

UNIVERSITÀ DEGLI STUDI DI NAPOLI
FEDERICO II



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DEGLI STUDI
DI BERGAMO



清华大学
Tsinghua University

CI - China - Italy
LAM Joint Laboratory
on Advanced Manufacturing

中意先进制造联合实验室

Summer School PROGRAM

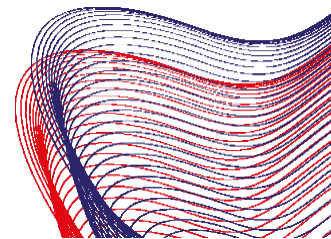
Fifth Edition
Naples, July 17th-21th

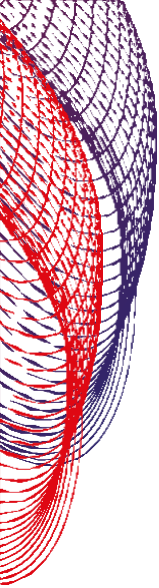


CI-LAM Technical Partners



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Cooperation and
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Background

CI - China - Italy
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The CI-LAM Summer School is one of the core activities of this higher education program, and in 2023 it already counts its **5th Edition**. The 1st Edition was launched in **2019** and was held in **Naples (IT)** from the 15th to the 28th July. It saw participants from the **Tsinghua University, the Federico II University of Naples and the University of Bergamo**.

In the following years, due to the outbreak of the **COVID-19 Pandemic**, the 2020-2021 Editions of the CI-LAM Summer School were held remotely, with online training, innovation and matchmaking activities. Online activities led to a significant increase of students joining the initiative; for instance, in 2021 **60 students from 24 different universities** from China, Italy and other countries joined the program.

Last year, due to some remaining travel restrictions, the 3rd Edition activities were held both **in presence and remotely**. Two face-to-face classes were trained: one at the University of Bergamo, and the other one at the Tsinghua University in Beijing; the two classes were joined together via a video conferencing platform to create a single virtual class and participate together in the activities with **Chinese and Italian professors**.



The Summer School 2023



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For its 2023 5th Edition, the **CI-LAM Summer School** will finally be completely **face-to-face** and on-site once again. A single class, made of Italian and Chinese Master's and/or PhD students, will attend classes and join lab activities in **Naples (IT)** at the **San Giovanni a Teduccio Science Park of the Federico II University of Naples**.

However, we will keep using video conferencing platforms. We expect to have at least 20-25 students on-site in Naples, and at least 50 other students joining remotely. The maximum number of participants is **100 students**. This year we have planned **16 activities: 8 classes, 4 laboratories and 4 matchmaking sessions**. 12 activities will be offered by university professors, while the remaining 4 activities will be offered by industrial experts. Each lecture will be 1 hour and a half, and those researchers interested in the topics will have the opportunity to join R&D matchmaking sessions and discuss about joint **research cooperation programs**. The number of research groups joining the matchmaking sessions will be in equal number from both the Chinese and Italian side.

The official language of the CI-LAM Summer School will be **English**. By the end of the program, students passing the tests will receive a **"Certificate of Attendance"**, issued by CI-LAM with the official endorsement of the three organizing academic institutions: **Tsinghua University, Federico II University of Naples, University of Bergamo**.



