

Ali Batuhan Özürmeli

Software Engineer · Perception, Embedded AI & Full-Stack Systems

Hatay, Turkey | +90 535 831 1473 | alibatuhan404@gmail.com

linkedin.com/in/mralibatu | batuhanozurmeli.com | github.com/mralibatu

Available immediately



PROFILE

Software engineer working across three areas that usually stay separate: LiDAR perception and sensor security on embedded hardware, applied machine learning and signal processing, and production backend and full-stack systems. Built ROS2 perception pipelines for unmanned ground vehicles on NVIDIA Jetson, designed a novel frequency-domain method for detecting LiDAR spoofing, and independently shipped multi-tenant SaaS platforms now running in production. Most drawn to problems where the method exists only on paper or inside a lab — designing the approach, building the hardware and signal chain it needs, and getting it to hold up on real data outside controlled conditions.

PROFESSIONAL EXPERIENCE

Freelance Software Developer

Self-employed · VeraHQ, Turkey | 10/2025 – present

- **Limon Akademi** — multi-tenant K-12 education platform now in production (NestJS / TypeScript, React, PostgreSQL 18; 28 tables, 142 REST endpoints, four user roles): Row-Level Security tenant isolation, opaque-token sessions with Argon2id and TOTP MFA, dependency-free HTML and image sanitisers, and ~420 automated tests across four layers.
- **Vera** — clinical management and decision-support system for audiology clinics on a PostgreSQL + Neo4j hybrid: AES-256-GCM encrypted patient data, weighted graph traversal for differential diagnosis, mobile QR stock intake streamed to the desktop over server-sent events, and a hash-chained append-only audit log enforced by database trigger, with post-deploy smoke tests that trigger automatic rollback on failure.
- **LQ** — cognitive training platform (Flutter + Flame client, NestJS API, Python worker). Turned a GPU-less server constraint into a PostgreSQL job queue using FOR UPDATE SKIP LOCKED with adaptive worker backoff, avoiding a message broker entirely; built a pgvector retrieval pipeline that injects rule-based domain interpretations into the prompt and penalises the model's self-reported confidence against objective system state.
- **Şeffaf Şehir** — multi-tenant citizen reporting platform sold to municipalities (NestJS / TypeScript, Next.js 16 PWA, PostgreSQL 16 + PostGIS; 93 endpoints, 18 tables, 35 migrations, 76 test cases against a real PostGIS instance in CI). Enforced the core privacy rule — reporter identity visible only to institutions — in the type system rather than by convention, splitting citizen- and institution-facing queries into repository classes that cannot reach each other at compile time; added tenant isolation through PostgreSQL Row-Level Security with a connection pinned per request via AsyncLocalStorage.
- **Mentoring** — advise other developers and teams on architecture, database design and security for their own projects.

Software Engineering Intern

Beyond Technologies, Ankara | 07/2024 – 08/2024 · 06/2025 – 09/2025

- Built an end-to-end ROS2 perception pipeline for unmanned ground vehicles using LiDAR/camera sensor fusion and the Cylinder3D semantic segmentation architecture.
- Trained and optimised segmentation models on the WildScenes dataset with MMDetection3D, then deployed them for real-time inference on NVIDIA Jetson Orin Nano.
- Reduced on-device inference latency through ROI filtering and model export experiments (ONNX / TensorRT) to bring the pipeline within real-time constraints on Jetson hardware; validated autonomous navigation in structured field tests.
- Invited back for a longer second placement with independent ownership of the perception stack.

Community Co-Lead & Volunteer Instructor

Hello World, Adana | 2024 – 06/2026

- Designed and taught 20+ hands-on workshops in Java, Python and web development, reaching over 300 individual students; organised technology events and industry collaborations.

EDUCATION

B.Sc. Software Engineering — 100% English-taught programme

Adana Alparslan Türkeş Science and Technology University, Turkey | 09/2021 – 06/2026

- Graduated 15 June 2026 · GPA 3.1 / 4.0
- Thesis: "Detection of Spoofing Attacks in LiDAR Sensors via Frequency-Domain Analysis" (48 pp.), supervised by Assoc. Prof. Dr. Fatih Kılıç

