

About me

My goal is to empower robots with autonomous reasoning and acting capabilities. I am mainly interested in planning and control for mobile robots, with a focus on loco-manipulation in legged systems, drawing on both model-based and data-driven approaches.

Research

- 2024–Current **Ph.D. Student at Italian Institute of Technology (IIT)**, *Genoa*, Italy.
Exploring autonomous loco-manipulation planning and control for hybrid wheeled-legged quadruped robots.
- 2024 **Research Fellow at Sapienza University of Rome**, *Rome*, Italy.
Developing a multi-sensory framework for safe multi-room crowd navigation. Research activity involves:
- integration of laser-based and vision-based perception;
 - development of a planning module to enable navigation in multi-room environments;
 - framework validation through real-world experiments using the TIAGo mobile manipulator.

Education

- 2024–Current **Italian Institute of Robotics and Intelligent Machine (I-RIM)**, *Genoa*, Italy.
- Ph.D. in Robotics and Intelligent Machines (DRIM)
 - Curriculum: Hostile and Unstructured Environments
 - Research Line: Humanoids and Human Centered Mechatronics (HHCM) at Italian Institute of Technology (IIT)
 - Supervisor: Nikolaos Tsagarakis
- 2021–2024 **Sapienza University of Rome**, *Rome*, Italy.
- M.Sc. in Artificial Intelligence and Robotics, *110/110 cum laude*
 - Thesis: “Safe robot navigation in a crowd: Application to the TIAGo mobile manipulator”
 - Supervisor: Prof. Giuseppe Oriolo
- 2018–2021 **University of Campania “Luigi Vanvitelli”**, *Caserta*, Italy.
- B.Sc. in Electronic and Computer Science Engineering, *110/110 cum laude*
 - Thesis: “Object Detection with Neural Networks for Robotics Applications: the YOLO Solution”
 - Supervisor: Prof. Ciro Natale

Publications

- 2024 **P. Carboni, G. Nardini, E. Santini, G. Gravina, T. Belvedere, M. Cipriano, F. d’Orazio, G. Oriolo**, A Vision-Based Control Scheme for Safe Navigation in a Crowd, *17th International Workshop on Human-Friendly Robotics (HFR)*, Lugano, Switzerland.
- 2024 **G. Gravina, L. Nunziante, A. De Luca**, Energy-based Residual for Collision Detection Using a Velocity Observer, *Sixth Italian Conference on Robotics and Intelligent Machines (I-RIM)*, Rome, Italy.

Projects

- 2025–Current **Fault-tolerant quadruped locomotion.**
Development of control policies to enable quadruped robots locomotion on harsh environments under the presence of joint hardware faults. The task is addressed with a pure RL framework using Brax as physics engine and MuJoCo as simulator. Project website [here](#).
- 2024 **Safe robot navigation in a crowd.**
Development of a sensor-based scheme for safe mobile robot navigation in multi-room and dynamic environments. The framework leverages Nonlinear Model Predictive Control (NMPC) for motion generation and Control Barrier Functions (CBFs) for collision avoidance. The project is being developed using Python, ROS, Gazebo and acados. Project website [here](#).
- 2023 **Planing throwing motion for mobile manipulators, *Autonomous and Mobile Robotics course*.**
Offline planning of a kinodynamically feasible and balance-safe throwing motion for a mobile manipulator. The motion planning problem is addressed by solving an Optimal Control Problem (OCP) using the *fmincon* function of the Matlab Optimization Toolbox.
- 2023 **Dynamic balance force control for humanoid robots, *Underactuated Robots course*.**
Development of a framework to ensure stability of a legged robot during task execution by regulating contact forces with the ground. The project has been developed in C++ and validated in the DART simulation environment.
- 2023 **Visual odometry, *Probabilistic Robotics course*.**
The project aims to estimate the robot trajectory and the position of fixed landmarks in a 3D environment given in input a sequence of images and the camera parameters. The framework leverages epipolar geometry and Projective ICP (PICP) to estimate the robot pose and KD-Trees for data association. The project has been developed in C++.
- 2023 **Collision detection with energy residual using velocity observer, *Physical Human-Robot Interaction course*.**
Development of a collision detection pipeline based on a scalar monitoring signal of the system kinetic energy, for rigid manipulators. The solution relies on proprioceptive sensors only and assumes only the robot joint positions are available. The project has been developed in Matlab and Simulink.
- 2023 **Video prediction on Moving MNIST and KITTI datasets, *Deep Learning course*.**
Development of a Deep Learning model to solve the SpatioTemporal predictive learning task. A fully convolutional architecture has been implemented in Pythorch Lightning. Performance are evaluated considering both Moving MNIST and KITTI datasets.
- 2022 **Visual servoing application to the dVRK simulator, *Medical Robotics course*.**
Development of an Image Based Visual Servoing (IBVS) technique to autonomously control the Endoscopic Camera Manipulator (ECM) and track the end-effectors of the Patient-Side Manipulators (PSMs), aiming at facilitating the teleoperation of the da Vinci surgical robot by. The project has been developed in C++ and validated using the da Vinci Research Kit (dVRK) in CoppeliaSim to simulate the patient-side and two Geomagic devices and one Oculus Rift for the master-side control and feedback.
- 2022 **Normal-based ICP, *Robot Programming course*.**
The project aims to build a map of the mobile robot's surroundings relying on a 2D laser scan and leveraging KD-Trees and ICP. The project has been implemented using C++ and ROS.

Software skills

Languages	Python, C/C++, MATLAB, Simulink, \LaTeX .
Robotic frameworks	ROS, ROS2.
Robotics simulators	Mujoco, IsaacSim, Gazebo, CoppeliaSim.
Libraries	Eigen, CasADi, acados, PyTorch, Jax/Flax.
Tools	git, Docker.

Awards and Scholarships

- 2024 **A vision-based control scheme for safe navigation in a crowd**, *Best Paper Award*, 17th International Workshop on Human-Friendly Robotics.
- 2024 **Robot navigation in crowds**, *Scholarship*.
Winner of a scholarship concerning the development of motion planning and control algorithms for wheeled mobile robots' navigation in dynamic environments. The scholarship has been awarded by Sapienza University of Rome.

Languages

Italian	Mother tongue
English	Professional knowledge

Personal Links

LinkedIn	https://www.linkedin.com/in/giovanbattista-gravina/
GitHub	https://github.com/gianni0907
Webpage	https://gianni0907.github.io