Schedule

	TIME IN ITALY 9:00-12:00	TIME IN CHINA 15:00-18:00	TOPICS	LECTURER
DAY 1 17 JULY	8:30-10:30 Lecture 11:00- 13:00 Lecture	14:30-16:30 Lecture 17:00-19:00 Lecture	Additive Manufacturing Data-driven decision-making for maintenance	Prof. Antonello Astarita Ing. Roberto Sala
	14:30-18:00 Laboratory 14:30-18:00 Laboratory	----- -----	Laboratory: Mechatronic Laboratory: Meditech	Prof. Rosario Schiano Lo Moriello
DAY 2 18 JULY	8:30-10:30 Lecture 11:00- 13:00 Lecture	14:30-16:30 Lecture 17:00-19:00 Lecture	Collaborative robots COBOTS Automation and non-linear control techniques	Prof. Fanny Ficuciello Prof. Mario Di Bernardo
	14:30-18:00 Laboratory 14:30-18:00 Laboratory	----- -----	Laboratory: Mechatronic Laboratory: Meditech	Prof. Rosario Schiano Lo Moriello
DAY 3 19 JULY	8:30-10:30 Lecture 11:00- 13:00 Lecture	14:30-16:30 Lecture 17:00-19:00 Lecture	Systematic Innovation Technology 5G communications for industry	Dr. Jason Wang Prof. Tonia Tulino
	14:30-18:00 Laboratory 14:30-18:00 Laboratory	----- -----	Laboratory: Measurements and Sensors	Prof. Michele Riccio @STMicroelectronics - Arzano
DAY 4 20 JULY	9:30 - 11:00 Visit 11:00 - 13:00 Visit	----- -----	Academy Visit	Apple Developer Academy 5G Academy
DAY 5 21 JULY	8:30-10:30 Lecture 11:00- 13:00 Lecture	14:30-16:30 Lecture 17:00-19:00 Lecture	High performance Motor Control New trends in additive manufacturing	Prof. Xiao Xi Prof. Mariangela Quarto
DAY 5 21 JULY	15:00-18:00		Closing Ceremony - Delivery of Attendance Certificates	Federico II University of Naples - San Marcellino e Festo

The timetable will be adjusted according to the lecturers' schedule.

Candidate topics for summer school 2023

From the Chinese side

- **Dr. Jason Wang**, Systematic Innovation Technology
- **Prof. Xiao Xi**, High Performance Motor Control

From the Italian side

- **Prof. Antonello Astarita**, Additive Manufacturing
- **Prof. Mario Di Bernardo**, Automation and non-linear control techniques and through Artificial Intelligence
- **Prof. Fanny Ficuciello**, Collaborative robots COBOTS
- **Prof.ssa Mariangela Quarto**, New trends in additive manufacturing for resilient and sustainable industry
- **Ing. Roberto Sala**, Data-driven decision-making for maintenance delivery and improvement in the Industry 4.0 context
- **Prof. Antonia M. Tulino**, 5G communications for industry

Laboratories for summer school 2023

- **Prof. Michele Riccio**, Mechatronic Systems
- **Prof. Schiano Lo Moriello**, Measurements and Sensors for Industry
- **Laboratories at Meditech**
- **Academy Visit**



Short abstracts of the lectures and

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biographies of speakers



Dr. Jason Wang

Short Bio

Founder and CEO of IMA-INNOCLOUD (Beijing) Technology Co., Ltd.. Jason Wang, 54, got his Master degree from Electrical Engineering Dept., Tsinghua Univ. (THU) in 1993. He has been served as senior lecturer in THU for 5 years, and then moved to industry in 1998.

During his career experience of more than 30 years, he founded several successful companies in automation, robotics as well as innovation services, such as Smart Factory Institute, diagnosis and service provider for life-cycle management of smart factory; and IMA Innocloud, offering innovation training, services, and innovation management software.

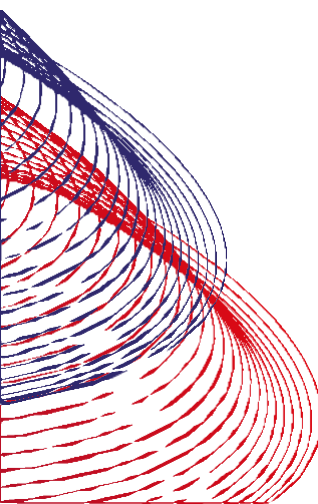
He co-founded China Sci-tech Automation Alliance (CSAA) in 2011, and has been successfully leading the organization to be one of most dynamic and well known alliance in smart manufacturing and advanced automation areas. Jason Wang has rich experiences and in-depth insights to advanced manufacturing/Industry 4.0/ Industrial Internet domestically and worldwide. He is also very active in international collaboration and technical transfer.

