

# UNIGE-UC3M Experience: International Collaboration agreement fostering Doctoral Education

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INTERNATIONAL COOPERATION IN DOCTORAL EDUCATION: FINDINGS AND THE WAY FORWARD

YERUN network

Project: LinkEduRes: Linking Education and Research towards the European Education Area

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# Index

1. The origin of the research activities
2. The framework of the collaboration
3. Faculty UNIGE Team
4. Faculty UC3M Team
5. Two active Cotutelas
6. Results
7. Future collaboration

# The origin of the research activities

## UC3M-Santander Chairs of Excellence 2017

The goal of the UC3M-Santander Chairs of Excellence Program is to promote excellence in research by attracting leading **international researchers** to the University to help our departments, research institutes and research groups to **strengthen** and **increase** their international ties, as well as to improve their technical and scientific skills, develop long-term collaborations and share teaching and research experiences with these renowned researchers.

## Carlo Regazzoni - Universita Degli Studi di Genova, Italy

He is full professor at DITEN Dept., University of Genova, Italy, where he is head of the Information and Signal Processing for Cognitive Telecommunications research group. Since 2009 he is coordinator of international PhD courses (EMJD ICE, ICE) on Interactive and Cognitive Environments.

**Project:** The scientific goal was to study and develop behavioral self-aware representation and inference techniques to allow embodied Cognitive Dynamic System associated with physical autonomous agents to learn from experiences observed and proactive situation patterns.

# The framework of the collaboration

## General Cooperation Protocol between Universidad Carlos III de Madrid (Spain) and Università Degli Studi di Genova (Italy)

1. Duration: **8 June 2018 – 8 June 2022**
2. Framework of cooperation between UC3M and UNIGE in order to undertake **joint actions** that promote the development of activities within the framework of the **PhD programs in Electrical Engineering, Electronics and Automation and Joint Doctorate in Interactive and Cognitive Environments (JD ICE)** curriculum: [Self-aware Autonomous Systems](#)
3. The signed parties show their will to **cooperate**, among others, in the following actions fields:
  - PhD thesis codirection
  - PhD thesis cotutela
  - Workshops and Conferences organization
  - Establishment of programs for Academic interchange
  - Establishment of joint publications and research proposals
  - Any other actions agreed by the parties

# Faculty UNIGE Team

## Joint Doctorate in Interactive and Cognitive Environments (JD ICE)

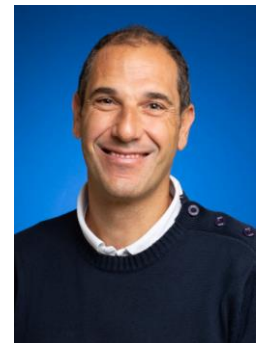
### Prof. Carlo Regazzoni (Università degli Studi di Genova)

He is full professor of Cognitive Telecommunications Systems at DITEN, University of Genoa, Italy. He has been responsible of several national and EU funded research projects. He is currently the coordinator of international PhD courses on Interactive and Cognitive Environments involving several European universities. He served as general chair in several conferences and associate/guest editor in several international technical journals. He has served in many roles in governance bodies of IEEE SPS and He is serving as Vice President Conferences IEEE Signal Processing Society in 2015-2017.



### Prof. Lucio Marcenaro (Università degli Studi di Genova)

He has over 20 years of experience in signal processing and image sequence analysis. He is the author of about 160 scientific papers related to signal processing for computer vision and cognitive radio. He graduated in Electronic Engineering in 1999 and obtained a Ph.D. in Computer Science and Electronic Engineering in 2003. He is an Associate Professor in Telecommunications for the Polytechnic School of Engineering of the University of Genoa. His main current research interests are video processing for event recognition, detection, and localization of objects in complex scenes, distributed heterogeneous sensors, and bio-inspired cognitive autonomous systems.



