Alessandro Puglisi

PhD Candidate in Underwater Robotics · Underwater Perception
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Skills

Programming	C++, Python, MATLAB, C, LaTeX
Software	ROS 1/2 (Robot Operating System), Stonefish, Gazebo, Simulink, Linux, git/GitHub
Libraries and Toolboxes	opencv, matplotlib, apriltag, pytorch, colmap, robotics-toolbox, Nav2
Engineering	Robotics, Perception and State Estimation, Control Theory, Systems Modeling

Experience

INESCTEC - Robotair
Porto, Portugal (Remote)

Robotics Python Developer Summer Intern — *Jul. 2025 - Sept. 2025*

- Developed new **python** features for Robotair, a platform to simplify robotics software development and deployment.
- Documented **ROS debugging** system syntax and best practice for users.
- Handled **version control** best practice in a software project involving four different teams. Integrated and prototyped new **ROS-containerization** features for the Robotair **DevOps platform**,using **python_on_whales** API's for docker.

Space Robotics Lab (SRL)
Sendai, Japan

Research Student — *Apr. 2024 - Aug. 2024*

- Researched methods for robustly and efficiently transforming a prototype multi-modal limbed climbing robot, equipped with a transformable gripper-wheel module.
- Integrated the new module in high/low-level control software, with a **ROS2** architecture written in **C++** and **python**.
- Improved **Gazebo** simulation reliability and **ros2_control** joints controller performance, by fine-tuning dynamical parameters and **PID** gains. Obtaining a realistic simulation for algorithm testing.
- Tested the updated software and transition algorithm on the physical system, achieving system stability and eliminating steady-state error in motor control.

Projects

Simulation of MBARI's Underwater Vehicles (MOLA, Doc Ricketts)

Personal Project — *Jan. 2026 - Present*

- **Stonefish** simulation migration from of a previous personal project in Gazebo.
- Defined physical-visual realistic 3D models of MOLA AUV and ROV Doc Rickets (using **blender**). Integrated thrusters actuation, teleoperation, and sensing, based on vehcicle's official specifications and MBARI's research papers.
- Tested state of the art compuer vision and robotics algorithms on custom modeled world (**kalman filtering**, **colmap SfM**, gsplat, **apriltag**, **ORB-SLAM3**).
- New simulation projects are under development! e.g. Lightweight manipulator for MOLA, acoustic SLAM with factor graph (gtsam), deep sea animals tracking, autonomous coral reef restoration farm navigation.

ROS2 Driver for Blueprint Oculus M3000d Forward Looking (imaging) Sonar

PhD Experiment set-up — *Dec.2025 - Present*

- Investigated working principle of **acoustic sensing**, related software interface, and used data structures.
- Updated previous model ROS2 drivers from the proprietary **C++** sdk, for the M3000d sensor model.
- Integrated **acoustic data pre-processing** and explored possible state estimation approaches (e.g. odometry via acoustic image optical flow or from sonar's internal AHRS).

Modeling, Control, and Dexterity Analysis of a Multi-Modal Limbed Robot

M.S. Thesis, "Space Robotics Lab Sequel" — *Sept. 2024 - Mar.2025*

- Modeled the kin/dyn of a transformable gripper-wheel limbed robot, extending MATLAB **robotics-toolbox**.
- Researched performance indices for the maneuverability of limbed systems, deriving a novel theory of dexterity.
- Developed software for analyzing the novel "base manipulability ellipsoid" and visualizing robot kinematics.
- Proved the reliability of the new performance criteria, with a **nature-inspired** example, based on insect kinematics.
- Designed a new joint controller in MATLAB and Simulink, Implemented and simulated both in wheeled and legged locomotion mode, with ROS 2 (C++) and Gazebo.