SPEECH TOPIC:

AI accelerates scientific discovery and technological innovation.

SPEECH ABSTRACT:

Starting with the basic process of scientific discovery and technological innovation, the lecture provides a brief introduction to the common methods and tools used in technological innovation and the history of the evolution of technological innovation methodologies. The concept of the technology innovation lifecycle is introduced and students are guided through the value creation process from need-idea-innovation-development-commercialization. Emphasis is placed on how to use technology system evolution trees for technology direction prediction, how to use innovation tools such as Triz to solve specific technology challenges, and how to use the latest artificial intelligence technologies to accelerate scientific discovery and improve the efficiency of R&D and innovation.



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Prof. Xi Xiao

Short Bio

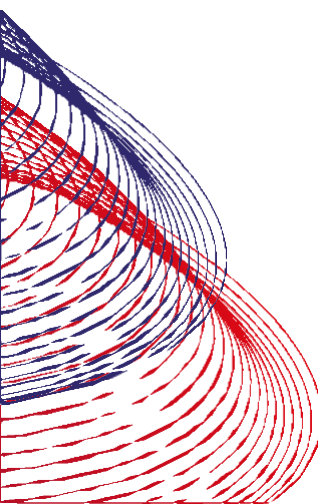
Xi XIAO received the B.E., M.E., and Ph.D. degrees from Saint-Petersburg State Technical University, Russia, in 1995, 1997, and 2000, respectively. Since 2001, he has been with the Department of Electrical Engineering, Tsinghua University, Beijing, China, where he is currently a **Professor and Vice-Dean of Graduate School of Tsinghua University**.

His main areas of research interest: 1) High-performance control of AC machines and its application in servo systems and robot control system; 2) Energy Storage System in microgrid and microgrid community; 3) Wave energy conversion system. He is the author and co-author of more than 150 peer-reviewed articles and proceedings papers, as well as 3 books and 40 patents.

Professor Xiao has served as a member of the standing Council of China Power Supply Society, director member of the Beijing Power Electronics Society, Editorial Board Member of journal of Electrical Engineering and China Electrical Engineering Canon. Professor Xiao has also served as General and Organizing Committee Chairs for numerous conferences in motor control and power electronics.

SPEECH TOPIC:

HIGH PERFORMANCE MOTOR CONTROL



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Prof. Antonello Astarita

Short Bio

Antonello Astarita is associate professor of manufacturing at the University of Naples "Federico II", he is interested in additive manufacturing, solid joining and plastic deformation processes of metals and sustainable production. He is co-author of more than 100 research articles published in high reputation journals and is also member of several editorial boards.

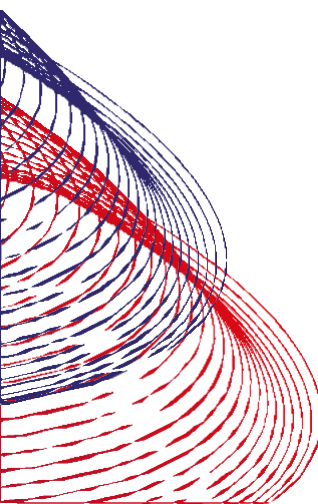
Prof. Astarita was also principal investigator in some research grants and holds also numerous research contracts with public and private companies. Prof. Astarita already received the ASM Silver Medal in 2022, the ESAFORM Scientific Prize in 2018 and the ASM-IIM Visiting Lectureship Award in 2016.

SPEECH TOPIC:

Additive Manufacturing of Metals: Sustainability and Challenges

SPEECH ABSTRACT:

This short lesson will give an insight on the newest applications of additive manufacturing techniques highlighting their contribution in making more sustainable the industrial production. The lesson will start with the introduction of the fundamental aspects of the processes and with the presentation of the taxonomy of the field, then the most appealing applications will be explained. The second part of the lesson will be devoted to the study of the sustainability of the processes and to the analysis of their potentialities in bringing industrial production on a more sustainable dimension. Lastly the implication of AM techniques on market and society will be reviewed and the future challenges for researchers, companies and professionals will be discussed.