# Faculty UC3M Team

## Doctoral Program in Electrical Engineering, Electronics and Automation

### Prof. José María Armingol Moreno

Full Professor of Robotics and Automation at Intelligent Systems Laboratory (Carlos III University). José María Armingol received his Ph.D. in Automation from the Universidad Carlos III of Madrid in 1997. His research interest focus on Computer Vision, Image Processing and Real-Time Systems applied to Intelligent Transportation Systems.



### Prof. David Martín Gómez

He is Associate Professor at the Universidad Carlos III de Madrid (UC3M) and a member of the Intelligent Systems Laboratory (LSI). His lines of research are perception systems, computer vision, sensor fusion, intelligent transportation systems, advanced driver assistance systems, autonomous ground vehicles, unmanned aerial vehicles, positioning and autonomous navigation of ground and aerial vehicles, and self-awareness, reasoning and decision-making under uncertainty in autonomous vehicles.



### Prof. Arturo de la Escalera Hueso

Industrial Engineer by the Universidad Politécnica de Madrid from 1989, where he defended his doctoral thesis in 1995. He joined the Universidad Carlos III de Madrid in 1993 where he is a Full Professor since 2018. His main research line is autonomous Vehicles with special emphasis in the application of Computer Vision for road environment perception and object recognition in real time.



### Prof. Pablo Marin-Plaza

He joined the Department of Systems and Automation Engineering at Universidad Carlos III de Madrid, becoming a member of the Intelligent Systems Lab. In 2013, he received the Master degree in Robotics and Automation. He started working as an assistant lecturer in 2013 and his current research interests include computer vision and autonomous ground vehicles. In 2018, he obtained the title of Doctor Engineering in Electric, Electronic, and Automation.



# Two active Cotutelas

## Hafsa Iqbal (Cotutela PhD candidate at UNIGE and UC3M)

Hafsa Iqbal received her BSc degree in Electrical Engineering from University of Engineering and Technology Taxila, Pakistan in 2016 and MS degree (Gold Medal) in Electrical Engineering from National University of Sciences and Technology, Pakistan in 2018. She is currently a PhD student and involved in the JD ICE program of University of Genoa, Italy and University Carlos III of Madrid, Spain. Her research interests include signal processing and AI techniques for cognitive environments.



## Sheida Nozari (Cotutela PhD candidate at UNIGE and UC3M)

Sheida received her first master's degree in Computer engineering - artificial intelligence from Azad University, Iran, in 2017 and her second master's degree in human-computer interaction from the University of Paris-Saclay, France, in 2019. She is currently pursuing a Ph.D. degree under the Joint Doctorate in Self-aware Autonomous System program between the University of Genoa, Italy, and the Carlos III University of Madrid, Spain. Her research interests include imitation learning, self-awareness, autonomous multi-agent, and learning techniques for cognitive and interactive environments.



