Enbiya Çabuk

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Personal Info

Author of forgeNN, a deep learning framework built from scratch in Python/NumPy and published on PyPI. I am a Control and Automation Engineering student at ITU specializing in the intersection of high-performance software engineering and machine learning for autonomous systems. My work focuses on building ML systems, from implementing automatic differentiation to engineering C++ accelerated pipelines to solve complex problems in computer vision and time-series analysis for the aerospace and defense sectors.

Education

Istanbul Technical University *Istanbul, Turkey*

Control & Automation Engineering | Expected Graduation: June 2027 *Sep 2023 - Current*

- Ranked 4883rd out of 3 million people in the exam. (Top 0.16%)

Work Experience

Backend Developer *Istanbul, Turkey*

Coverse *Feb 2025 - Oct 2025*

- Worked on the backend infrastructure for a film focused social platform incubated at ITU Çekirdek.
- Designed robust RESTful APIs and optimized SQL database schemas to handle user interactions.

IT Coordinator *Istanbul, Turkey*

ITU OTOKON *Sep 2024 - Current*

- Modernized IT operations by completely redeveloping the OTOKON and ITURO websites. Replaced legacy systems with a new high-performance architecture and a MongoDB registration database.

Software Team Member *Istanbul, Turkey*

ITU GAMMA *Feb 2024 - Dec 2024*

- Researched UAV subsystem dynamics including airspeed sensors and autonomous landing algorithms to inform control design.
- Developed a responsive Flight Interface GUI using PyQt for real-time telemetry tracking and mission monitoring.

Projects

rigidRL : A 2D Rigid Body Physics Engine for Deep Reinforcement Learning *GitHub*

Developing a 2D rigid body physics engine, optimized for deep reinforcement learning integration. *October 2025 - Current*

- Developing a high-performance 2D rigid body physics engine in C++ and SDL2, optimized for deep reinforcement learning integration.
- Architecting a flexible Entity-Component System (ECS) to enable user defined robot morphologies and dynamic environmental constraints.

forgeNN: A Modern Deep Learning Framework from Scratch *GitHub | PyPI*

Sole author of a new deep learning framework, forgeNN, developed in Python. The framework is open-source and published on PyPI. *Aug 2025 - Current*

- Engineered a dynamic computation graph with reverse-mode automatic differentiation from first principles.
- Developed a full suite of modules including Transformer blocks with multi-head self-attention.
- Implemented vectorized tensor operations, achieving a 3.2x training speedup over PyTorch on MNIST benchmarks while reaching a test accuracy of >97%.

C++ Neural Network Inference Engine

A high performance C++ backend for a Python trained NN, achieving significant speedup for real time applications. *Aug 2025*

- Built C++/Eigen inference engine for MLP networks; wrapped with PyBind11 for NumPy integration, achieving 6.5x speedup.

LSTM Autoencoder for UAV Telemetry Anomaly Detection

An unsupervised deep learning system to monitor sensor data in real time and flag critical flight anomalies. *Aug 2025*

- Trained an LSTM autoencoder in TensorFlow on normal flight data to learn the signature of healthy system behavior, focusing on reconstructing sensors.
- Designed a full detection pipeline that calculates reconstruction error (MAE) and uses a statistical threshold to flag injected sensor failures.

Monocular Visual Odometry Pipeline for GPS-Denied Navigation

A computer vision system to estimate camera motion and reconstruct its trajectory from a sequence of images. *Sept 2025*

- Implemented a full visual odometry pipeline from scratch using OpenCV, processing image sequences from the KITTI dataset.
- Utilized ORB for feature detection and BFMatcher with Lowe's ratio test for robust feature matching between frames.
- Recovered camera pose (Rotation & Translation) by computing the Essential Matrix and decomposing it, chaining transformations to plot the vehicle path.

Skills

Programming Languages	Python, C++, Rust, SQL, JavaScript, HTML/CSS, MATLAB, C#
AI & ML Frameworks	NumPy, TensorFlow, PyTorch, OpenCV, SciPy, Pandas
Tools & Libraries	Git, CMake, SDL2, PyQt, Eigen, PyBind11, MongoDB, Flutter
Core Competencies	Deep Learning, Reinforcement Learning, Computer Vision, Control Theory, Automatic Differentiation

Languages

English (Professional) **German** (Intermediate) **Turkish** (Native)