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Prof. Mario Di Bernardo

Short Bio

Mario Di Bernardo is Professor of Automatic Control at the University of Naples Federico II, Italy and Visiting Professor of Nonlinear Systems and Control at the University of Bristol, U.K. He currently serves as Deputy pro-Vice Chancellor for Internationalization at the University of Naples and coordinates the research area and PhD program on Modeling and Engineering Risk and Complexity of the Scuola Superiore Meridionale, the new School of Advanced Studies located in Naples. On 28th February 2007 he was bestowed the title of Cavaliere of the Order of Merit of the Italian Republic for scientific merits from the President of Italy.

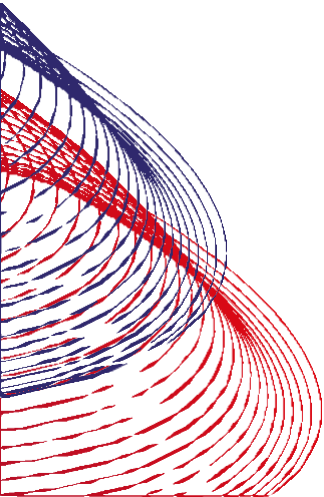
He authored or co-authored more than 220 international scientific publications including more than 110 papers in scientific journals, a research monograph and two edited books. According to the international database SCOPUS (June 2022), his h-index is 51 and his publications received over 11000 citations by other authors. He is regularly invited as Plenary Speakers in Italy and abroad.

SPEECH TOPIC:

An introduction to modeling and control of complex multiagent systems

SPEECH ABSTRACT:

This lecture will be devoted to the give students a brief introductions to the modeling, analysis and control of complex multiagent systems also known as complex networks. From large flocks of minidrones, to autonomous vehicles, smart grids and cellular populations, finding a way to close the loop between the microscale, where agents live, and the macroscopic properties that typically need to be controlled is a crucial open challenge for network control and the automation of complex systems and infrastructures. Controlling a system of interest requires being able to sense, compute and actuate. When complex systems are involved, addressing each of these ingredients requires finding new approaches. What and how many agents need to be controlled/sensed and at what scale is a question beyond the current state-of-the-art that requires a new holistic approach to modelling/analysing and controlling large scale network systems. In this lecture I will give snapshots into the crucial problems this entails and give a flavour of the most recent solutions that were proposed to solve the problem. I will use some case studies from applications and hands-on numerical examples to motivate and illustrate the theoretical derivations giving an overview of the key challenges in the field and opportunities for further research and development.



Short abstracts of the lectures and

biographies of speakers



Prof. Fanny Ficuciello

Short Bio

Fanny Ficuciello received her degree in Mechanical Engineering with academic honors and a Ph.D. in Computer and Automation Engineering at the University of Naples Federico II in 2007 and 2010 respectively. Currently, she is Associate Professor of Robotics and Control at the University of Naples Federico II.

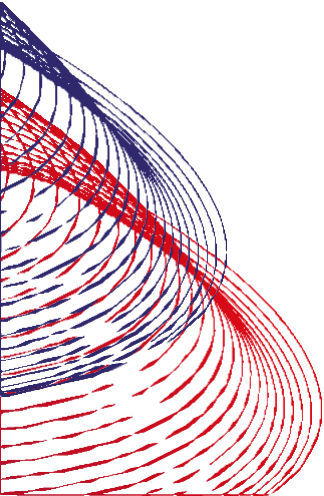
She is responsible of the scientific research in medical robotics at the Robotics Lab of ICAROS Center (Interdepartmental Center for Advances in Robotic Surgery). She is Vice-director of ICAROS Center. She is a member of Prisma Lab (Projects of Robotics for Industry and Services, Mechatronics and Automation) of the University of Naples Federico II.