Mobile Robot Odometry, Mapping and Way-points Navigation

Perception, Localization, and Mapping for Mobile Robots *Apr. 2023 - July 2023*

- Implemented **Odometry** estimation for an autonomous shuttle, with ROS and C++.
- Mapped an indoor environment from ROS bag Laser Scan and 3D Lidar data, using **slam_toolbox**.
- Denoised the map, and performed autonomous navigation from csv waypoints, using AMCL (Adaptive Monte Carlo Localization) for localization and **Navigation** stack for path generation and tracking.

Simulation and Trajectory Tracking Control of a Car-like Robot

Control of Mobile Robots *Dec. 2023 - Jan.2024*

- Simulated a car-like robot with kinematic and dynamic bicycle model, using **ROS** and **odeint C++** library.
- Designed and Implemented a **PI trajectory tracking** controller with **feedback linearization**, with C++, relying on Bode theory for controller tuning.
- Analyzed controller performance for different kinematic/dynamic models, using **Python** to read and plot ros bags.
- Maintained tracking error below 3% in x and y coordinates, over a trajectory with a 2-meter amplitude.

Education

University of Montpellier, RSM LIRMM *Montpellier, France*

PhD Candidate in Underwater Robotics Perception *Oct. 2025 - 2028*

- **PhD Thesis**: *Mapping and monitoring of the surface condition and biological colonization of submerged parts of offshore wind turbines using acoustic imaging*
- **Advisors**: Vincent Creuze, Juliette Drupt, Frederic Comby
- **Topics**: Semantic opti-acoustic simultaneous localization and mapping, sensor fusion, deep learning

Max Planck Institute of Animal Behavior *Konstanz, Germany*

WildDrone Summer School *Sept. 2025*

- **Program**: Intensive week of talks and workshops from leading multidisciplinary researchers in the field of robotics and biology. Discussing relevant research projects, tools, and best practice to fill the gap between the two domains.
- **Topics**: Robotics, environmental monitoring, eDNA, conservation biology, animal behavior, remote sensing

Politecnico di Milano *Milano, Italy*

M.S. in Automation and Control Engineering *Sept. 2022 - Apr. 2025*

- **Final Grade**: 110L/110L
- **MSc Thesis**: Motion Control and Manipulability Analysis of LIMBERO-GRIEEL: a Multimodal Limbed Robot for Unstructured Environments
- **Relevant Courses**: Perception Localization and Mapping, Control of Industrial and Mobile Robots, Networked Control, Data Driven Control, Model Identification and Data Analysis, Dynamics of Mechanical Systems.
- Simulated and controlled robotic systems in Python and C++ using ROS and Gazebo, employing classical and advanced multi-variable controllers.

Tohoku University *Sendai, Japan*

Exchange Student at Space Robotics Lab *Apr. 2024 - Aug. 2024*

- **Courses** : System Control Engineering, Laboratory Experiments.
- Conducted experiments in different fields of Engineering: fluid dynamics, thermodynamics, electronic filtering.

Politecnico di Milano *Milano, Italy*

B.S. in Automation and Control Engineering *Sept. 2019 - Sept. 2022*

- **Final Grade**: 110/110L
- **Relevant Courses**: Fundamentals of Robotics, Informatics, Linear Algebra and Geometry, Probability, Calculus 1 and 2, Electronics, Measurement and Instrumentation, Modeling of Mechanical Systems.
- Mastered control theory, its mathematical foundations, and the software required for implementation.

Extra Activities and Certificates

Volunteering

Ailerons (Joined Oct.2025): Non-profit multidisciplinary scientific association.
Primary objectives of study, protect and educate about sharks and rays in the Mediterranean.

Formation

- **Ocean:** Scuba Diving SSI Advanced Adventurer, FESSMM Niveau 2, SSI Blue Oceans, Coral Reef Restoration, Remote Sensing and Mapping for Coral Reef Conservation (conservationtraining.org)
- **Software Tools:** ROS2 Basics and Intermediate, ROS2 Nav2 (Udemy), OpenCV, TensorFlow-Keras, PyTorch Bootcamp (OpenCV University)