# Results

## International journals collected in the Journal Citation Reports (JCR)

1. Thekke Kanapram, D.; Marcenaro, L.; Martin Gomez, D.; Regazzoni, C., "Graph-Powered Interpretable Machine Learning Models for Abnormality Detection in Ego-Things Network", *Sensors*, Volume 22 (6), 2260, 15 March 2022
2. H. Iqbal, D. Campo, P. Marin-Plaza, L. Marcenaro, D. M. Gómez and C. Regazzoni, "Modeling Perception in Autonomous Vehicles via 3D Convolutional Representations on LiDAR", *IEEE Transactions on Intelligent Transportation Systems*, doi: 10.1109/TITS.2021.3130974.
3. Hafsa Iqbal, Damian Campo, Lucio Marcenaro, David Martin Gomez, Carlo Regazzoni, "Data-driven transition matrix estimation in probabilistic learning models for autonomous driving", *Signal Processing*, Volume 188, 2021, 108170, ISSN 0165-1684, <https://doi.org/10.1016/j.sigpro.2021.108170>.
4. Mahdyar Ravanbakhsh, Mohamad Baydoun, Damian Campo, Pablo Marin, David Martin, Lucio Marcenaro, Carlo Regazzoni, "Learning Self-Awareness for Autonomous Vehicles: Exploring Multisensory Incremental Models", *IEEE Transactions on Intelligent Transportation Systems*, Vol. 22 (6), 3372 – 3386, 2021, ISSN: 1524-9050, DOI: 10.1109/TITS.2020.2984735.
5. D. T. Kanapram, M. Marchese, E. L. Bodanese, D. M. Gomez, L. Marcenaro and C. Regazzoni, "Dynamic Bayesian Collective Awareness Models for a Network of Ego-Things," in *IEEE Internet of Things Journal*, vol. 8, no. 5, pp. 3224-3241, 1 March 1, 2021, doi: 10.1109/JIOT.2020.3043199.
6. Damian Campo, David Martin, Lucio Marcenaro, "Unsupervised Anomaly Detection Using Intelligent and Heterogeneous Autonomous Systems: Highlights From the 2020 IEEE Signal Processing Cup Student Competition", *IEEE Signal Processing Magazine*, Vol: 37 (5), 152 – 157
7. D. Thekke Kanapram, P. Marin-Plaza, L. Marcenaro, D. Martin, A de la Escalera, C. Regazzoni, "Self-Awareness In Intelligent Vehicles: Feature based Dynamic Bayesian models for Abnormality Detection", *Robotics and Autonomous Systems*, Vol:134, 103652
8. Divya Thekke Kanapram, Fabio Patrone, Pablo Marin-Plaza, Mario Marchese, Eliane L Bodanese, Lucio Marcenaro, David Martin Gomez, Carlo Regazzoni, "Collective awareness for abnormality detection in connected autonomous vehicles", *IEEE Internet of Things Journal*, Vol: 7 (5), 3774 – 3789, 2020
9. Damian Campo, Mohamad Baydoun, Pablo Marin, David Martin, Lucio Marcenaro, Arturo de la Escalera, Carlo Regazzoni, "Learning Probabilistic Awareness Models for Detecting Abnormalities in Vehicle Motions" *IEEE Transactions on Intelligent Transportation Systems*, DOI: 10.1109/TITS.2019.2909980



# Results

1. Contributions to international conferences
2. Invited speaker by the University of Genoa to participate in GTTI – Thematic Meeting on Multimedia Signal Processing 2018. Cavalese, Trento, Italy, January 21 - 23, 2018.
3. Guest speaker for the University of Genoa to participate in the 2019 IEEE SPS / EURASIP / ISIF Summer School on Signal Processing (S3P-2019), Arenzano, Genoa (Italy), September 9 - 13, 2019.
4. Members of IEEE Signal Processing Society - IEEE Autonomous Systems Initiative (SPS - ASI)
5. IEEE Signal Processing Cup 2020: Unsupervised abnormality detection by using intelligent and heterogeneous autonomous systems
6. ICAS 2021 Challenge: Self-awareness in heterogeneous Multi-Robot Systems

# Future collaboration

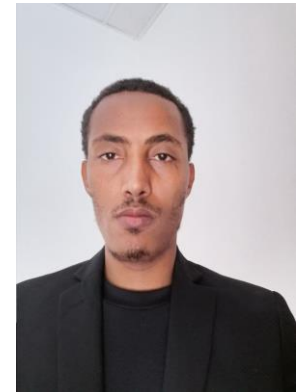
## Giulia Slavic (Cotutela PhD candidate at UNIGE and UC3M)

She obtained her titles of Electronics and Information Technologies Engineer in 2017 and MS of Internet and Multimedia Engineering in 2020 from the University of Genoa, Italy. She is currently a PhD student at the University of Genoa. Her research interests include the use of deep learning and signal processing algorithms for sequential multisensory data.



## Abrham Shiferaw Alemaw (Future Cotutela)

He obtained his B.Sc. title in computer science in 2010 from Addis Ababa University, Ethiopia, and MS in Internet and Multimedia Engineering in 2021 from the University of Genoa, Italy. His research interests include incorporating various machine learning algorithms for Imitation learning in multi-sensor self-aware, autonomous systems.



## New Agreement between UNIGE and UC3M

Duration: 8 June 2022 – 8 June 2026