SPEECH TOPIC:

Human-Robot Interaction and Collaboration

SPEECH ABSTRACT:

In the face of the unpredictability of human behaviors, the adoption of suitable impedance strategies to control robots in the presence of humans is an essential paradigm to ensure reliability and safety. For advanced robots, which operate in anthropic environments by cooperating with humans and substituting them in some tasks, the quality of performance is not just about accuracy and repeatability. Indeed, it rather depends on the ability of the robots to adapt their behaviors dynamically and according to the task and human intentions. The shared control approach is a natural evolution of human-robot cooperation where humans and robots are autonomous agents coupled through physical or cognitive interaction. In contrast to semi-automated systems that require human input or intervention to control actions, in a shared control system the human and the robot can act independently from each other. Unpredictable environments, like homes, offices, hospitals, roads traveled by cars and streets inhabited by humans, as well as hazardous/challenging environments like surgical site, natural disasters, underwater or space exploration, environment with toxic chemical, biological, or physical agents, require advances in autonomous robotics and automation. On the other hand, full automation of a task is not always applicable or even desirable. Shared control is a design approach to integrate the best of human (creativity, adaptivity, interaction) and automation (speed, reliability, precision and inexhaustible task execution capability). This approach can provide great advantages in a wide range of domains, such as industrial, medical and service. In this talk, control strategies for human-robot cooperation and shared control will be presented with applications in different domains.



Short abstracts of the lectures and

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Prof. Mariangela Quarto

Short Bio

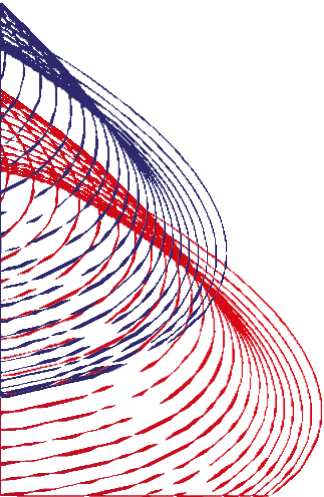
Prof. Mariangela Quarto is an Assistant Professor at the Department of Management, Information and Production Engineering, University of Bergamo. She received her Ph.D. in Economics and Management of Technology from the University of Pavia. Her main research interests include micro-manufacturing, specifically micro Electrical Discharge Machining, and additive manufacturing processes (especially metal-MEX and Powder Bed Fusion) with particular attention to the machinability of particular materials (difficult to cut for micro-EDM and special alloys for additive manufacturing) and the processes optimization both from the economic and technical point of view applying models and algorithms for predicting and simulating the key performance indicators.

SPEECH TOPIC:

New trends in additive manufacturing for resilient and sustainable industry

SPEECH ABSTRACT:

The lesson will give a general overview about the additive technologies now available to produce metallic materials and components for high added value industrial applications. A focus on the available standards and qualification issues for parts will be also performed based on the recent advancements in this field. Particular attention will be paid to laser powder bed techniques, binder jetting, direct energy deposition and material extrusion. The techniques will be described and critical aspects of most promising among them will be discussed. The typical defects, features and microstructure development will be presented and the effect of the unique features of additive metals will be discussed based on expected materials performances. These characteristics will be correlated with the economic aspects and advantages with a critical evaluation of the impact of these technologies in the sustainable manufacturing panorama.



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Prof. Michele Riccio

Short Bio

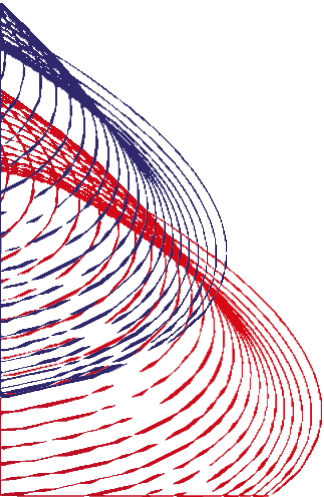
Michele Riccio received the bachelor's degree (2004) and Master of Science (2007) in electronics engineering from the University of Naples "Federico II," Italy: both with academic honours. He received the Ph.D. degree in January 2011 discussing a thesis entitled "Electro-thermal interaction in modern power devices: modeling, simulation and experimental analysis". He is currently an Associate Professor with the Department of Electrical Engineering and Information Technology, University Federico II, Naples. He coauthored more than 125 papers in peer-reviewed international journal and conference proceedings. His papers have been cited >1 600 times in other international papers.

