

Munawar Kazmi

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Profile

Robotics and AI engineer (MSc AI and Robotics, Commendation) working on AI reliability and human-robot interaction. Two archived, citable preprints and HRI research on the JD humanoid. Every published number is reproducible from a public, CI-tested repository, each with a plain-language guide.

Featured Research

legibility-bounds: certified limits on legible motion 2026 · github.com/munawarkazmi/legibility-bounds
Sole author. Python, computational geometry, exact predicates. Preprint for IEEE RA-L.

- Proved a ceiling **no trajectory within the path budget can exceed**, not the clarity one search happened to find; **32 of 32 certified intervals hold, zero violations**, widest gap 0.0567.
- The same argument prices safety: **3 of 8 keep-out pairs certify a positive cost**, the other 5 certify nothing and say so, which no comparison of two searches can establish.

plan-failure-bench 2026 · github.com/munawarkazmi/plan-failure-bench
Sole author. Python, PDDL, differential testing, CI. Working paper on Zenodo.

- Designed **60 proof-carrying instructions** over two symbolic environments; every ground-truth label is a mechanical proof re-verified by **548 CI tests** on each commit.
- Judge-free scoring**: a deterministic checker, differentially tested against an independent PDDL toolchain, assigns one verdict per response; detection is never reported without its paired false positive count.
- Ran an **18-run grid over four models**, plain and semantically obfuscated; the versioned obfuscation caught and retired two artefacts of its own first token scheme.

Trust-calibrated HRI on the JD humanoid, MSc thesis 2023 - 2024 · University of Hertfordshire
Isaac Sim digital twin, ROS2, physical deployment. Supervised by Dr Patrick Holthaus.

- Built a sim-to-real pipeline transferring verbal and non-verbal intent communication to physical hardware; measured a **significant clarity effect** (4.9 vs 5.8 on a 7-point scale, $p = 0.017$, $d = 0.58$) in user trials.

Selected Projects

llm-nav-shield: detect, recover, or halt 2026 · github.com/munawarkazmi/llm-nav-shield

- Neurosymbolic shield composing two verified cores: a deterministic verifier caught **35/35 and 32/32 unsafe LLM proposals with zero misses** (qwen2.5-7B, Llama-3.3-70B), and a provably-correct planner recovered **38/38** to verified-safe paths, with **10/10 correct halts** where no safe path exists and **zero unsafe trajectories forwarded**; every number replayed in CI.

ROS2 path planning: A* and D* Lite for Nav2 2025 - 2026 · github.com/munawarkazmi/ros2-dynamic-path-planning

- ROS-free C++20 planning core with Nav2 plugin adapters; over a seeded 200-trial blocked-route benchmark D* Lite replans **4.3x faster on average, 11x on the median**, path costs matching on **all 1,716 measurements**, optimality fuzz-validated against Dijkstra over 185,237 replans.

Experience

Full-Stack Software Engineer (Contract), Safina International Multan, Pakistan; Jul 2026 - present
Sole engineer of a live seven-role platform: billing, payroll, append-only ledger under PostgreSQL RLS.

Visiting Lecturer, AI and Robotics, Pak-Turk Maarif Schools Multan; Aug 2025 - present

- Designed and taught an applied ML curriculum for **30+ students**; project teams reached **92% model accuracy**, a **28% average error reduction** over their first working baseline.

Embedded Systems Engineer (Contract), Muxtronics Multan, Pakistan; Jan 2025 - May 2025
Deterministic C++ ESP32 firmware and a LoRa mesh, sub-3-second alert latency at 100 m, shipped in a safety-critical product.

Robotics Integration Specialist, Robot House, University of Hertfordshire Hatfield, UK; Jan 2024 - May 2024

Research Associate, University of Hertfordshire Hatfield, UK; May 2023 - Dec 2023
Optimised TensorFlow LLM inference for the Unitree Go1 quadruped, cutting latency 29% across 200 trials.

Embedded Systems Intern, National Centre of Robotics and Automation Islamabad; Mar 2022 - Apr 2022

Education

MSc Artificial Intelligence and Robotics, Commendation, University of Hertfordshire 2023 - 2024

BEng Mechatronics Engineering, National University of Sciences and Technology (NUST) 2018 - 2022

Publications

Kazmi, M. (2026). Certified Bounds on Achievable Legibility under a Path Cost Budget. Preprint for IEEE Robotics and Automation Letters, Zenodo. DOI 10.5281/zenodo.21834955.

Kazmi, M. (2026). plan-failure-bench: A Machine-Checkable Benchmark of How Language Model Planners Fail. Working paper, Zenodo. DOI 10.5281/zenodo.21756817.

Kazmi, M. (2025). Enhancing Human-Robot Companionship: Comparing Verbal and Non-Verbal Communication Cues in Humanoid Robots. MSc thesis research, University of Hertfordshire.

Technical Skills

Robotics and systems: C++20, Python, ROS2 (Nav2, plugins), differential and property-based testing, CI/CD, Docker

AI and simulation: PyTorch, TensorFlow, TensorRT, LLM evaluation and integration, Isaac Sim, MuJoCo, Gazebo, Unity

Embedded and full-stack: ESP32, LoRa mesh, bare-metal C/C++, Jetson, React, TypeScript, PostgreSQL