

EDUCATION

Technical University of Munich, Munich, Germany	<i>Oct 2024 – Present</i>
<ul style="list-style-type: none">M.Sc. Robotics Engineering	
Sabancı University, Istanbul, Turkey	
<ul style="list-style-type: none">B.Sc. Mechatronics Engineering (Major) - GPA: 3.68/4.00B.Sc. Computer Science & Engineering (Double Major) - GPA: 3.58/4.00	<i>Sept 2019 - June 2023</i> <i>Sept 2020 - June 2024</i>
Çınar Private Science High School, Istanbul, Turkey - GPA: 97.91/100	<i>Sept 2014 - June 2018</i>

PUBLICATIONS

Paper Title: Local Path Planning with Dynamic Obstacle Avoidance in Unstructured Environments	<i>IEEE IECON 2024</i>
<ul style="list-style-type: none">Authors: Okan Arif Güvenkaya, Selim Ahmet İz, Mustafa Ünel	

RESEARCH INTERESTS

Autonomous Mobile Robotics, Swarm (Multi-Agent Systems), Unmanned Aerial Vehicles (UAVs), Reinforcement Learning, Motion Control, Path Planning, Computer Vision, Machine Learning, Deep Learning, Artificial Intelligence

WORK EXPERIENCE

Quantum Systems, Glitching, Germany Software Engineer/Swarm Developer	<i>March 2025–March 2026</i>
<ul style="list-style-type: none">Develop algorithms for multi-drone operationsOptimize algorithms for overall mission performanceUse simulations for development and then deploy to embedded LinuxFind solutions in the areas of multi-vehicle-routing, scheduling and data fusionIntegrate code into an existing ROS2 Nvidia architecture	
ASELSAN, Ankara, Turkey Intern	<i>July – Sept 2022</i>
<ul style="list-style-type: none">Conducted system identification, controller design, and controller application for a 3-degree-of freedom system named "SATCOM on the Move Antenna System".	

RESEARCH EXPERIENCE

Technical University of Munich Autonomous Aerial Systems Lab, Munich, Germany Semester Thesis	<i>Oct 2025 – March 2026</i>
<ul style="list-style-type: none">Designed and implemented optimization-based UAV trajectory planning methods within safe flight corridors under dynamic feasibility constraints.Compared STO and MIQP formulations for collision-free trajectory generation with respect to smoothness, feasibility, and runtime.Proposed a local temporal conflict-resolution method for multi-UAV operations in narrow passages.Research: Github	
Sabancı University Mechatronics Research Laboratory, Istanbul, Turkey Research Assistant	<i>July 2023 – Sept 2024</i>
<ul style="list-style-type: none">Engaged in collaborative research focused on path planning for unmanned ground vehicles in conjunction with unmanned aerial vehicles.Operating in a dynamic environment, our path planning algorithm integrates both local and global strategies.Research resulted in conference paper in conference IEEE IECON 2024.	
Sabancı University PURE, Istanbul, Turkey Research Assistant	<i>Oct 2022 – Jan 2023</i>
<ul style="list-style-type: none">PURE (Program for Undergraduate Research): Performed segmentation and mask operations on bacteria images for the deep-learning algorithm UNET.Project: Report	
Sabancı University Soft Robotics and Control Lab, Istanbul, Turkey Research Intern	<i>Sept – Oct 2022</i>
<ul style="list-style-type: none">Designed and controlled a 3D printer for the Embedded 3D Printing project.Project: Poster, Report, Video	

HONORS & AWARDS

<ul style="list-style-type: none">Dean's High Honor List, Sabancı UniversityDean's Honor List, Sabancı UniversityNational University Exam Achievement Scholarship, Sabancı University<ul style="list-style-type: none">Scholarship amount: \$81000	<i>June 2020, Feb 2021, June 2021</i> <i>Feb 2020, Feb 2022</i>
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TEACHING EXPERIENCE

Sabancı University, Istanbul, Turkey Learning Assistant PROJ 201	<i>Sept 2021 - Jan 2022</i>
<ul style="list-style-type: none">Mentored students in the Undergraduate Project Course, focusing on "Aerodynamic Optimization of a Racecar Using CFD."Conducted workshops on 3D CAD and CFD	

- Duties included conducting office hours and providing guidance to students on course materials, assignments, and laboratory work in the Introduction to Computer Aided Draft & Solid course during the summer term.

