www.networks.imdea.org

a n n u a l   r e p o r t
2022

developing the science of networks

foreword

Albert Banchs
Deputy Director (acting Director)
of the IMDEA Networks Institute
July 2023

annual report 2022

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IMDEA Networks Institute is a top research institute focusing on the Science of Networks and Communication Technology. The Institute is carrying out fundamental, systems-oriented networking research with a strong emphasis on technology transfer to industry and standard bodies. Our researchers have expertise on a wide array of topics, such as mobile networks, protocols, security, optimization, and machine learning, as well as new cutting-edge research areas such as quantum computing and quantum networking.

While classical computation and communications systems continue to develop, one complementary field has made a surprisingly fast transition from pure to applied research as well as to the industry. In early 2019, IBM presented the world with the first commercially-available quantum computer. A quantum computer uses the laws of quantum physics to both solve some particular problems faster than classical computers (known in the literature as "quantum supremacy") and to address another type of problems which are intractable to classical computers entirely. This latter category of problems regards simulating microscopic physical systems, such as atoms and molecules, which provides the background for potential groundbreaking research in many fields such as medicine, chemistry and materials science.

Quantum computers ingest quantum states as input, which describe the complete properties of a quantum system at a given moment. Decoding the quantum state into classical bits is, however, impossible for all but the smallest system. To overcome this obstacle, the transfer of the quantum state from a sensor to a processor is done by "teleporting" the state, by a process somewhat creatively named quantum teleportation. This procedure makes use of a purely quantum mechanical property named "entanglement", meaning that two or more systems are tied in a specific manner which makes them act in a coordinated mode, to move a quantum state from one system to another. A simple example would be a sensor observing an atomic system. The sensor itself is quantum-computational in nature, therefore it has a superconducting chip containing a small number of qubits which behave according to the same laws as the atoms themselves. The observation involves encoding the state of the observed atomic system onto the qubits of the sensing device. The next step is the transfer of the state from the qubits of the sensing device to the qubits of a quantum computer, which would have the necessary capacity to perform some relevant tasks, such as simulation. In order to transfer this state from the sensor to the computer, one needs to use the quantum teleportation protocol, which requires a shared quantum entanglement between the two nodes.

The requirement for quantum state transfer by using entangled links as well as classical communication (one cannot communicate by entanglement alone, as this would mean sending signals faster than the speed of light, which is forbidden by Einstein's Special Relativity theory) has given rise to the need for a global quantum network. The purpose of a quantum network is to transfer entanglement between nodes wanting to communicate, such that quantum teleportation of states is then possible. When we combine quantum networks and classical networks (for example the Internet) as two layers of a more complex architecture, this gives rise to what is commonly known as the *Quantum Internet*.

IMDEA Networks is actively involved in quantum network research through its Quantum Information Group, focusing on problems such as entanglement routing, network-based prediction using quantum machine learning algorithms and classical-to-quantum data encoding. As a national initiative, the IMDEA Networks institute is also a node in what is to become the Madrid Quantum Network, a first implementation of a regional quantum network, uniting research institutes and universities and providing an important platform for advancing quantum networking research, not only at the network-functional level, but also in terms of important applications, including Quantum Key Distribution and Quantum Dense Coding protocols.

Quantum Computation and Communication are bringing a paradigm shift to the field of Information Theory as a whole, and with this shift comes our ability to address new problems and find solutions that will change our society and improve our lives. IMDEA Networks is an active part of quantum informational research and aims to become one of the important centers for quantum communications research in Spain.

As every year, my gratitude goes to the Regional Government of Madrid for its continued support of this economy transforming initiative, as well as to all those who are contributing to make this exciting project an international success.

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executive
summary

1

A research team of technical leaders

The research team of IMDEA Networks consists of preeminent technical leaders. All IMDEA Networks researchers have a meritorious research record that includes publications in the most influential venues in our area of research, and they have graduated from, or worked for, top-level international universities. At the same time, our scientists also possess an extensive industry background. Most of them have been employed at leading industry research laboratories, and have been granted many patents during their professional careers. This background is essential to carry out research that can be transferred to companies and in turn be transformed into profitable products that will stimulate economic growth and job creation.

In addition to experienced world-renowned researchers, an essential part of the Institute's research team is composed of highly motivated pre-doctoral researchers, keen to explore new ideas, who are pursuing their PhD theses at IMDEA Networks. In 2022 the Institute graduated 9 new PhD Students and hired 7 new pre-doc researchers. The steady flow of highly qualified doctors produced by the institute is an important contribution to the national and European economy.

The awards and prizes received by our researchers for their research work and achievements testify to their international reputation. In 2022, Narseo Vallina and his collaborators received the CNIL-INRIA Privacy Protection Award 2022 for their paper "50 Ways to Leak Your Data: An Exploration of Apps' Circumvention of the Android Permissions System".

