Lorenzo Vignoli

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Research Interest

Integrating AI and machine learning into the design, modeling, and control of intelligent mechanical systems, with applications in both robotics and materials science. My focus is on developing adaptive, data-driven systems by leveraging computational intelligence in both robotic perception and control and in the study of complex material behaviors. Currently, I am completing my Master Thesis at EPFL, focused on vision-based reconstruction and control of a soft robotic trunk, and working on an AI-driven autonomous pruning robot for precision agriculture.

Education

EPFL *Master Thesis* *Feb 2025 - Present*

- Thesis title: "Vision-based Soft Robotic Arms Reconstruction and Closed-loop Control".
- Advisors: Prof. Dr. Josie Hughes (EPFL) and Prof. Dr. Francesco Braghin (PoliMi).

Politecnico di Milano *MSc Data Science for Industrial Engineering* *Sep 2023 - Present*

- Focus on artificial neural networks, autonomous vehicles, digital twinning, and applied statistics.

EPFL *Swiss-European Mobility Programme (SEMP)* *Feb 2025 - Present*

- Semester abroad with studies focused on advanced control systems and data-driven design.

Alta Scuola Politecnica *Multidisciplinary Honors Program* *Jan 2024 - Present*

- 30 additional ECTS courses in innovation and mechanical design, jointly held by the Polytechnics of Milan and Turin.
- Multidisciplinary projects applying AI to mechanical problems.

Politecnico di Milano *BSc Mechanical Engineering* *Sep 2020 - Sep 2023*

- Grade: 110/110 with honors.

Research and Work Experience

Student Researcher, Master Thesis *Lausanne, Switzerland*
CREATE Lab *Feb 2025 – Present*

- Feedback control of a bio-inspired soft robotic trunk via CNN-based shape reconstruction.

Student Researcher, VinPRO Project *Turin, Italy*
PIC4SeR *May 2024 – Present*

- Development and testing of an autonomous pruning robot combining segmentation and control.
- Construction of a ROS-based system with high-precision electric actuation in collaboration with Yanmar.

Student Worker *Londonderry, UK*
Erasmus Plus *Jun 2019 – Jul 2019*

- Project management: a technology-driven festival on Italian culture.

Internship *Massa Lombarda, Italy*
WASP Srl *May 2018 – Jul 2018*

- Data collection on Delta Wasp printer performances and clay feedstocks, calibration, and assembly.

Fellowships and Awards

Alta Scuola Politecnica (ASP) Scholarship *Jan 2024*

- Selected among the 150 best students from the Polytechnics of Milan and Turin.

Swiss-European Mobility Programme (SEMP) Scholarship *Mar 2024*

- Funded coursework and research period at EPFL.

EPFL Master Thesis Funding *Feb 2025*

- Funded Master Thesis project at EPFL.

Selected Projects

Autonomous Vehicles - Path Planning and Navigation *Sep 2024 - Jan 2025*

- Implementation of path planning and autonomous navigation algorithms in ROS and Gazebo.

Digital Twin of Pressure Vessel and Battery Degradation *Oct 2024 - Feb 2025*

- Twin modeling with surrogate models, Metropolis-Hastings, and Particle Filter for RUL estimation.

Blood cells classification and Mars terrain segmentation *Oct 2024 - Dec 2024*

- Computer vision tasks with CNNs and U-Net on biomedical and Mars datasets.