Giovanbattista Gravina
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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

2025–*Current* **Ph.D. Student at Italian Institute of Technology (IIT)**, *Genoa*, Italy.
Exploring learning-based approaches to solve loco-manipulation tasks with 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

2025–*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: Dr. 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

2026 **KYON: Semi-Modular Wheel–Legged Quadruped With Agile Bi-Manual Capability**, L. Rossini, A. Laurenzi, F. Ruscelli, Y. Zhang, J. Jiang, G. Gravina, L. Baccelliere, C. Burchielli, S. Cordasco, L. Muratore, N. Tsagarakis, *Robotics and Automation Letters*.
(Submitted, Preprint on arXiv)

2026 **Learning Fault-Tolerant Locomotion with Adaptive Gait Timing**, G. Gravina, L. Rossini, C. Rizzardo, A. Laurenzi, N. Tsagarakis, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2026)*.
(Accepted)

2026 **Crowd navigation in a multi-room environment: An MPC framework for mobile robots**, G. Gravina, F. D'Orazio, M. Cipriano, T. Belvedere, G. Oriolo, *Frontiers in Robotics and AI, Special Issue on "Social Robot Navigation – Opportunities, Algorithms, Tools, and Systems"*.

2024 **A Vision-Based Control Scheme for Safe Navigation in a Crowd**, P. Carboni, G. Nardini, E. Santini, G. Gravina, T. Belvedere, M. Cipriano, F. D'Orazio, G. Oriolo, *17th International Workshop on Human-Friendly Robotics (HFR)*, Lugano, Switzerland.

2024 **Energy-based Residual for Collision Detection Using a Velocity Observer**, G. Gravina, L. Nunziante, A. De Luca, *Sixth Italian Conference on Robotics and Intelligent Machines (I-RIM)*, Rome, Italy.

Selected Projects

2026–*Current* **Learning to adapt and interact in long-horizon loco-manipulation tasks**.
The target platform is the KYON robot, a quadruped equipped with two arms. The tasks under investigation span from pick-carry-place to environment-interactive navigation, like removing obstacles from the path or using objects to reach a goal position. Investigating both (flow) policy learning and optimization over a learned world model to ease real-world adaptation and generalization. The policy should emit both end-effectors trajectory and base commands, then tracked by RL-based low level controllers.

2026–*Current* **Learning multiple skills in a unified policy via multi-expert distillation**.
Leveraging reinforcement learning and imitation learning to unify different behaviors in a single policy. The addressed use-case is fall recovery and locomotion under joint failures for a quadrupedal robot: the policy autonomously selects the appropriate skill (getting up and quadrupedal or bipedal locomotion) by implicitly reconstructing the failure condition from proprioceptive observations only. Neither fault information nor skill selection is provided. Implementation builds on top of IsaacLab framework.

2025 **Fault-tolerant quadruped locomotion**.
Developing control policies for quadruped locomotion in harsh environments under joint hardware faults. The problem is addressed using an end-to-end reinforcement learning framework based on an asymmetric actor–critic architecture with knowledge distillation. Implementation uses Flax for neural network modeling, Brax for learning algorithms, and MuJoCo Warp for physics simulation. Project website here.

2024 **Safe mobile robot navigation in multi-room crowded environment**.
Developed a sensor-based framework for safe mobile robot navigation in dynamic, multi-room environments. The system combined Model Predictive Control (MPC) for motion generation with Control Barrier Functions (CBFs) for collision avoidance. Implementation used Python, ROS, Gazebo, and acados. Project website here.

2023 **Planning 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 humanoid 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.

Software skills

Languages	Python, C/C++, MATLAB, Simulink, LaTeX.
Robotics frameworks	ROS, ROS2, IsaacLab.
Robotics simulators	MuJoCo, MJX, IsaacSim, Gazebo, CoppeliaSim.
Libraries	Eigen, CasADi, acados, PyTorch, Jax/Flax, Brax
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`