, Artificial Intelligence — Ethiopia
- Expected December 2026. Thesis in progress: robust pose-graph optimization for SLAM. — Aug 2023 – Dec 2026
- Coursework: Artificial Intelligence, Machine Learning, Deep Learning, Computer Vision, Reinforcement Learning, Probabilistic Graphical Models, Natural Language Processing, Distributed Systems for AI, Cognitive Science.

BSc **Eritrean Institute of Technology**, Computer Engineering — Eritrea

Technical Skills

State estimation and sensor fusion: EKF (robot_localization), particle filters, factor graphs and pose-graph optimization (GTSAM, g2o), robust estimation (M-estimators, GNC, IRLS, DCS, Switchable Constraints), Lie groups SE(3), IMU processing and time sync, GNSS with navsat_transform

SLAM and mapping: LiDAR-inertial SLAM (Point-LIO), loop closure, globally consistent mapping, TF chains, geographic frames (WGS84, ENU, UTM), evaluation (ATE, RPE)

Navigation: Nav2 tuning and benchmarking (costmaps, controller, planner), MCL/AMCL

Simulation: Gazebo Harmonic, multi-robot simulation, URDF/Xacro, CAD to robot model, wireless link simulation

Drones: PX4 SITL, offboard control with MAVROS, ArduPilot SITL

Perception: YOLOv8 in ONNX Runtime (C++), ByteTrack, Kalman-filter target estimation, PCL

Programming and tools: C++17, Python, ROS 2, PyTorch, Docker, Git, Linux, FastAPI

Teaching and technical writing: University teaching since 2021, lab material, client technical reports

Achievements

- Student teams I mentored and coordinated won 1st place at a national innovation competition, 2023.