

PERSONAL INFORMATION **Zoe Betta**

## PROFESSIONAL OBJECTIVES

During my PhD, I would like to complete my education and academic formation by enriching and perfecting my robotic abilities. In particular, I would like to deepen the research methodology with the goal of didactic activity also in academic contexts.

## EDUCATION AND TRAINING

A.A. 2022/2023 – today's date

**University of Genova**

Enrolled in the Ph.D. program of national interest in Robotics and Intelligent Machines. Curriculum Inspection and Maintenance of Infrastructures and title: Autonomous quadrupeds to improve public infrastructures resilience. Tutor: Antonio Sgorbissa e Carmine Recchiuto. Courses taken: Open Science and Research Data Management, Ethics and Bioethics in Bioengineering and Robotics, Paper Writing, Vibration Analysis and Predictive Maintenance. Summer School: Deep Learning and Computer Vision School. Activities in collaboration of Autorità di Sistema Portuale del Mar Ligure Occidentale for the development of strategies for inspecting ships' holds with quadruped robots.

A.A. 2020/2021- A.A. 2021/2022

**University of Genova**

Master's Degree in Robotics Engineering with mark 110 cum laude. Thesis of title: Multi-floor building exploration for autonomous quadruped robot. Exams taken: Advanced and robot programming (29), Artificial Intelligence for Robotics I (30L), Artificial Intelligence for Robotics II (30), Computer Vision (29), Human Computer Interaction (30), Mechanics of Mechanisms and machines (29), Mobile Robots (26), Modelling and Control of Manipulators (30), Real-Time Operating Systems (30), Research Track 1 (30), Research Track 2 (30), Software Architectures for Robotics (30L), Biomedical Robotics (30L), Cooperative Robotics (29), Experimental Robotics Laboratory (27), Flexible Automation (29), Machine Learning for Robotics II (30), Research Methodology (28), Social Robotics (30L), Virtual Reality for Robotics (27).

A.A. 2017/2018- A.A. 2019/2020

**Alma Mater Studiorum University of Bologna**

Bachelor's Degree in Ingegneria dell'automazione with mark 110 cum laude. Thesis of title: Modellistica dei motori elettrici e analisi di sensitività. Exams taken: Analisi matematica T1 (29), Analisi matematica T2 (29), Fisica generale T1 (26), Fisica generale T2 (28), Fondamenti di informatica T (30L), Geometria e algebra T (30L), Meccanica razionale T(28), Elettrotecnica T (25), Fondamenti di elettronica per l'automazione T (30), Fondamenti di meccanica applicata alle macchine T1 (26), Fondamenti di meccanica applicata alle macchine T2 (27), Reti logiche T (30L), Controlli automatici T1 (30L), Controlli automatici T2 (30), Azionamenti Elettrici T (24), Calcolatori Elettronici T (25), Economia e organizzazione aziendale (30), Foundations of industrial robotics (24), Ingegneria e tecnologie dei sistemi di controllo T (30L), Laboratorio di architetture e programmazione dei sistemi elettronici industriali T-A (30L), Macchine automatiche (30L).

A.S. 2012/2013 – A.S. 2016/2017

**Liceo scientifico A. Tassoni di Modena**

I received my scientific diploma with a final grade of 100/100

I attended the school year 2015/2016 (fourth year), as an exchange student, at the Nooksack Valley High School in Nooksack, Washington State.

## OTHER TRAINING EXPERIENCES

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April 2021

### **Business training course in Project Management e Problem Solving**

Training course in two days kept by the trainer Sebastiano Gambera on the themes of Problem Solving applied to company activities and of Project Management and teams management. Sebastiano Gambera is a trainer on themes such as Finance, Project Management, and Problem Solving and it is licensed with the Structogram method.

December 2019 - February 2020

### **H.P.E. Coxa – Modena Via R. Dalla Costa 620: Internship**

Internship with the university in the company of the automotive sector H.P.E. Coxa. The activities, in a team project, were focused on the modeling and the control of electrical actuators.