SELECTED PROJECTS

SHIELD — Spectral Hybrid Interference Elimination LiDAR Defense

Bachelor's thesis | 2025 – 2026

- Closed a gap in the LiDAR spoofing literature: published defences rely on temporal or motion cues across consecutive frames and collapse when the vehicle is stationary. A systematic review (IEEE Xplore, ACM DL, arXiv, 2017–2025) found no time–frequency analysis applied to LiDAR security.
- Introduced Short-Time Fourier Transform analysis of raw sensor returns as the detection primitive, making detection motion-independent and possible from a single frame; adapted STFT to LiDAR by solving circular angular boundary conditions and sparse point-cloud resampling.
- Designed a dual-spectrogram pipeline — Range spectrogram for spatial discontinuity, Intensity spectrogram for interference chaos — feeding a 9-feature Random Forest, with CFAR adaptive thresholding, a safety clamp and hysteresis logic that raised detection recall from 34% to 93%.
- Diagnosed and fixed a catastrophic domain gap: a model scoring 97.1% in simulation collapsed to 8.2% on real sensor data with over 90% false positives. Built a trace-based injection method to place synthetic attacks onto authentic UGV captures, producing a 3,836-sample hybrid dataset that recovered real-world accuracy to 79.3%.
- Final system: 81.6% accuracy, 94.1% precision, 87.3% recall, 3.1% false positives on real clean frames and 38.8 ms per frame — inside the 100 ms budget of a 10 Hz LiDAR. Published methods report higher headline figures but are validated in simulation or laboratory conditions; these are measured on authentic sensor captures.

PlantSense — IoT Acoustic Plant Stress Detection

Samsung Innovation Campus | 2024 – 2025

- Ultrasonic cavitation sensing of plant water stress is established in the literature but confined to the lab, requiring instrumentation costing thousands of euros. Reproduced it on under €10 of hardware — a custom piezo circuit with a signal-conditioning stack on a Raspberry Pi Pico W — turning a laboratory technique into a deployable irrigation sensor.
- Applied FFT analysis to isolate plant signals from ambient noise, separating stressed from healthy states with a decisive event-rate margin (173.5 vs. 2.5 events/hour).

ADDITIONAL PROJECTS

- **Livora** — Flutter vocabulary-learning application with a spaced-repetition study flow and its own Node.js API.
- **Not Arkadaşım** — Flutter application for students to share course notes with one another, built around peer networking rather than one-way content delivery.
- **MindCare AI** — AI-assisted therapy assistant; the entry that reached the Regional Stage of the Huawei ICT Competition.
- **AfetLink** — NDN-based emergency communication protocol with a compressed 5-byte message format, built at a disaster management hackathon.

TECHNICAL SKILLS

Perception & Robotics: ROS2, LiDAR/camera sensor fusion, 3D point cloud segmentation, Cylinder3D, MMDetection3D, CARLA, Velodyne VLP-16, Open3D, PCL

Machine Learning & AI: PyTorch, scikit-learn, feature engineering, model optimisation and quantisation, ONNX, TensorRT, CUDA, NumPy, Pandas, self-hosted LLMs (Ollama, Qwen2.5), RAG (LlamaIndex, pgvector)

Signal Processing: FFT, STFT, spectrogram analysis, CFAR adaptive thresholding, median filtering, morphological operations, embedded acoustic sensing

Embedded & Hardware: NVIDIA Jetson Orin Nano, Raspberry Pi Pico W / RP2350, Arduino, custom analogue sensor circuits, real-time on-device inference

Backend: NestJS, Express, Node.js, TypeScript, REST API design, TypeORM, Kysely, session security (Argon2id, TOTP/MFA, opaque tokens, refresh rotation)

Databases: PostgreSQL (Row-Level Security, PostGIS, pgvector, pgTAP, partitioning, triggers), Neo4j / Cypher, SQL, schema design, migrations

Frontend & Mobile: React, Next.js, Vite, TanStack Query, Tailwind, i18next, Flutter (Riverpod, GetX, Flame), MapLibre

Infrastructure & Testing: Linux, Docker & Docker Compose, Caddy, nginx, PM2, GitHub Actions, Git; Jest, Vitest, Playwright, supertest, pgTAP; deploy, rollback and verified backup pipelines

Programming: Python, C++, C, TypeScript, JavaScript, Java, Dart, C#

LANGUAGES

Turkish: Native · **English:** Full professional proficiency (100% English-taught degree)

ACHIEVEMENTS

Huawei ICT Competition — advanced to Regional Stage (2024)

REFERENCES

Assoc. Prof. Dr. Fatih Kılıç — thesis supervisor, Dept. of Electrical & Electronics Engineering, Çukurova University · fkilic@cu.edu.tr

Mehmet Tuğgüm — Chief Engineer, Calibration & Weighing Systems, İSDEMİR · mtuggum@isdemir.com.tr