

# Okan Arif Güvenkaya

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## EDUCATION

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### Technical University of Munich, Munich, Germany

- M.Sc. Mechatronics Robotics and Biomechanical Engineering

Oct 2024 - Present

### Sabancı University, Istanbul, Turkey

- B.S. Mechatronics Engineering (Major) - GPA: 3.68/4.00
- B.S. Computer Science & Engineering (Double Major) - GPA: 3.58/4.00

Sept 2019 - June 2023

### Çınar Private Science High School, İstanbul, Turkey

Sept 2020 - June 2024

GPA: 97.91/100

Sept 2014 - June 2018

## PUBLICATIONS

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### Paper Title: [Local Path Planning with Dynamic Obstacle Avoidance in Unstructured Environments](#)

IEEE IECON 2024

- Authors: Okan Arif Güvenkaya, Selim Ahmet İz, Mustafa Ünel

## RESEARCH INTERESTS

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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

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### Quantum Systems, Glitching, Germany | Software Engineer/Swarm Developer

March 2025 - Present

- Develop and test algorithms for multi-drone operations
- Optimize algorithms for overall mission performance
- Use simulations for development and then deploy to embedded Linux
- Find solutions in the areas of multi-vehicle-routing, scheduling and data fusion
- Integrate code into an existing ROS2 Nvidia architecture

### ASELSAN, Ankara, Turkey | Intern

July – Sept 2022

- Conducted system identification, controller design, and controller application for a 3-degree-of freedom system named "SATCOM on the Move Antenna System".

## RESEARCH EXPERIENCE

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### Technical University of Munich Autonomous Aerial Systems Lab , Munich, Germany | Semester Thesis

Oct 2025 – Present

- Developing optimization-based trajectory generation methods for UAVs under dynamic and kinematic constraints.
- Designing cost functions targeting trajectory smoothness, feasibility, and mission efficiency.
- Extending it for future UAV swarm trajectory optimization.

### Sabancı University, Istanbul, Turkey | Research

July 2023 – Sept 2024

- 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

Oct 2022 – Jan 2023

- 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, İstanbul, Turkey | Research Intern

Sept – Oct 2022

- Designed and controlled a 3D printer for the Embedded 3D Printing project.
- Project: [Poster](#), [Report](#), [Video](#)

## HONORS & AWARDS

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- **Dean's High Honor List**, Sabancı University

June 2020, Feb 2021, June 2021

- **Dean's Honor List**, Sabancı University

Feb 2020, Feb 2022

- **National University Exam Achievement Scholarship**, Sabancı University

June 2018

- Scholarship amount: \$81000

## TEACHING EXPERIENCE

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### Sabancı University, İstanbul, Turkey | Learning Assistant PROJ 201

Sept 2021 - Jan 2022

- Mentored students in the Undergraduate Project Course, focusing on "Aerodynamic Optimization of a Racecar Using CFD."

- Conducted workshops on 3D CAD and CFD

**Sabancı University, Istanbul, Turkey | Learning Assistant ENS 209**

*July - Aug 2021*

- 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

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### 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

*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

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**Programs and Programming Languages:** Python, C++, Rust, ROS2, C#, MATLAB, Unity, GitLab, MATLAB Simulink, MATLAB App Designer, Rust, Raspberry Pi, Arduino, Solidworks, Simscale, ANSYS, G-Code, LTSpice, ImageJ,

**Languages:** Turkish (Native), English (Advanced)

## VOLUNTEER WORK

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<b>Sabancı University Robotic Club (SURK), Istanbul, Turkey   Board Member</b>	<i>Sept 2019 - Sept 2024</i>
<ul style="list-style-type: none"><li>Organized workshops on Solidworks 3D CAD and robot programming for club members.</li><li>Workshops: <a href="#">Video</a></li></ul>	
<b>MÜDEK (Association for Evaluation and Accreditation of Engineering Programs)   Student Evaluator</b>	<i>April 2024</i>
<ul style="list-style-type: none"><li>Served Evaluated engineering education programs and accreditation processes.</li><li>Provided student perspective insights to enhance program effectiveness and ensure standards compliance, including participation in the evaluation of Gaziantep University.</li></ul>	
<b>Civil Involvement Project, Istanbul, Turkey   Volunteer</b>	<i>Feb - May 2019</i>
<ul style="list-style-type: none"><li>Coordinated weekly activities for children with neurodevelopmental disorders.</li></ul>	