SPEECH TOPIC:

Microcontroller-based IoT circuits for health monitoring

SPEECH ABSTRACT:

The Microcontroller-based IoT Circuits for Health Monitoring class is a comprehensive learning opportunity that focuses on the integration of microcontrollers and Internet of Things (IoT) technologies for monitoring vital health parameters. This class is designed to provide students with the essential knowledge and practical skills needed to develop innovative solutions in the field of health monitoring. Hands-on learning is emphasized throughout the class, enabling students to gain practical experience in designing and prototyping microcontroller-based circuits. They will work with popular microcontroller platforms like STM32, acquiring skills in circuit design, sensor integration, and programming to create functional health monitoring systems.



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Dr. Roberto Sala

Short Bio

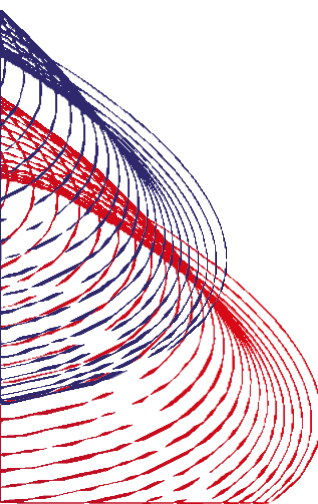
Roberto Sala is a research fellow at the Department of Management, Information and Production Engineering of the University of Bergamo (Italy) where he is also member of the CELS Research Group on Industrial Systems Engineering, Logistics, and Service Operations. He received his PhD in Technology, Innovation, and Management at the University of Bergamo in 2021 with a thesis on data-driven decision-making processes to improve the maintenance service delivery. His research interests gravitate around data-driven decision-making, maintenance, Industry 4.0, and product-service systems. He has participated into multiple projects at Regional, National and European level in these research areas.

SPEECH TOPIC:

Data-driven decision-making for maintenance delivery and improvement in the Industry 4.0 context

SPEECH ABSTRACT:

The availability of data is transforming the decision-making practices of companies across different levels, such as strategic, tactical, and operational. Maintenance services are expected to greatly benefit from this data availability since by analyzing the health status of assets, service providers can make well-informed and timely decisions to prevent failures. However, offering data-based maintenance services is not a simple task, as it requires providers to establish proper structures for collecting, analyzing, and utilizing historical and real-time data effectively. This involves implementing appropriate information flows, methods, and competencies. This lecture will explore how manufacturing companies can restructure their maintenance service delivery process to be driven by data and not only rely on the human experience. The presentation will showcase the Dual-perspective, Data-based, Decision-making process for Maintenance service delivery (D3M) framework, along with relevant methods and tools, using a combination of theoretical examples and case studies. Furthermore, the lecture will discuss the advantages and challenges associated with the data-driven transformation that manufacturing companies are currently undergoing.



