

**JUEVES 13 DE FEBRERO DE 2025, 18:30h-19:00h**

## **Aerial Robotics and the Advanced Center for Aerospace Technologies**

Aerial robotics has gained significant relevance in Robotics both from the point of view of research and the increasing number of applications. In the first part of this talk, I will introduce recent results of the research in aerial robotics by including aerial manipulators, bioinspired flapping wing robots, and soft aerial robots to decrease the risk in interaction with people. The presentation will cover fully autonomous robots and multi-robot systems, and collaboration with humans (aerial coworkers).

I will also introduce some applications to the inspection and maintenance of infrastructures and industrial plants, including electrical power lines, civil infrastructures and oil and gas industries.

In the second part of my talk, I will present the Advanced Center for Aerospace Technologies CATEC. I will introduce the characteristics of this Center, which already has new facilities in Galicia. The Center develops technologies and applications in Unmanned Aerial Vehicles, Avionics, Urban Air Mobility, Materials and Processes in Aerospace Manufacturing, Additive Manufacturing, Aerospace Testing Systems and Robotics and Automation in Aircraft Manufacturing. The Center has a very important role in the technology transfer to companies.

Finally, I will pay attention to the role of CATEC in the training of students and young engineers in the aerospace sector by including participation in very important projects with the best centers and companies in the world.

### **Aníbal Ollero:**



Anibal Ollero is Head of GRVC Robotics Laboratory with 70 members (average in the last 5 years) at the University of Seville and Scientific Director of the Centre for Aerospace Technologies (CATEC) also in Seville. He has been a full professor at Schools of Engineers in Vigo and Malaga (Spain), and a researcher at the Robotics Institute of Carnegie Mellon University (Pittsburgh, USA) and LAAS-CNRS (Toulouse, France).

He authored about 1,000 publications, including more than 275 papers in journals, and 9 books, and has been editor of 15 books. He led more than 190 research and innovation projects. He has an Advanced Grant from the European Research Council, has coordinated 7 European projects of the European Framework Programmes and participated, leading a partner team, in 45 projects of these Framework Programmes. He has transferred technologies in 89 contracts with 49 companies. He has been supervisor or co-supervisor of 53 PhD Thesis.

He has been recognized with 33 awards, including the Rei Jaume I Award in New Technologies 2019, the Spanish National Research Award in Engineering 2021, the ICUAS Achievement Award "for outstanding achievements and contributions in Unmanned Aviation and Aerial



## JAI Talks (2025)

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Robotics”, elected among the three European Innovators in 2017 and among the European personalities in 2017, and has been Overall Winner of the ICT Innovation Radar Prize 2017 of the European Commission, First European EU Drone Application Award and Second in the EURON-EUROP Technology Transfer Award, 2010. In Spain, he received the Andalusia Award for Engineering Development 2021, and the Automatica National Award 2022. He has obtained the Best Paper Award at many Robotics and Unmanned Aerial Systems Conferences. The jury of the Jaume I award, which included 5 Nobel Laureates and personalities from companies and institutions, awarded the leadership of Anibal Ollero in aerial robotics and highlighted the "invaluable ability to combine excellence in research and technological innovation with the transfer of technology to companies in aerial robotics”.

He is an IEEE Fellow, co-chair of the “IEEE Technical Committee on Aerial Robotics and Unmanned Aerial Vehicles” and coordinator of the “Aerial Robotics Topic Group” of euRobotics. He was a member of the “Board of Directors” de euRobotics until March 2019 and a founder and president of the Spanish Society for Research and Development in Robotics until November 2017. He is a member of the Royal Engineering Academy of Spain, the Royal Science Academy of Galicia and the Royal Science Academy of Seville. He is also “Doctor Honoris Causa” by the Universidad de Málaga.

### **Aníbal Ollero**

Director Científico del CATEC

Director del Laboratorio GRVC de la Universidad de Sevilla

<https://grvc.us.es/newweb/head-of-the-laboratory/>

**JUEVES 13 DE FEBRERO DE 2025, 19:00h-19:30h**

## **Intelligent Humanoid Robots in the Real World**

Humanoids represent the exponent of intelligent robotics. They have hyperdegrees of freedom, which usually reach more than 30, and a high control complexity. These robots try to reproduce behaviours of the human body in the physical domain, such as locomotion, manipulation and perception, and also in cognitive aspects, actively cooperating with humans. The question that arises is whether they will be able to perform complex tasks in the real world, not in labs, where environments are unstructured with difficult boundary conditions and human-humanoid interaction mimics daily life activities. The talk presents the bases of humanoid robots and focuses on several applications in real environments or very close to them. Applications will be presented, beyond the classic locomotion ones, such as ironing, serving as a waiter or assistant, opening and closing boxes, etc. In all of them, the skills of humanoids are intelligent, including the coordination of all the elements of the body. The implemented control architectures will be presented, ranging to whole body stability, bimanipulation, multisensory perception, multimodal human-robot interaction and several cognitive skills, such as empathy and anticipation. Likewise, AI-based learning and decision-making systems will be presented in all these applications, which will allow humanoids to leave the laboratories and enter the real world.

