Politecnico di Torino

DIMEAS SEMINAR

INTERACTING DRONES FOR NATURE CONSERVATION & SPACE EXPLORATION

SPEAKER

Salua Hamaza

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SALA FERRARI, II floor, DIMEAS Politecnico di Torino

ABSTRACT

Drones have traditionally been used as "eyes in the sky," relying primarily on cameras to observe their surroundings, avoid obstacles, and operate autonomously. However, despite their advancements in visual and navigational capabilities, drones remain the only robots incapable of physical interaction with their environment. This limitation stands in contrast to humans and other types of robots that interact and shape the world primarily through physical contact—manipulating objects, building structures, and transforming our surroundings to suit our needs.

My research aims to bridge this gap by addressing the scientific and technological challenges required to enable a new class of drones designed for physical interaction with their environment. These "interacting drones" represent a paradigm shift in aerial robotics, integrating novel design principles inspired by biological systems to achieve both compliance and adaptability in their movements and interactions.

By advancing the autonomy and versatility of drones through bodily intelligence — combining compliant hardware with interaction control algorithms — my work seeks to expand their functional capabilities. These advancements will empower drones to perform complex tasks in challenging environments, such as nature conservation (e.g., forest monitoring, tree harvesting, sampling) and space exploration (e.g., handling delicate materials or assembling structures). Ultimately, my mission is to demonstrate these transformative capabilities in real-world scenarios, showcasing the positive impact of interacting drones.

Biography

Dr. Salua Hamaza is an Assistant Professor in Aerial Robotics and Director of the BioMorphic Intelligence Lab at TU Delft, Netherlands. Her team consists of 7 PhDs and 2 PostDocs. She holds a Ph.D. in Robotics and Autonomous Systems from the University of Bristol, UK, and an M.Sc. in Robotics jointly awarded by the University of Bologna, Italy, and TU Delft. She was a Postdoc at Imperial College London and a visiting researcher at the University of Seville, Spain, and the University of Twente, Netherlands.

Since joining TU Delft in 2021, Prof. Hamaza has secured ≈ €2 million in research funding. Her achievements include receiving the prestigious VENI grant from the Dutch Research Council (NWO), awarded nationally to only 12% of applicants, and being a finalist in the $10 million XPRIZE Rainforest competition for advancing technologies in nature conservation. She collaborates with partners such as the European Space Agency (ESA) and has featured on CNN International and the BBC.

Her work has been recognized with two IEEE Best Paper Awards (RA-L; IROS) and third prize for the Best Ph.D. in Robotics in the UK. She serves as Associate Editor for IEEE Robotics and Automation Letters, technical chair for top robotics conferences (IROS, ICRA), and Program Chair for ICUAS 2025.