

SIMONE ORELLI

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👤 SUMMARY

Control Systems Engineer and PhD student (ABRO, Sapienza University of Rome) with a strong interest in nonlinear and geometric control, robotics, and autonomous systems. I enjoy working across the full pipeline, from modeling and simulation to experimental validation, combining theory with hands-on development. My interests include aerial robotics, physical interaction, estimation and sensing, and machine learning for robotics. Driven by curiosity, I continuously explore new topics at the intersection of mathematics, physics, and engineering. Outside of work, I enjoy playing guitar, sports, and chess.

🎓 EDUCATION

PhD, Automatic Control, Bioengineering and Operations Research (ABRO)
Sapienza Università di Roma, Rome, Italy

2025 - 2028 (expected)
Cycle: 4st

M. Eng. equivalent, Control Engineering (LM-25)

Sapienza Università di Roma, Rome, Italy

Thesis: *Nonlinear geometric control of partially-coupled underactuated floating vehicles*

Nov 2021 - Jul 2025

Final grade: 110/110 with honors

Supervisor: Antonio Franchi

B. Eng. equivalent, Information Engineering (L-8)

Sapienza Università di Roma, Latina, Italy

Thesis: *Markovian and Semi-Markovian Stochastic Processes*

Sep 2016 - Oct 2021

Final grade: 110/110 with honors

Supervisor: Costantino Ricciuti

Technical Institute: Business Information Systems

ISIS Pacifici & De Magistris, Sezze (LT), Italy

Sep 2011 - Jul 2016

Final grade: 100/100

💼 EXPERIENCES

Research Engineer - SOAR-TOUCH (EU-funded Research Grant)

EU-funded collaboration between DIAG (Sapienza University of Rome) and Robotics and Mechatronics (University of Twente), developing robust and energy-aware force-based control for aerial robotic manipulation using Soft Optical Tactile (SOT) sensing. [Project website]

Aug 2025 - Present

Sapienza University of Rome

(DIAG)

+ University of Twente (RAM)

- Design and validation of force-based control strategies enabling stable and safe contact with the environment using SOT sensing, while minimizing pushing force and energy consumption.
- Robustness-oriented development and testing under exogenous disturbances (e.g., wind / external perturbations), bridging simulation and real experiments.
- Development of reliable simulation pipelines (MATLAB/Simulink) and experimental procedures for measurement and validation.
- Data acquisition and synchronization (tactile images, forces, poses); automation and analysis in Python.
- CNN-based real-time inference pipeline for estimating interaction forces directly from tactile images.
- Ongoing research period at the University of Twente (international collaboration and experimental methodologies).

Autopilot Control Systems Engineer

Partner of “Sapienza Aerospace Student Association - SASA” for the project “Sapienza Flight Team - SFT”.

Sep 2024 - May 2025

Sapienza University of Rome

Faculty of Engineering

- Contributed to the design and implementation of a geometric tracking controller for autonomous vertical flight of a VTOL tricopter, including stabilization and management of flight transitions.

Tutoring activity

Tutor for the course *Fondamenti di Automatica I: Teoria dei Sistemi* under the supervision of Mattia Mattioni.

Sep 2022 - Dec 2022

Sapienza University of Rome

Latina campus

- Developed exercises and didactic material supporting the course topics; classes held during the first semester of the 2022/2023 academic year.

Universal Civil Service

Volunteer Operator

*Sep 2021 - Sep 2022
Municipality of Sezze*

- Support to adults and elderly people in difficult conditions.
- Assistance at municipal offices for initiatives promoted for social services.
- Support for public events to promote and protect the territory.
- Carried out project tasks ensuring understanding and achievement of the objectives set.

☒ TECHNICAL SKILLS

Software and tools	Microsoft Office, Simulink, Stateflow, Blender, Autodesk Fusion 360, Cisco Packet Tracer
Programming languages	Arduino, Assembly, C, C++, Java, MATLAB, Python (ML/CNN pipelines), Visual Basic
Web languages	CSS, JavaScript, L ^A T _E X, PHP, XHTML, XML
Databases	E/R scheme, MariaDB, Microsoft SQL, MySQL

▢ LANGUAGE SKILLS

Italian	Native
English	B2 (Self-assessed)
French	A2 (Basic)
Spanish	A2 (Basic)

☛ ACADEMIC PROJECTS

Details and media at s.orionio.github.io

Nonlinear geometric control of partially-coupled underactuated floating vehicles

Winter - Spring 2024/2025

Master's thesis on static hovering of generically tilted multirotor platforms (GTM) on $SE(3)$, with emphasis on partially coupled underactuated vehicles. Starting from a general GTM model and the geometric controller, provided a rigorous Lyapunov-based proof of local exponential stability of the closed-loop error dynamics, filling a gap left by prior experimental-only validations. The analysis uses nonlinear control and differential geometry in a coordinate-free framework; high-fidelity simulations confirm stability and robustness.

Control of underactuated robots via input-constrained receding-horizon DDP

Winter - Spring 2023/2024

Co-developed (team of 3) an optimal controller for underactuated robots using Differential Dynamic Programming (DDP) with Levenberg–Marquardt regularisation and MPC-style receding horizon. Validated on pendubot and acrobot, achieving precise tracking under hard torque constraints for highly nonlinear dynamics.

Modeling and simulation of the Mars helicopter “Ingenuity”

Winter - Spring 2023/2024

Collaborated in a team of 4 to realize a detailed Simulink model of the Ingenuity helicopter flying in the Martian atmosphere.

Self-balancing robot on two wheels

Autumn - Winter 2023

Worked in a team of 3 to build (including 3D-printed parts), model (MATLAB/Simulink), and control a two-wheeled self-balancing robot in a digital loop with Arduino (stepper motors, MPU6050, Kalman filter, PID).

Decentralized control of the charging process of a fleet of electric vehicles

Winter - Spring 2023/2024

Collaborated in a team of 3 to develop classical and decentralized MPC strategies for optimal scheduling of a large fleet of plug-in electric vehicles, using a subgradient method for mixed-integer programming.

Control of a video-game race car using a convolutional neural network

Winter 2023

Designed, trained, and tested (Keras) a convolutional neural network (CNN) to control a race car in OpenAI's Car Racing environment.

Graduation thesis*Summer - Autumn 2021*

Thesis developed with Costantino Ricciuti on Markovian and Semi-Markovian Stochastic Processes.

Web application for delivery leveraging on MySQL DB*Spring - Summer 2021*

Developed (team of 2) a PHP/CSS-based web platform for food delivery, featuring a MySQL database with E/R scheme, state diagrams, and role-based interfaces for customers, restaurants, and riders.

Web application for shipping*Spring - Summer 2021*

Implemented (team of 2) a PHP-developed web platform for shipping services, utilizing CSS and XML for design and data handling; client-server model with distinct roles (clients, couriers, managers, admins) supporting shipment requests and tracking.

Intranet managing*Spring 2020*

Built and configured (team of 2) an intranet in Cisco Packet Tracer (router, switch, HTTP, DNS, FTP, SMTP).

Chat client-server*Autumn - Winter 2019/2020*

Designed and implemented a simple client-server chat application with C++ on Linux (Ubuntu virtual machines).