PROJECTS

Autonomous UAV Cave Exploration and 3D Mapping in Unity (ROS2)

Oct-March 2026

- Delivered an end-to-end autonomous quadrotor cave-exploration stack in Unity using ROS2, orchestrated by a mission-level FSM (takeoff → entry → exploration).
- Perception & Mapping: Depth-based perception → point cloud pipeline; online 3D occupancy mapping (OctoMap) and lantern detection integrated into the navigation stack.
- Mission Autonomy (FSM): Mission-level State Machine coordinating takeoff, cave entry/navigation, exploration modes, and recovery/transition logic.
- Exploration: 3D Frontier Detection and goal selection for autonomous exploration, coupled with the global map to drive next-best-view / target decisions.
- Planning & Control: Combined global path planning + local planning with trajectory generation (polynomial/quintic) and obstacle avoidance (OctoMap collision checks), executed via geometric SE(3) tracking controller in Unity + ROS2.
- Project: [GitHub](#)

Vision-Based Opponent Detection and Autonomous Blocking in F1TENTH Racing:

Oct – Feb 2026

- Developed a modular ROS2-based autonomous racing system on the F1TENTH (1:10 scale) platform, enabling autonomous blocking against a dynamic opponent.
- Implemented vision-based opponent detection using a YOLOv8 model trained on a custom dataset and LiDAR-based particle filter localization for accurate real-time state estimation.
- Designed multi-raceline trajectory planning and a finite-state machine (FSM) for perception-driven decision making and strategic raceline switching.
- Executed trajectories using a Pure Pursuit controller with dynamic lookahead tuning and validated the system in real-time experiments under competitive racing conditions.
- Project: [Video](#), [Report](#)

Mobile Robot Development for Intralogistics

Sept – Oct 2025

- Designed and implemented a full mobile robot stack covering kinematics, perception, control, localization, and navigation on a Raspberry Pi platform.
- Applied PID control for low-level motion, Dijkstra algorithm for global path planning, and OpenCV-based visual object detection.
- Performed multi-sensor fusion using camera, ultrasonic, and color sensors to enable reliable operation in structured indoor environments.

Autonomous Driving in ROS-based Unity Simulation

March – Aug 2025

- Designed and implemented an autonomous driving stack in ROS, integrating perception, planning, decision-making, and control modules.
- Developed path planning modules including global waypoint processing, short-term goal selection, and trajectory generation using the TEB local planner.
- Project: [Simulation Video](#)

Reinforcement Learning for Humanoid Motion Optimization

March – Aug 2025

- Modeled humanoid motion in MuJoCo using real gait data collected via motion capture system.
- Processed static and dynamic trials in OpenSim, performing scaling, inverse kinematics, and gait cycle extraction.
- Implemented a PPO-based reinforcement learning framework in DeepMind's dm_control to track human joint angles, maintain upright posture, and minimize control effort.
- Project: [Project Presentation](#)

Vision Based Motion Control of a Differential Drive Robot

Feb – June 2023

- Developed PID control for a differential drive robot, achieving target position against external disturbances.
- Designed the robot in Solidworks and implemented coding and physical control via Raspberry Pi.
- Used ArUco markers for position detection and created 2D animations.
- Project: [Report](#), [Hardware Video](#), [Simulation Video](#)

Implantation, Interaction Control, and Experimental Characterization of a Haptic Interface

Feb – June 2023 Sept 2022 – June 2023

- Designed a spherical haptic system for educational purposes, utilizing various representation methods used in robotics such as unit quaternions, rotation matrices, Euler angles and Axis-angle.
- Created a user-friendly GUI to provide a 3D rendering of the system and physical system.
- Project: [Hardware Video](#), [GUI Video](#)

Detecting Traffic Violations of Heavy Vehicles via Computer Vision

Sept 2022 – Jan 2023

- Detected traffic violations of heavy vehicles using computer vision methods.
- Employed techniques such as Hough line detection, foreground detection, noise elimination, blob analysis, and optical flow.
- Project: [Report](#)

Sabancı Motorsports, Aerodynamics Department Leader

Feb 2020 - Jan 2022

- Acted as the Aerodynamics department leader (Sept 2021 - Jan 2022) and a department member (Feb 2020 - Sept 2021) in the Sabancı Motorsports team. Workshop Video about CFD

- Designed and optimized aerodynamic packages, including rear wing and front wing of a race car.
- Conducted cooling optimization of the battery box design via conjugate heat transfer.

Sabancı Aerospace Team, Team Member

July 2020 – Sept 2021

- Collaborated as a team member in the Sabancı Aerospace team for the TEKNOFEST Rocket Competition.
- Conducted structural, thermal, and CFD analyses of the rocket.

SKILLS

Programs and Programming Languages: Python, C++, Rust, ROS2, C#, MATLAB, Unity, GitLab, MATLAB Simulink, MATLAB App Designer, Rust, Raspberry Pi, Arduino, Solidworks, Simscape, ANSYS, G-Code, LTSpice, ImageJ,
Languages: Turkish (Native), English (Advanced)

VOLUNTEER WORK

Sabancı University Robotic Club (SURK), Istanbul, Turkey | Board Member

Sept 2019 - Sept 2024

- Organized workshops on Solidworks 3D CAD and robot programming for club members.
- Workshops: [Video](#)

MÜDEK (Association for Evaluation and Accreditation of Engineering Programs) | Student Evaluator

April 2024

- Served Evaluated engineering education programs and accreditation processes.
- Provided student perspective insights to enhance program effectiveness and ensure standards compliance, including participation in the evaluation of Gaziantep University.

Civil Involvement Project, Istanbul, Turkey | Volunteer

Feb - May 2019

- Coordinated weekly activities for children with neurodevelopmental disorders.