Emanuele Cuzzocrea

Curriculum Vitae

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I am currently a Ph.D. student in Robotics and Intelligent Machines at the Italian Institute of Technology (IIT) in Genoa, within the Humanoid & Human Centered Mechatronics (HHCM) Lab, under the supervision of Dr. Nikolaos Tsagarakis. During my Master's studies, I conducted research at the PRISMA Lab, where I contributed to the hardware construction of the SOLO 12 quadruped robot and carried out my thesis, titled "*Studying Locomotion Gaits for Quadruped Robots in Push-and-Slide Tasks*", supervised by Prof. Fabio Ruggiero. My research interests include legged robotics, loco-manipulation, navigation, optimal control, and reinforcement learning. Outside of robotics, I enjoy speedcubing, tennis, golf, chess, drawing, and video game development.

Education

2025–Present **Ph.D. Student in Robotics and Intelligent Machines**.
Italian Institute of Technology (IIT), Genoa, Italy
Lab: Humanoid & Human Centered Mechatronics (HHCM)
Supervisor: Dr. Nikolaos Tsagarakis

2022–2025 **M.Sc. in Automation and Robotics Engineering**.
University of Naples Federico II, Naples, Italy
Thesis Title: Studying Locomotion Gaits for Quadruped Robots in Push-and-Slide Tasks
Supervisor: Prof. Fabio Ruggiero
Graduation grade: 110/110 cum laude

2019–2022 **B.Sc. in Automation Engineering**.
University of Naples Federico II, Naples, Italy
Thesis Title: Motion Programming of a Robot in the Matlab-Coppeliasim Environment
Supervisor: Prof. Luigi Villani
Graduation grade: 110/110 cum laude

2014–2019 **Secondary School Education**.
Giovanni Da Procida Scientific High School, Salerno, Italy
Graduation grade: 100/100 cum laude

Master's Thesis

Title *Studying Locomotion Gaits for Quadruped Robots in Push-and-Slide Tasks*
Supervisor Prof. Fabio Ruggiero
Co-supervisors Dr. Pierluigi Arpenti, Ing. Michele Avagnale

Description The thesis explores the execution of a push-and-slide task using the ANYmal-D quadruped robot with a stick rigidly mounted to its base. A hybrid control strategy is employed, combining both model-based and reinforcement learning techniques. The policies were trained using the Isaac Lab framework, and successfully transferred to the real robot. The objective is to determine the best gait, base orientation, and force values to perform the task. Statistically significant differences between different parameter combinations are assessed through analysis of variance (ANOVA).

Master's Degree Exams

- Nonlinear Dynamics and Control, grade: 30/30
- Robot Interaction Control, grade: 30/30 cum laude
- Field and Service Robotics, grade: 30/30 cum laude
- Intelligent Robotics, grade: 30/30 cum laude
- Virtual Prototyping, grade: 30/30 cum laude
- Machine Learning, grade: 30/30 cum laude
- Robotics Lab, grade: 30/30
- Identification and Optimal Control, grade: 30/30
- Foundations of Robotics, grade: 30/30 cum laude
- Design and Development of Real-Time Systems, grade: 30/30
- Advanced Control, grade: 28/30
- Electric Drives for Automation and Robotics, grade: 30/30
- Advanced Mechanics, grade: 30/30
- Models and Methods of Operations Research, grade: 30/30

Research Experiences

2025–Present **Ph.D. Student at Italian Institute of Technology (IIT)**.
Italian Institute of Technology (IIT), Genoa, Italy
Description: As a Ph.D. student in the Humanoid & Human Centered Mechatronics Lab, I am investigating control and planning methods for mobile robots, focusing on navigation, loco-manipulation, and reinforcement learning.

2024–2025 **Internship at PRISMA Lab**.
PRISMA Lab, University of Naples Federico II, Naples, Italy
Description: Between September 2024 and March 2025, I carried out my Master's thesis at PRISMA Lab. From March to August 2025, I continued collaborating with the lab to conduct experimental validation on the real ANYmal-D quadruped robot, with the goal of publishing the results in IEEE RA-L.

2024 **Construction of the SOLO 12 Quadruped Robot**.
PRISMA Lab, University of Naples Federico II, Naples, Italy
Description: Between February 2024 and July 2024, I had the opportunity to actively participate in the hardware construction of the open-source SOLO 12 quadruped robot by PAL Robotics at the PRISMA Lab. My contributions included 3D printing all hardware components, assembly, and working on the electronics.

Publications

- E. Cuzzocrea, M. Avagnale, P. Arpenti, F. Ruggiero, "Analysing Locomotion Gaits for Quadruped Robots in Push-and-Slide Tasks". Submitted to *IEEE Robotics and Automation Letters (RA-L)*, August 2025.

