

Edoardo Caciorgna

Enthusiastic Robotics and Automation Engineer

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Professional Summary

I'm a Master's degree graduate engineer passionate about electronics, robotics and programming, with a Bachelor's in Electronics Engineering and a Master's in Robotics and Automation Engineering from the University of Pisa. Skilled in C++, Python, ROS2 and embedded systems. My key projects include developing a fully autonomous driving car and leading the Driverless sector of my university's Formula Student team. These experiences honed my abilities in teamwork, task scheduling, performing under pressure and cross-disciplinary problem-solving. I'm curious, driven and enjoy applying unconventional approaches to tackle challenges across various disciplines.

Education

- 2022–2025 **Master's Degree in Robotics and Automation Engineering**, *University of Pisa*, Pisa, Italy, 110/110 cum laude (GPA 4.0 cum laude)
- 2018–2022 **Bachelor's Degree in Electronic Engineering**, *University of Pisa*, Pisa, Italy, 94/110

Master's Thesis

Title SmartDrive Project: Development of a 1:5 scale autonomous vehicle

Overview Designed and developed a complete 1:5 scale autonomous racing vehicle platform integrating advanced perception, SLAM and control algorithms for Formula Student Driverless competition standards. The project demonstrates state-of-the-art real-time embedded control achieving 100Hz operation with sub-millisecond latencies.

- Key Contributions**
- **Hardware Architecture:** Engineered multi-tiered platform with NVIDIA Jetson AGX Orin, redundant safety MCU (STM32) and comprehensive sensor suite (ZED2 stereo camera, RPLiDAR S2, Xsens RTK-GNSS/INS).
 - **Real-Time Software Stack:** Implemented deterministic ROS2-based pipeline on PRE-EMPT_RT kernel, reducing worst-case latencies under full load;
 - **Multi-Modal Perception:** Developed fusion framework combining YOLOv11s neural network with motion-compensated LiDAR processing, achieving robust cone detection across varying conditions;
 - **Dual SLAM Implementation:** Deployed complementary EKF-SLAM for 100Hz real-time state estimation and Graph-SLAM for globally optimized mapping, handling track's map efficiently;
 - **Advanced Control Synthesis:** Pioneered Advanced-Step Real-Time Iteration MPC (AS-RTI-MPC) with acados solver, achieving 20-30% tracking error reduction versus standard MPC through temporal compensation;
 - **Performance Metrics:** Achieved 0.528ms mean control computation time with 99th percentile at 1.289ms, providing 8.7ms safety margin for guaranteed 100Hz operation.

Technologies C++, Python, ROS2, ACADOS, CasADI, Gazebo, TensorRT, CUDA, g2o, GTSAM, OpenCV, PCL, Real-Time Linux

Professional Experience

- Jan 2024 – Robot Mechanics Tutor, University of Pisa, Pisa, Italy**
- Dec 2024**
 - Teaching assistant for “Robot Mechanics” course for Master’s students in Robotics and Mechanical Engineering, providing in-depth explanations of Lie groups and their applications in robotics.
 - Led hands-on MATLAB sessions on Closed-Loop Inverse Kinematics (CLIK) and Computed Torque Control, supporting students in understanding and implementing the algorithms.
- Sep 2023 – Driverless and AI/Software Development Sector Manager, E-Team Squadra Corse, Pisa, Italy**
- Oct 2024**
 - Sector management and coordination with other departments;
 - Software development for STM32 and Atmel electronic boards;
 - Led sponsor relations and projects integration.
- Sep 2022 – Developer, E-Team Squadra Corse, Pisa, Italy**
- Sep 2023**
 - Implementation of an autonomous driving algorithm using Model Predictive Control;
 - Trajectory planner based on track limits and optimal lap planner.

Projects

- SmartDrive Project** Design and development of an autonomous driving system for a 1:5 scale vehicle, utilizing stereocamera, LiDAR, IMU and GPS sensors. **Main contributions:**
- **Simulator:** Created a complete simulation environment in Gazebo and ROS2 for both sensors and vehicle dynamics;
 - **Hardware and software integration:** Designed the vehicle’s electrical system and integrated multiple sensors for real-time data acquisition;
 - **Software stack development:** Implemented the full software stack in Python3, C++ and ROS2 to collect, process and fuse sensor data for autonomous driving functionalities.
- Autonomous Driving @ETeam Squadra Corse**
 - **Control and Navigation system** for autonomous driving FSAE car based on SLAM and cone detection;
 - **Real-time code** development using FreeRTOS and C++ for Vehicle Control Unit (VCU) and other critical low-level system;
 - **Telemetry** using radio communication to transmit CAN data to ground station pit.

Technical Skills

- Programming Languages** C/C++, Python, Bash, MATLAB, Simulink
- Frameworks** ROS/ROS2, CasADI, ACADOS, Gazebo, FreeRTOS
- Tools** Git, VSCode, Microsoft Office, Linux (Shell Commands), Fusion360, MATLAB, Simulink, ArduinoIDE, CANAnalyzer, CANtools, PlatformIO, STM32, FreeRTOS

Languages

Italian Native

English C1 : Proficient

Honors & Awards

- National Finalist** Team Mathematics Olympics, April 2016
- Provincial Finalist** Individual Physics Olympics, February 2015