

MICHELE LISI

Robotic Engineer

LANGUAGES

Italian: Native
English: Advanced (B2)

TECH STACK

ros ros2 ros2-control micro-ROS Gazebo Python C/C++ Docker
Julia Linux OpenCV TensorFlow PyTorch Solidworks Cura LaTeX

ABOUT ME

I am an enthusiastic engineer with a deep passion for legged robots, bio-inspired robots, bio-mimetic agent behavior and high-level robotics software.

Driven by curiosity and a commitment to excellence, I continuously seek new ways to harness technology for innovative solutions. As a quick learner with a keen eye for detail, I am ready to go the extra mile, especially when working on projects that captivate my interest.

EDUCATION

Master's Degree in Robotic and Automation Engineering | Università di Pisa

📅 04/2025

Points: 109/110

Average score: 26.5

📍 Pisa, Italy

Thesis title:

Theoretical Development and Experimental Validation of Residual Theory Based Collision Estimation on Legged Robots

Thesis professor(s):

Manolo Garabini, Franco Angelini, Michele Pierallini

Courses:

- **Computational Intelligence and Deep Learning**
This course covered single and multi-layer perceptron networks, techniques for supervised and unsupervised learning, deep neural networks, genetic algorithms, and fuzzy systems.
- **Symbolic and Evolutionary Artificial Intelligence**
The course explored multi-objective and lexicographic optimization algorithms, genetic algorithms, reinforcement learning, the application of Non-Archimedean numbers, and POSIT number representations for accelerating neural network computations in hardware. It also included a seminar on quantum computing.
- **Mechanical and Mechatronics Laboratory**
This laboratory-based course focused on microcontrollers, semiconductors, and sensors used in mechatronics, as well as motor control techniques and image processing with filtering.
- **Robot Control**
Topics included control techniques for completely actuated robots, analysis and control of nonlinear systems, and general strategies for robotic system control.
- **Distributed Robotic Systems**
The course addressed graph theory, discrete and optimal planning, motion planning, distributed algorithms, consensus protocols, and strategies for formation and coverage control in multi-agent robotic systems.

• Guidance and Navigation Systems

This course provided an in-depth study of navigation sensors, Earth models and reference frames, dead reckoning, mechanization equations, sources of navigation errors, localization systems such as GPS and LORAN, line-of-sight (LOS) based guidance systems including PNG and APNG, waypoint navigation, and fuzzy guidance techniques.

Bachelor's Degree in Computer Science and Automation Engineering | Politecnico di Bari

📅 2019

📍 Bari, Italy

Thesis title:

Characterization of infrared sensors

Thesis professor(s):

Mario Savino

PUBLICATIONS

📄 Submitted Articles

- L. Boccalini, C. Cavaliere, R. Costanzi, *et al.*, "Design and development of an autonomous surface vehicle for supporting underwater navigation," in *Latest Advancements in Mechanical Engineering*, F. Concli, L. Maccioni, R. Vidoni, and D. T. Matt, Eds., Cham: Springer Nature Switzerland, 2024, pp. 116–125, ISBN: 978-3-031-70465-9.

📄 Currently Writing

- M. Lisi, *Haptiquad: Residual-based contact forces estimator with proprioceptive sensing for quadrupeds*.

UNIVERSITY PROJECTS

THESIS - Theoretical Development and Experimental Validation of Residual Theory Based Collision Estimation on Legged Robot | 🔄 | 🔄 | 🔄

Quadruped C++ Pinocchio ros2 MBO Gazebo Mujoco

- Implementation of a flexible and robot-agnostic framework capable of correctly estimating ground reaction forces acting on any floating base robot without using F/T sensors and only exploiting IMU readings and joint position, velocity and torques. The force estimation is performed employing two momentum based observer, which is based on residuals theory

Benchmarking Object Detection Models for Mosquito Larvae Identification | 🔄

Python Docker MMDetection Object Detection Neural Networks

- Realization of a reusable and flexible framework to perform object detection finalized on the identification mosquito larvae. The work consisted in the expansion of an already existing dataset and a benchmark of different networks trained on it using MMDetection and Docker.

Manipulator Multi Controller | 🔄

Gazebo KDL ros2 ros2-control Computed Torque Backstepping Adaptive Backstepping

- Development of a controller in the ROS2-control and Gazebo framework that implements a Computed Torque Controller, PD with Gravity Compensation, Backstepping Controller, and Adaptive Backstepping Controller.

Lidar Odometry for a Quadruped Robot |

[Odometry](#) [Quadruped](#) [C++](#) [Python](#) [Gazebo](#) [ros2](#)

- Implementation and validation of a 2D Lidar based localization system for Centro Piaggio's quadruped robot. The system has been validated both in simulation using Gazebo, and on the real robot.
-

Prototyping and Deployment of an Autonomous Surface Vessel

[Solidworks](#) [C](#) [Arduino](#) [EasyEDA](#) [Soldering](#) [PCB](#)

- Development of an Autonomous Surface Vessel intended for lake monitoring. The work included the complete design from scratch of the vessel and the prototyping of a PCB to control the correct positioning of a USBL sensor using a linear actuator.
-

Lexicographic Reinforcement Learning Benchmark on MuJoCo environment | |

[Python](#) [Julia](#) [RL](#) [Gym - Mujoco](#) [PyTorch](#) [tkinter](#) [numpy](#)

- The project compares different reinforcement learning networks based on lexicographic DQNs, trained on the Mujoco Ant environment. The project has also led on the creation of a custom data analysis tool similar to TensorBoard capable of showing the network's results and effectively comparing them.
-

A network comparison in semantic segmentation for urban scenario

[Python](#) [TensorFlow](#) [Neural Networks](#)

- A thorough benchmark among different semantic segmentation neural networks trained from scratch on a custom created and augmented dataset based on urban scenario.
-

PointCloud Meshing |

[PointCloud](#) [open3d](#) [ros](#) [Python](#) [RealSense](#) [ICP](#) [PoseGraph](#)

- Realization of a system in the ROS framework that elaborates the PointClouds from RealSense cameras into 3D models. The algorithm isolates the points relative to the object of interest (a car) and reconstructs a 3D model of it.
-

Automotive simulator for E-Team Squadra Corse

[Carla](#) [Unreal Engine](#) [Python](#) [Blender](#) [Automotive](#)

- Development of an automotive simulator using Carla, an Unreal Engine 4 plugin, and different tools to interact with the simulation using their APIs. The aim of the simulation was to use it to prototype the stack software for an autonomous race vehicle.
-

PERSONAL PROJECTS

Crawlbert MK1-P

C C++ Solidworks ESP32 PCB creation

- A proof of concept of low budget autonomous track based vehicle. Its design has been created from scratch, 3D printed, and integrated with its hardware. A microcontroller, along with a custom made PCB, is able to receive commands via Bluetooth, control the motors, equipped with encoders, read IMU data and interact with a TFT screen.
-

Hexapod

Solidworks Raspberry Pi ros2 C++ microROS

- A work in progress legged robot equipped with six leg with 3 DOF each. It uses a microcontroller for low level control (servos, IMU, etc) which interacts using microROS with a Raspberry Pi, which handles higher level tasks.

REFERENCES