Short abstracts of the lectures and biographies of speakers



Prof. Rosario Schiano Lo Moriello

Short Bio

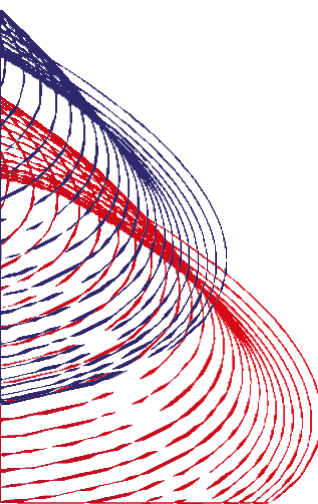
Rosario Schiano Lo Moriello received the M.S. degree (cum laude) in Materials Engineering and the Ph.D. degree in Electrical Engineering from the University of Naples Federico II, Naples, Italy, in 2001 and 2004, respectively. Since 2006, he has been an Assistant Professor of Electrical and Electronic Measurements with the Department of Information Systems, University of Naples Federico II, where he has been an Associate Professor of Mechanical and Thermal Measurements with the Department of Industrial Engineering, since 2020. He is also the Head of the Laboratory for Measurements in Mechatronics and Innovative Technologies at the Center for Advanced Metrological and Technological Services, University of Naples Federico II. He has authored or coauthored more than 130 papers published on the most relevant journals or proceedings of international conferences and workshops. His research interests include electrical, electronic, mechanical, and thermal measurements. In particular, he is currently dealing with the definition, implementation, and characterization of 1) Internet of-Things-based monitoring and measurement platforms; 2) advanced sampling and processing strategies for embedded measurement systems; and 3) innovative methods based on digital signal processors for compensation of bias and drift of microelectromechanical-system-based inertial measurement units.

SPEECH TOPIC:

~~IoT-platform for environmental parameters monitoring~~

SPEECH ABSTRACT:

The IoT-platform for environmental parameters monitoring class is a comprehensive learning opportunity that focuses on the possibility offered by Internet of Things (IoT) technologies for monitoring quantities of interest and showing their value and evolution on cloud dashboards. This class is designed to provide students with the essential knowledge and practical skills needed to develop IoT platforms and the associated dashboards for data visualization. Hands-on learning is emphasized throughout the class, enabling students to gain practical experience in handling a typical application for IoT platform implementation, i.e., Node-RED, and mastering the most common communication protocol in the IoT paradigm, i.e., MQTT.



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Prof. Antonia Tulino

Short Bio

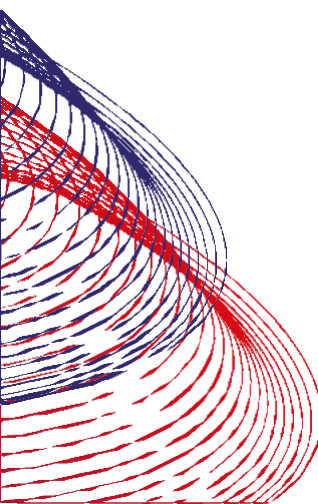
Antonia M. Tulino (Fellow, IEEE) is currently a Full Professor at the Federico II University of Naples. She held research positions at the Center for Wireless Communications in Oulu, Princeton University, the Università degli Studi del Sannio, Italy, and Bell Laboratories, NJ, USA. Since 2019, she has been a Research Professor with the Department of Electrical and Computer Engineering, NYU Tandon School of Engineering, and the Director of the 5G Academy jointly organized by the Università degli Studi di Napoli, Federico II, and several leading ICT companies. Her research interests lay in the area of communication networks approached with the complementary tools provided by signal processing, information theory, and random matrix theory. From 2011 to 2013, she was a member of the Editorial Board of the IEEE Transactions on Information Theory. In 2013, she was elevated to IEEE Fellow. She has received several paper awards, including the 2009 Stephen O. Rice Prize in the field of communications theory. She was a recipient of the UC3M-Santander Chair of Excellence from 2018 to 2019 and selected by the National Academy of Engineering for the Frontiers of Engineering Program in 2013. From 2019 to 2021, she was the Chair of the Information Theory society Fellows Committee.

SPEECH TOPIC:

A NETWORK EVOLUTION STORY: FROM COMMUNICATION, TO CONTENT DISTRIBUTION, TO REAL-TIME COMPUTATION

SPEECH ABSTRACT:

In this talk, we will explore recent advancements in optimizing next-generation services over increasingly integrated computation-communication networks. We will discuss the evolution of digital services, from communication, to content distribution – with a particular focus on the critical role of the wireless edge – and finally delve into real-time computation overlooking increasingly relevant resource-intensive and latency-sensitive services and applications. The objective is to provide valuable insights on future network design and end-to-end service optimization for real-time performance and enhanced customer experience.



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