### **Carlos Balaguer:**



Carlos Balaguer is professor of robotics in the University Carlos III of Madrid and co-coordinator of the RoboticsLab research team formed by about 100 full-time researchers. His research focuses, among others, on intelligent robots, humanoid robotics, manipulation and locomotion control, assistance and service robots, rehabilitation and medical robots, robotics and automation in construction, and human-robot interaction. He is the director of the robotics hub RoboCity2030 that coordinates the research activities of all Madrid region universities and CSIC. He was also an elected director of the European Association of Robotics euRobotics. He has published more than 250 articles in journals and conference proceedings, and several books in the field of robotics. He has participated in 24 competitive European projects from the FP4 program to the current Horizon Europe one. He has received several awards, including the best book on Robotics by McGraw-Hill (1988); the 2006 Tucker-Hasegawa Award in Tokyo (Japan) for his important contribution in the field of robotics and automation in construction; and the 2014 award for the coordination of the Airbus-UC3M joint R&D center. He was the General Chair of the IEEE/RSJ IROS'2018 and IEEE-RAS Humanoids '2014 conferences.

**VIERNES 14 DE FEBRERO DE 2025, 13:45h-14:30h**

## **Deep-Sea Robotics Exploration: OceanOne<sup>K</sup>**

OceanOneK is a robotic diver with a high degree of autonomy for physical interaction with the marine environment. The robot's advanced autonomous capabilities for physical interaction in deep-sea are combined with the cognitive abilities of a human expert through an intuitive haptic/stereo-vision interface. OceanOneK was deployed in several archeological expeditions in the Mediterranean with the ability to reach 1000 meters and more recently the robot was tested in challenging tasks at Deep Dive Dubai. Distancing humans physically from dangerous and unreachable spaces while connecting their skills, intuition, and experience to the task promises to fundamentally alter remote work. These developments show how human-robot collaboration-induced synergy can expand our abilities to reach new resources, build and maintain infrastructure, and perform disaster prevention and recovery operations - be it deepin oceans and mines, at mountain tops, or in space.

### **Oussama Khatib:**



Oussama Khatib received his PhD from Sup'Aero, Toulouse, France, in 1980. He is Professor of Computer Science and Director of the Robotics Laboratory at Stanford University. His research focuses on methodologies and technologies in human-centered robotics, haptic interactions, artificial intelligence, human motion synthesis and animation. He is President of the International Foundation of Robotics Research (IFRR) and an IEEE Fellow. He is Editor of the Springer STAR and SPAR series, and Springer Handbook of Robotics. He is recipient of the IEEE Robotics and Automation, Pioneering Award, the George Saridis Leadership Award, the Distinguished Service Award, the Japan Robot Association (JARA) Award, the Rudolf Kalman Award, and the IEEE Technical Field Award. Professor Khatib is Knight of the National Order of Merit and a member of the National Academy of Engineering.

**VIERNES 14 DE FEBRERO DE 2025, 14:30h-15:15h**

## **A Revolutionary Theranostics Approach for Robotized Colonoscopy**

This talk will present the underlying concepts of EndoTheranostics, a novel ERC Synergy Grant project aiming at revolutionizing the diagnosis and therapy (theranostics) of colorectal cancer (CRC), impacting the quality of life of millions of individuals. CRC represents a significant proportion of malignant diseases. Interventions are often carried out during the latter stages of development, leading to low patient survival rates and poor quality of life. In 2022 a European Commission report stated that “colonoscopy-based screening has higher sensitivity than testing for blood in stool, but it is less acceptable to participants”. At the same time, effective methods to treat polyps in the colon are limited. Current approaches are often associated with unsafe oncological margins and high complication rates, requiring life-changing surgery. EndoTheranostics will usher in a new era for screening colonoscopy, advancing the frontiers of medical imaging and robotics. A tip-growing or eversion robot with a sleeve-like structure will be created to extend deep into hollow spaces while perceiving the environment through multimodal imaging and sensing. It will also act as a conduit to transfer miniaturized instruments to the remote site within the colon for theranostics. With these capabilities, the system will be able to offer: (i) painless colon cleansing in preparation for endoscopy, (ii) real-time polyp detection and tissue characterization through AI-assisted multimodal imaging, (iii) effective removal of polyps by conveying a “miniature mobile operating chamber” equipped with microsurgical tools to the target through the lumen of the eversion robot.

### **Bruno Siciliano:**



**Bruno Siciliano** is professor of robotics and control at the University of Naples Federico II. He is also Honorary Professor at the University of Óbuda where he holds the Kálmán Chair. His research interests include manipulation and control, human-robot cooperation, and service robotics. Fellow of the scientific societies IEEE, ASME, IFAC, AAIA, AIIA, he received numerous international prizes and awards, including the recent 2024 IEEE Robotics and Automation Pioneer Award. He was President of the IEEE Robotics and Automation Society from 2008 to 2009. He has delivered more than 150 keynotes and has published more than 300 papers and 7 books. His book “Robotics” is among the most adopted academic texts worldwide, while his edited volume “Springer Handbook of Robotics” received the highest recognition for scientific publishing: the 2008 PROSE Award for Excellence in Physical Sciences & Mathematics. His team has received more than 25 million Euro funding in the last 15 years from competitive European research projects, including two ERC grants.

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