

# LUIGI BERDUCCI

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I am a highly motivated Computer Scientist with a passion for robot learning and safe autonomy.  
Eager to drive innovation and achieve excellence with a collaborative spirit to work with brilliant minds.

## EMPLOYMENT

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Learning Team, Swiss-Mile Robotics • Robotics Intern (07/2024) - Present

- Reinforcement Learning for locomotion of wheeled-legged robots in industrial use cases.
- Techniques for robust transfer of trained policy into the real world.
- Skills: *pytorch, robotics simulation, ROS2, sim-to-real transfer*

xLab, University of Pennsylvania • Visiting Associate (02/2023) - (05/2023)

- Reinforcement Learning to adapt safety levels for long-term performance in multi-agent systems.
- Designed a safety filter (CBF) for collision avoidance of autonomous vehicles in competitive racing.
- Supported lab activities in the development and maintenance of the F1Tenth racecar simulator.
- Skills: *python, pytorch, clean-rl, openai-gym, casadi, cvxpy, vehicle-dynamics simulation*

F1Tenth Autonomous Racing Team, TU Wien • Team Member (09/2021) - (06/2024)

- Worked with ROS, Python, and C++ code for planning and control algorithms for robot navigation.
- Experience in software development on embedded devices (NVIDIA Jetson) for F1Tenth vehicles.
- Implemented RL-based, RRT, and Frenet planners for real-world autonomous racing.
- Adopted domain randomization for transferring policies from simulation to the real world.
- Skills: *C++, ROS2, python, sb3, pytorch, torch-script, linux, git, docker, sim-to-real transfer*

CPS Group, TU Wien • University Assistant (10/2020) - Present

- Research project on safe reinforcement learning for autonomous robotics systems.
- Developed a learner-verifier RL framework to formally guarantee safety with adaptive CBF.
- Developed a multi-agent environment for racing with Bullet physics simulation ([racecar\\_gym](#)).
- Supervised theses and projects on reinforcement learning, deep learning, and computer vision.
- Skills: *python, pytorch, tensorflow, sb3, mbrl-lib, casadi, pybullet, carla simulation*

INFN Roma Tre, Rome • Machine Learning Engineer, LEGEND-200 (01/2020) - (09/2020)

- Created a dataset of cosmic events and ambient noise for the LEGEND-200 experiment.
- Extended the optical maps to simulate realistic detections of events with SiPM sensors.
- Developed a two-stage machine learning classifier able to reject 95% of background noise.
- Skills: *python, pandas, scikit-learn, geant4 simulation*

## EDUCATION

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TU Wien, Vienna • PhD Student (10/2020) - Present

Safe Learning Algorithms for Intelligent Robotics Systems

University of Rome La Sapienza, Rome • BSc and MSc in Computer Science (01/2018) - (05/2020)

Full marks with honours (MSc Avg Grade: 30.3/31.0, BSc Avg Grade: 27.7/31.0)

## SKILLS

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Programming Languages - **Python**, C++, **ROS**

Machine Learning - **pytorch**, tensorflow, scikit-learn

RL Tools - **sb3**, openai-gym, clean-rl, mbrl-lib, isaac-lab

Optimization - **casadi**, cvxpy, gurobi

Simulators - isaac-sim, pybullet

Misc - **docker**, version control, **git**

### Conference Proceedings

- Berducci, L., Yang, S., Mangharam, R. & Grosu, R. (2023). Learning adaptive safety for multi-agent systems. *IEEE International Conference on Robotics and Automation (ICRA)*.
- Berducci, L. & Grosu, R. (2022). Safe policy improvement in constrained markov decision processes. *International Symposium on Leveraging Applications of Formal Methods (ISoLA)*.
- Brunnbauer\*, A., Berducci\*, L., Brandstätter\*, A., Lechner, M., Hasani, R., Rus, D. & Grosu, R. (2022). Latent imagination facilitates zero-shot transfer in autonomous racing. *IEEE International Conference on Robotics and Automation (ICRA)*.

### Workshops & Preprints

- Berducci, L., Yang, S., Giacobbe, M., Mangharam, R. & Grosu, R. (2024). FoSRL: A Tool for Formally-Guaranteed Safe Reinforcement Learning. *Workshop on Software Challenges in Formal Methods for Robotics (ICRA)*.
- Berducci, L., Yang, S., Giacobbe, M., Mangharam, R. & Grosu, R. (2024). Safe Learning under Assumptions in Human-Robot Systems. *Workshop on Design, Shared Control, and Robot Learning for Physical Human-Robot Interaction (ICRA)*.
- Scheuchenstuhl, D., Ulmer, S., Resch, F., Berducci, L. & Grosu, R. (2023). Enhancing robot learning through learned human-attention feature maps. *Workshop on effective Representations, Abstractions, and Priors for Robot Learning (ICRA)*.
- Berducci, L., Aguilar, E. A., Ničković, D. & Grosu, R. (2022). Hierarchical potential-based reward shaping from task specifications. Under review.

## COMPETITIONS

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### 9th, 10th, 11th F1TENTH Autonomous Grand Prix (2021-Present)

Team-based competition to deploy autonomous racing algorithms on F1Tenth miniature racecars. This experience helped me develop a collaborative spirit (*team 6-8 people*) and gain hands-on experience in robotic programming. The team *Scuderia Segfault* won the 1st prize in 2021, 3rd in 2022, and 2nd in 2023.

## SCHOLARSHIPS & GRANTS

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### Marshall Plan Scholarship (EUR 6 500) (12/2022)

Academic exchange program between Austria and the U.S. that offers scholarships for students from applied sciences and technical universities to conduct research abroad in the field of technical sciences.

### TU Wien 30 Under 30 (07/2022)

Campaign to present 30 people under 30 years of age who have proved their potential in various areas and have distinguished themselves through extraordinary achievements in scientific research.

### GARR Scholarship Orio Carlini (EUR 19 000) (01/2020)

Prestigious grant sponsored by Consortium GARR Association for innovation in the field of information technology, which recognizes excellence and supports achievements in research and development.

## LANGUAGES

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Italian - Native.

English - Level C1 (IELTS 7.0 in 2019), enforced by living/working in foreign countries since 2019.

German - Studying German (Level B1) and living in a German-speaking country.