## WORK EXPERIENCE

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October 2023 – January 2024

### **Università di Genova – Via dell'Opera Pia 13: Teaching Assistant**

Teaching assistant activities for the course of Social Robotics of the master's degree in Robotics Engineering. During this activity, I planned and organized practical exercise sessions for students aimed to obtain skills in the use of social robots.

June 2022 – June 2024

### **Università di Genova – Piazza dell'Annunziata 6: Tutor Didattico PM**

Support activities for first-year students who started their university path with the University of Genova. We proposed group activities with the goal of both providing academic support but also provide tools to plan their study time.

April 2021 - June 2021

### **I.I.S.S. Carlo Emilio Gadda – Via Nazionale, 6, Fornovo di Taro PR**

Support the teaching activities for the PCTO project with the goal of building a feeler gauge prototype, Sigma Meter using the technology of Arduino and the microcontroller STM32F407/417.

January 2021- today's date

### **S.p.e.I.I. – Via Cesare Gnudi, Bologna**

Support and group management in training activities and team building. Help in the designing of teamwork activities using the technology ESP8266. S.p.e.I.I. is a company focused on training and organizational development.

September 2017- today's date

### **Support and consulting with an occupational psychologist**

Activities of data entry and processing of psycho-aptitude and personality tests. Design of items to detect aptitude for abstract logical reasoning and numerical reasoning. Organizing and writing PowerPoint presentations for events and conferences.

## PUBLICATIONS

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2024

### **Planning for Effective Inspection Missions Using Quadruped Robots– Under publication for ICRA@40**

Betta Z., Cebollada Gracia I., Tabita M., Benini A., Corongiu D., Gaudino A., Recchiuto C. T., Sgorbissa A.

Quadruped robots guarantee high flexibility and can be used for many different operations. This flexibility implies a variety of possible situations for which the robot can be used, as well as great complexity in planning these operations. For this reason, we propose an initial framework based on PDDL to regulate the sequence of actions and better react to changes in very dynamic environments.

2024

### **People, cracks, stairs, and doors: vision-based semantic mapping with a quadruped robot supporting first responders in Search & Rescue– under publication for RO-MAN 2024**

Betta Z., Recchiuto C. T., Sgorbissa A.

This study introduces a system implemented on a legged robot, designed to generate a multi-layered

map that incorporates semantic information, specifically tailored for Search & Rescue robotics. The article discusses the development of a Machine Learning model based on visual data for recognizing people and environmental features, and its integration into a mapping and navigation architecture. The system was tested in two different locations using the Spot robot by Boston Dynamics, equipped with an external ZED2 depth camera. Tests are described in detail and results analyzed.

2024 **Perceptions and Opinions of Rescuers about a Quadruped Robot in an Earthquake Scenario**— under publication for RO-MAN 2024

Betta Z., Gaudino A., Benini A., Recchiuto C. T., Sgorbissa A.

This work illustrates the testing of the Spot Robot performed at the training camp of Civil Protection and ANPAS (National Association of Public Assistance) in Foligno. The camp simulates the aftermath of an earthquake with different types of collapsed buildings. We teleoperated the quadruped Spot robot in different areas of the camp where Spot needs to address different challenges. The focus of the testing was not on the objective performance of the robot but on how the robot was subjectively perceived by rescuers of ANPAS and Civil Protection. Initially, we formulated and tested two hypotheses to check if locomotion in some areas is perceived better than in other areas and if there are perceivable differences when the robot is using different types of locomotion gaits. Then, we conducted unstructured interviews with participants who observed the robot in action to describe their rescue procedures and give us suggestions and opinions on what operations they expect the robot might perform.

2024 **Immersive control of a quadruped robot with Virtual Reality Eye-wear**— under publication for RO-MAN 2024

Yousefi A., Betta Z., Mottola G., Recchiuto C. T., Sgorbissa A.