Certifications

2025 **ANYmal Master Operator**.
ANYbotics Academy, Zurich, Svizzera

2025 **ANYmal Operator**.
ANYbotics Academy, Zurich, Svizzera

2024 **ANYmal Satefy Training**.
ANYbotics Academy, Zurich, Svizzera

2023 **Advanced Proficiency in KNIME Analytics Platform**.
KNIME Analytics Platform, Zurich, Svizzera

2022 **TOEFL iBT level C1**.
Educational Testing Service

2021 **Course on Workplace Health and Safety**.
University of Naples Federico II, Naples, Italy

2020 **EASA ENAC Category A1/A3 (Drones)**.
European Aviation Safety Agency - National Agency for Civil Aviation

2017 **Cambridge English level B2**.
Cambridge Assessment English, Cambridge, United Kingdom

Awards

2018 & 2019 **Top 15 in the national phase of the Neuroscience Olympiad**.
Italian Society of Neurosciences (SINS), Italy

2018 & 2019 **1st place in the regional phase of the Neuroscience Olympiad**.
Italian Society of Neurosciences (SINS), Italy

2018 & 2019 **Honorable Mention at the Caianiello Award event**.
"E. R. Caianiello" Department of Physics of the University of Salerno, Salerno, Italy

2019 **Top 10 in the regional phase of the Mathematics Olympiad**.
Italian Mathematical Union (UMI), Italy

2019 **Top 10 in the regional phase of the Physics Olympiad**.
Association for Physics Teaching (AIF), Italy

2018 **1st place in the RI-SCATTI photography contest**.
Mediterranean Colors, Salerno, Italy

2017 **Honorable Mention at the Gennaro Capuozzo drawing contest**.
Gennaro Capuozzo Artistic and Literary Award, Naples, Italy

Course Projects

Legged Robotics Projects

- Development and comparison of model-based (MPC) and data-driven (RL) control strategies for quadruped robots using ROS and RaiSim (link).
- Development of a framework for autonomous dynamic gait transitions for quadruped robots using Deep RL with Reward Machines in RaiSim (link).

Robotics and Control Projects

- Control of the Haken–Kelso–Bunz oscillator using nonlinear control techniques (Feedback Linearization, Sliding Mode Control, Gain Scheduling) in MATLAB.
- Virtual Prototyping of a Remote Handling Facility Installation Tool for a nuclear fusion reactor using CATIA (link).
- Development of classification and regression algorithms using Machine Learning and Deep Learning techniques in KNIME and Python.
- Control of a mobile robot in ROS for trajectory tracking, including Gazebo world creation, goal setting, mapping, SLAM, and vision tasks (link).
- Implementation of control systems in ROS for the Kuka iiwa 14 robot manipulator, using KDL, ArucoRos, and OpenCV libraries, with validation in Gazebo (link).
- Trajectory tracking and obstacle avoidance for a wheeled soccer robots using Model Predictive Control in MATLAB.
- Development of trajectory planning and control algorithms for a SCARA robot botn in joint space and operational space in MATLAB.
- Control of an aircraft around its roll axis using linear control techniques in MATLAB.

Skills

Frameworks	ROS, Isaac Lab, RaiSim, MATLAB/Simulink, KNIME, CoppeliaSim, CoDeSys, Factory IO, SPICE, FICO Xpress, Cura
Programming Languages	C/C++, Python, MATLAB, Arduino, Mosel
CAD	CATIA
Libraries	PyTorch, Eigen, OCS2, Pinocchio, KDL, YALMIP, OpenCV, ArucoRos
Tools	Microsoft Office, LaTeX, Visual Studio Code
Collaboration	Git, GitHub, GitLab
OS	Windows, Linux, RT-POSIX, FreeRTOS

Languages

Italian	Native Speaker
English	C1 level (Master's thesis written in English, and most of the exams were held in English)
French	A2 level
German	A1-A2 level

Interests and Hobbies

Rubik's Cube	Since I was young, I have been passionate about Speedcubing, participating in a lot of international competitions and posting videos on my YouTube channel (link).
Arduino	My interest in Arduino dates back to elementary school and is closely tied to my passion for LEGO and Meccano. Among the projects I created during high school are humanoids (link, link), robotic hands (link, link) and Rubik's cubes solvers (link).
Sport	Playing sports has always been very important to me. I am currently registered with the Italian Golf Federation (FIG) playing golf at a competitive level, and I play tennis at an amateur level. In the past, I competed in tennis, athletics, and fencing in the epee discipline.
Chess	I have always found playing chess very stimulating. I have participated in numerous local and online tournaments.
Video Game Developing	Through the Construct 3 software, I often enjoy creating simple mobile games. One of them I published on the Play Store under the name JusTen (link).
Photography & Drawing	I have always loved photography and drawing, considering them powerful means of creative expression. I have participated in various contests, mainly related to social issues such as racism and femicide.
Juggling & Magic Tricks	During my free time, I often enjoy learning new skills, especially related to the world of juggling and magic, and then showing them when I am with my friends.