RICCARDO RETTORE

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ABOUT ME

Recent M.Sc. graduate in Control Systems Engineering, specializing in robotics and AI. Experienced in developing advanced algorithms for Deep Learning, Reinforcement Learning, Computer Vision and Control Systems designs. Passionate about applying AI and robotics to real-world challenges.

PROJECTS & RESEARCH

Master's Thesis - Leveraging Ground Penetrating Radar with Deep Reinforcement Learning for Subsurface-Informed Navigation (University of Padova & UPC)

- Developed RL frameworks for robots to navigate using surface and subsurface maps from GPR. Trained PPO and SAC agents to plan trajectories through dry soil while avoiding obstacles.
- Integrated autoencoder-based soil moisture estimation into RL environments for discrete and continuous navigation.
- Learned deep reinforcement learning for robotics, reward design for multi-objective navigation, sensor fusion between subsurface and surface data, and sim-to-real considerations for autonomous agricultural robots.

Aurora: Object Classification with Oriented Boosting (Github repository)

- Built a deep learning pipeline for 3D object classification using boosting and multi-task learning.
- Designed a multi-task loss balancing class and orientation accuracy with full preprocessing: voxelization, augmentation, labeling, and HDF5 compression.
- Gained experience in 3D data processing, CNN optimization, GPU-efficient training, and evaluation on ModelNet10/40.

Unicycle Controller Design (Github repository)

- Designed and compared linear and nonlinear feedback controllers for unicycle stabilization.
- Implemented Cartesian and posture regulation schemes in MATLAB/Simulink for tracking and stability.
- Gained experience in nonlinear control, stability analysis, and controller tuning under non-holonomic constraints.

Computer Vision for Parking Spot Detection (Github repository)

- Built a hybrid vision system to detect and classify parking slots using classical and ML methods.
- Combined region proposal (edges, selective search, connected components) with modified SIFT and MLP classification.
- Learned integration of classical image processing and machine learning, region proposal and feature engineering, model evaluation under real-world variability, and performance optimization for image-based classification tasks.

Control Systems for Double-Wheel Robot (Download Report)

- Designed nominal and robust LQR controllers for a self-balancing two-wheeled robot.
- Modeled dynamics via Lagrange formalism, linearized around equilibrium, and implemented sensor fusion with complementary filtering.
- Conducted simulations and real-time tests with integral and yaw control for improved stability and tracking.
- Learned modeling and linearization of nonlinear systems, LQR and state-feedback design, observer and filter implementation, real-time control deployment, and robustness analysis between simulation and hardware performance

WORK EXPERIENCE

Full-stack Developer   2020 - present
Freelancer   *Padova*

Collaborated with Padova-based startups to build cross-platform apps using Flutter and Google technologies. Skilled in building both front-end interfaces and back-end systems to deliver seamless, user-friendly solutions. Key projects are:

- **SDGs Managing App**: A cross-platform application enabling industries to input, track, and monitor compliance with sustainability rules and goals.
- **Restaurant and Hotel Management Apps**: Customized solutions for businesses to showcase menus, manage orders, and handle reservations efficiently.
- **Note-Taking App**: A mobile application designed for intuitive note-taking and organization, enhancing productivity for users.

Waiter   2018–2020
Da Mason Restaurant   *Trebaseleghe, PD*

Worked evening shifts while studying in high school.
Developed strong time management, teamwork, and customer service skills in a dynamic environment.

EDUCATION

Master degree in Control Systems Engineering, University of Padova, Italy   2023 - 2025
Final score: 110/110
Relevant Courses: Machine & Deep Learning, Reinforcement Learning, System Theory, Computer Vision, Control Engineering Laboratory, Convex Optimization, Robotics and Control I and II.

Erasmus Programme – Universitat Politècnica de Catalunya, Barcelona, Spain   Feb 2024 – Jul 2024
Conducted Master's Thesis as part of the Erasmus programme, titled *Leveraging Ground Penetrating Radar with Deep Reinforcement Learning for Subsurface-Informed Navigation in Autonomous Agricultural Robotics*. Currently preparing a research paper based on this work for submission to IEEE.

Bachelor degree in Mechatronics Engineering, University of Padova, Italy   2020 - 2023
Final score: 109/110
Relevant Courses: Machine Design, Electrical Machined and drives, Digital and Analog Electronics, Metallurgy, Applied Thermodynamics, Oriented Programming, Calculus, Linear Algebra, Computer Architecture, PLC and industrial communication networks.

High-School diploma in Applied Sciences, IIS Newton Pertini, Camposampiero (PD)   2015 - 2020

AWARDS

- **3 times winner of scholarship "1000 e 1 lode"** for the years 2021, 2022, 2023, awarded only to the top 3% best performing students of each degree.
- **Awarded by hometown** for two consecutive years for **ranking among the top 10 students** in the town.

SKILLS

Technologies

Python	Matlab	Latex
C	Simulink	Git
C++	OpenCV	Github Actions
ROS	Numpy	Solidworks
Tensorflow	Pandas	Fusion360
PyTorch		Blender

Soft Skills
Enjoy working in teams
Experience in managing high-pressure situations
Adapting to shifting priorities
Utilizing problem-solving skills to find effective solutions.

EXTRA-CURRICULAR ACTIVITIES

Founder & Active Member of a Cycling Team
Founded and actively participate in a local cycling team, organizing events and promoting cycling within the community.

Sports Enthusiast
Engaged in various outdoor sports, including cycling, hiking, running, trekking, and snowboarding, fostering a strong connection with nature and maintaining an active lifestyle.

Passion for Continuous Learning
Constantly engaged in personal projects to expand my knowledge, apply new tools, and explore emerging technologies.

LANGUAGES

English | B2 Certified by University of Padova, TAL Test

Italian | Native

Spanish | Beginner

CONTACTS AND PROFILES

- **Email**: riccardorettore@gmail.com
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- **GitHub**: github.com/RiccardoRettore
- **Portfolio**: riccardo-rettore-portfolio

REFERENCES

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