This work describes an immersive control system for a quadruped robot, designed to track the head movements of the operator wearing a virtual reality eye-wear, while also utilizing joystick commands for locomotion control. The article details the implemented closed-loop velocity control approach and the locomotion task specifications. The proposed method has been implemented on a Spot robot from Boston Dynamics, with Meta Quest 2 virtual reality system. Evaluation of the approach involved a user study, where participants engaged in immersive control of the quadruped robot within an indoor experimental environment and provided feedback through standardized questionnaires. Pairwise comparison of the resulting data revealed significant advantages for the proposed immersive control system over a standard remote controller, with enhanced performance observed in the second trial of using the control system. However, participants lacking experience with virtual reality systems reported increased distress symptoms following the experiment.

2023 **Multi-floor danger and responsiveness assessment with autonomous legged robots in catastrophic scenarios** – published for RO-MAN 2023

Betta Z., Paneri S., Gaudino A., Benini A., Recchiuto C. T., Sgorbissa A.

In this work, we propose a strategy to implement the first two steps of the DRABC paradigm (Danger, Response, Airway, Breathing, Circulation) used by rescuers in Search and Rescue (SAR) with the use of a mobile quadruped robot. The robot is programmed to autonomously explore and create a map of the environment with the main objective of identifying areas of danger and reporting them to rescuers (first step of DRABC). While completing this first goal the robot must also identify people still inside the building, mark their position but also evaluate the health state of the person and in particular the response (second step of DRABC). Specifically, we propose new strategies for SAR considering that autonomous behaviour is particularly relevant before the human rescuers arrive: therefore, the policy adopted should privilege covering a broader area in the available time, rather than exploring a smaller area in depth. Strategies have been tested with the Spot robot from Boston Dynamics concerning both exploration and health assessment. The software developed and the tests to validate it are thoroughly described and explained.

AWARDS

**University of Genova**

2021 Merit-based fee reduction since I was in the first percentile of students in my course for grades.

**University of Genova**

2020 Merit-based fee reduction since I graduated my Bachelor's degree with 110 cum laude.

**Alma Mater Studiorum University of Bologna**

2019 Winner of a scholarship for the notice of competition "incentivo per l'iscrizione ai corsi considerati di particolare interesse nazionale per l'a.a 2017/2018"

## VOLUNTEERING

- 2014-2020 **Parrocchia Beata Vergine Addolorata – Modena via Rangoni**  
Activities of summer school animation and catechism to children of age between 6 and 15. In the groups were present children with certification for psychological and learning disorders.
- 2014/2015 **C.S.I. (Centro Sportivo Italiano): training course for Animators first level**  
The following topics, in particular, were covered in the course: animation activities, animation activities with certified children, clowning, first aid

## PERSONAL SKILLS

Mother tongue(s) Italian

Other language(s)	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken Interaction	Spoken Production	
English	C2	C1	C1	C1	C1

Levels: A1/2: Basic user - B1/2: Independent user - C1/2 Proficient user  
Common European Framework of Reference for Languages

During my academic path at the University of Genova, I sustained eligibility to the English level B-2.

**Communication skills** Study and work experiences abroad have enabled me to develop a high degree of interpersonal versatility, a spirit of adaptation, and a keen interpersonal sensitivity. During my internship, I was able to refine my communication and teamwork skills while working in a project team. I enjoy working with children and teenagers, I value activities in which they can express themselves and experience being in a team or a group.

**Organisational / managerial skills** I am reliable and organized. My time-management skills and my study method allowed me to conclude all of the exams in the year scheduled by the Plan of Study. Apart from the study and occasional work activities, I enjoy going out with different groups of friends.

**Computer skills** I am proficient with the following O.S.: Windows, Mac, Linux Ubuntu. I frequently use most of the Microsoft Office Suite. I use the Internet for research and to correspond via email. I have knowledge of the following programming languages: C, C++, and Python. I am able to use drawing CAD such as Creo. I use different engineering softwares such as Matlab, Simulink, and Codesys. I am proficient in using ROS. I can program microcontrollers, in particular STM32F407/417, Arduino, and ESP8266.

**Trattamento dei dati personali** Autorizzo il trattamento dei miei dati personali presenti nel cv ai sensi dell'art. 13 del Decreto Legislativo 30 giugno 2003, n. 196 "Codice in materia di protezione dei dati personali" e dell'art. 13 del GDPR (Regolamento UE 2016/679)