



MECHANICAL ENGINEERING SEMINAR

Monday, November 24 2025 at 14:30, D. Dan and Betty Kahn Building, Room 217

Wearable Exoskeletons and Underwater Robotics research at the MDM Lab

Prof. Benedetto Allotta, Ph.D.

Full Professor of Robotics and Mechanism Design, University of Florence

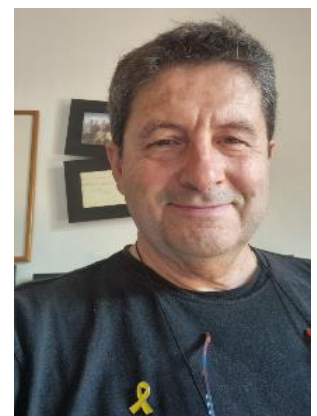
Hosted by: Dr. Nili Krausz

The seminar will present the two main active research areas at the MDM Lab at the University of Florence: (1) Wearable robotics for rehabilitation and assistance in impaired hand function, (2) Underwater robotics. The talk initially explores the potential of wearable hand exoskeletons to significantly improve functional independence and quality of life for people with disabilities, supporting daily activities and home rehabilitation. Despite the benefits, adoption is limited by technical issues like weight, bulkiness, and poor battery life. The goal is to create reliable, accessible, and clinically valid systems. In this context, the MDM Lab team developed DANTE, a fully wearable exoskeleton with a hybrid and modular design, capable of reproducing over twenty gestures. DANTE, controlled via myoelectric signals, was successfully presented at EXPO 2025 in Osaka, bringing the systems to a development stage that allows for clinical validation.

The second part of the talk is devoted to the underwater robotics activities of MDM Lab, including research on **mutant** (reconfigurable) underwater vehicles. Underwater drones are designed based on operational needs, so two different families exist, meeting conflicting requirements: 1) Carry out surveys over large areas of seafloor or water column using available on-board power efficiently. 2) Perform close inspection or intervention on submerged infrastructures. These tasks require conflicting design features. Close inspection and intervention, require compact, "stocky," shape with several actuators aimed at achieving hovering with good pose precision. For surveying large areas of the seafloor, the preferred shape is torpedo, and hover is not requirement. Mutant underwater drones, featuring reconfigurable shape are the right answer to the need to obtain drone excellent performance in both hovering and survey tasks.

Prof. Allotta earned his MS in Mechanical Engineering from the University of Pisa (1987) and his PhD in Robotics (magna cum laude, 1992) from the Scuola Superiore Sant'Anna. He served as a tenured assistant professor at Sant'Anna (1993–2001) before joining the University of Florence in 2001 as associate professor of Applied Mechanics, later becoming full professor of Robotics and Mechanism Design (2005–present) and directing the Department of Industrial Engineering (2015–2019). He currently coordinates the master's program in Robotics, Automation and Electrical Engineering and serves on the faculty boards of the Tuscan doctoral program "Smart Industry" and Italian National Doctoral School in Robotics and Intelligent Machines (DRIM, 2022–present).

His work has earned major distinctions, including the I-RIM Best Paper Award (2020), Teledyne Marine Award (2016), John F. Alcock Memorial Prize (2014), and Ettore Funaioli Award (2007). He was appointed Knight (2002) and later Officer (2017) of the Order of Merit of the Italian Republic, one of Italy's highest civilian honors.



A senior IEEE member, Prof. Allotta specializes in marine and wearable robotics, with over 90 peer-reviewed publications and nine patents. He has co-founded several robotics startups, led student teams to international success in marine robotics competitions, and secured significant European and national funding—including leadership of the €3M FP7 ARROWS underwater archaeology project and contributions to SUNRISE/BRUCE, SUONO, and RECON-UV. He is currently PI of the Tech Incubation project SEAMORPH, developing a startup based on the University of Florence's patented RUVIFIST underwater reconfigurable robot, funded by RoboIt.