Berke Tunc

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Education

The University of Manchester — Manchester, UK
BSc (Hons) Computer Science and Mathematics — Expected First Class — *Sep. 2025 – June 2028*
Relevant Coursework: Linear Algebra, Probability, Statistics, Data Science

Experience

Junior Controls Engineer — Manchester, UK
Manchester Stinger Motorsports | *Formula Student* — *2025 – Present*

- Diagnosed and fixed controller failures preventing the autonomous vehicle from completing the acceleration event in simulation, taking the car from failing at track start to reliably finishing the full track autonomously.
- Re-architected a standalone bicycle-model vehicle dynamics simulator into a ROS2-based simulation, enabling the autonomous control stack to be developed and tested in closed loop without the physical vehicle.
- Streamlined a multi-module perception–planning–control research stack in **ROS**, cutting end-to-end inference latency by **18 ms** and inter-module communication overhead by **15%**.
- Analyzed sensor data from **40+ autonomous test runs** to identify controller failure modes.

Nonlinear Time-Series Research Paper (Co-Authored with Engin Kandiran) — Istanbul, TR
Yeditepe University | *Presented at CHAOS 2025 International* — *May 2024 – Jun 2025*

- Co-authored a reviewed paper on nonlinear time-series analysis and chaos theory, modelling system sensitivity and chaotic dynamics across environmental datasets spanning **5 cities and 3 years of observations**.
- Produced reproducible **Python research pipelines** encompassing automated preprocessing, statistical feature extraction, and visualisation across **5 dataset variants**.
- Composed findings from **20+ academic sources** to establish methodology, contributing directly to the paper's experimental framework and evaluation criteria.

Projects

AviationSim | *Python, ROS2, PX4, Gazebo, MAVSDK, OpenCV, Isaac Lab* — June 2026 – Present

- Pivoted the project into a classical-vs-reinforcement-learning research comparison: built and validated a GPU-parallelized Isaac Lab RL training environment (verified on an RTX 5070) to train a residual policy on top of the classical controller, confirming environment correctness via controlled ablations (isolating a 2D vs 3D action-space bug and a missing boundary-geometry bug) before committing to a full training run.
- Diagnosed a monocular visual-inertial odometry (OpenVINS) divergence to a degenerate rotation-only initialization motion; fixed it by adding lateral translational excitation, cutting divergence from unbounded (12s to nonsense) to 14x slower bounded drift, and shipped a live ground-truth-vs-estimate watchdog for safe auto-abort.
- Built a full LiDAR-based 3D obstacle-avoidance pipeline (16-channel LiDAR, Octomap occupancy mapping, 3D A* planner to MAVSDK trajectory follower), demonstrating verified collision-free autonomous flight through a staggered 3-row pillar slalom.
- Engineered a GPS-denied, vision-based precision-landing controller (OpenCV/solvePnP ArUco pose estimation feeding a cascaded PI velocity control law over PX4/MAVSDK at 20 Hz), enforcing GPS independence at the control-law level rather than the state estimator.

Legal Assistant Chatbot, yapayuzuv | *Redis, PostgreSQL, FastAPI, SwiftUI* — May 2026 – Present

- Architected and shipped a production AI chatbot (iOS) that queries 15+ live Turkish government/court APIs via a FastMCP server and synthesizes cited legal answers using a 3-stage agentic pipeline with Anthropic's Claude API.
- Enforced registration security: bcrypt password hashing, symbol/length/complexity rules, and DNS MX record validation to block fake email domains at sign-up.
- Deployed FastAPI backend on Hetzner VPS (nginx, SSL, PostgreSQL, Redis).
- Built an internal admin panel with live log viewer, feedback analytics, and 30-day bar chart; integrated UptimeRobot uptime monitoring.

Technical Skills

Languages: Python, C/C++, SQL, Java, HTML/CSS, R
Frameworks: React, Express
Developer Tools: Git, Google Colab, ROS2, Isaac Lab, Jupyter, Docker
Libraries: PyTorch, OpenCV, pandas, NumPy, Matplotlib, XGBoost, Eigen3, raylib, doctest