Furthermore, an IMDEA Networks research team won the first EIT Jumpstarter award with the business idea LiFi4Food. The start-up offers an integrated, innovative, and sustainable communication system formed by self-sustainable and battery-free IoT devices to monitor and control environmental parameters in high-tech agri-food facilities such as vertical farms and greenhouses. It takes advantage of the LED lamps already installed in such sites to deploy a LiFi network that supplies the battery-free sensors (equipped with solar cells) with both power and data.

For the six years from 2017 to 2022, we are ranked No.2 in the csrankings.org index in our research areas of mobile computing and measurements and performance analysis and No.15 in Europe in the field of computer networks.

The excellence of our scientific results

The efforts made by our team to produce outstanding scientific work led to a large number of scientific publications in 2022, in addition to prizes for the high quality of our scientific

results. For example, IMDEA Networks researchers Vincenzo Mancuso, Antonio Fernández Anta and co-authors received the Mario Gerla Best Paper Award 2022, an extraordinary achievement for the publication "Cleaning Matters! Preprocessing-Enhanced Anomaly Detection and Classification in Mobile Networks". Also, Alejandro Blanco, Joerg Widmer and co-authors received the Best Paper Award at ACM WiNTECH 2022 for the paper "AX-CSI: Enabling CSI extraction on commercial 802.11ax Wi-Fi platforms", and Andrea Pinto, Giuseppe Santaromita, Claudio Fiandrino, Domenico Giustiniano, Flavio Esposito received the Best Student Paper Award at the IEEE Conference on Network Function Virtualization and Software Defined Networks 2022.

It is particularly worth highlighting the impact that IMDEA Networks had this year on the best conferences and journals in our area. We published a substantial number of papers at top journals, such as IEEE Transactions on Wireless Communications, IEEE Transaction on Mobile Computing, IEEE Transactions on Communications, and IEEE Transactions on Information Theory, among others, and at the very top conferences in our area, such as IEEE INFOCOM, ACM IMC, ACM Mobisys, and ACM CoNext, and have served in the Technical Program Committees of such conferences. IMDEA Networks is among a selected group of European institutions that have published consistently in these venues for many years. Furthermore, IMDEA Networks is organizing highly important conferences. Joerg Widmer has been appointed general co-chair and Domenico Giustiniano vice general chair of ACM Mobicom 2023, one of the most prestigious conferences in the area of mobile networking, which will be held in Madrid. Vincenzo Mancuso is one of the general chairs of IEEE SECON 2023, another well-known conference on sensing, communication, and networking which will also be held in Madrid. This confirms the leading roles that our professors play in the research community.

Contributing to a knowledge-based economy

The ultimate goal of IMDEA Networks is to produce high quality research results that contribute to a knowledge-based economy. Our strategy to transfer scientific and technological developments to industry over the last year has led to various new collaborations in addition to strengthening the existing partnerships with some of our key industrial collaborators.

During 2022, our researchers have contributed to 28 ongoing research projects that have attracted funding from various sources: 10 European projects, 13 national projects, and 5 financed by the regional government of Madrid, in addition to 9 contracts with industrial partners, and 4 as subcontractors of EU projects.

Among industry collaborations, it is worth mentioning the strategic partnerships maintained by IMDEA Networks. Telefonica co-founded 5TONIC with IMDEA Networks and

has a Joint Research Unit (JRU), in addition to participating in many research projects together. Ericsson is a key partner of 5TONIC and collaborates with IMDEA Networks in multiple fronts, including research projects as well as in of the leading Masters in the world on SDN and NFV. NEC collaborates with IMDEA Networks on many fronts and has established a Joint Research Unit (JRU) with us.

Communicating our results

In addition to producing results of the highest technical quality and applying them to improve the life of the citizens, it is also very important for the Institute that these positive

contributions to society are conveyed to the general public, to prospective PhD students, scientists, academics and specialists from other areas; all in all, to decision-makers, stakeholders, and collaborators, so that they can appreciate the benefits of having such a research institute located in Madrid.

Over the last years, we have been consistently appearing in national and international, specialized and generic media with a large outreach, and this year has been no exception. ABC, El País, El Mundo, RTVE, La Vanguardia, Invertia (El Español), Newtral, Europa Press, Redes Telecom, Cadena Ser Madrid Sur, Innovaspain, Total Telecom, The Independent, Science X Network, are some of the circa 175 unique media outlets that carried our news during 2022.

Building on our results of 2022, in the year ahead we look forward to making further impactful scientific discoveries, establishing fruitful collaborations, launching exciting new research initiatives and increasing our outreach, all in the interest of society.
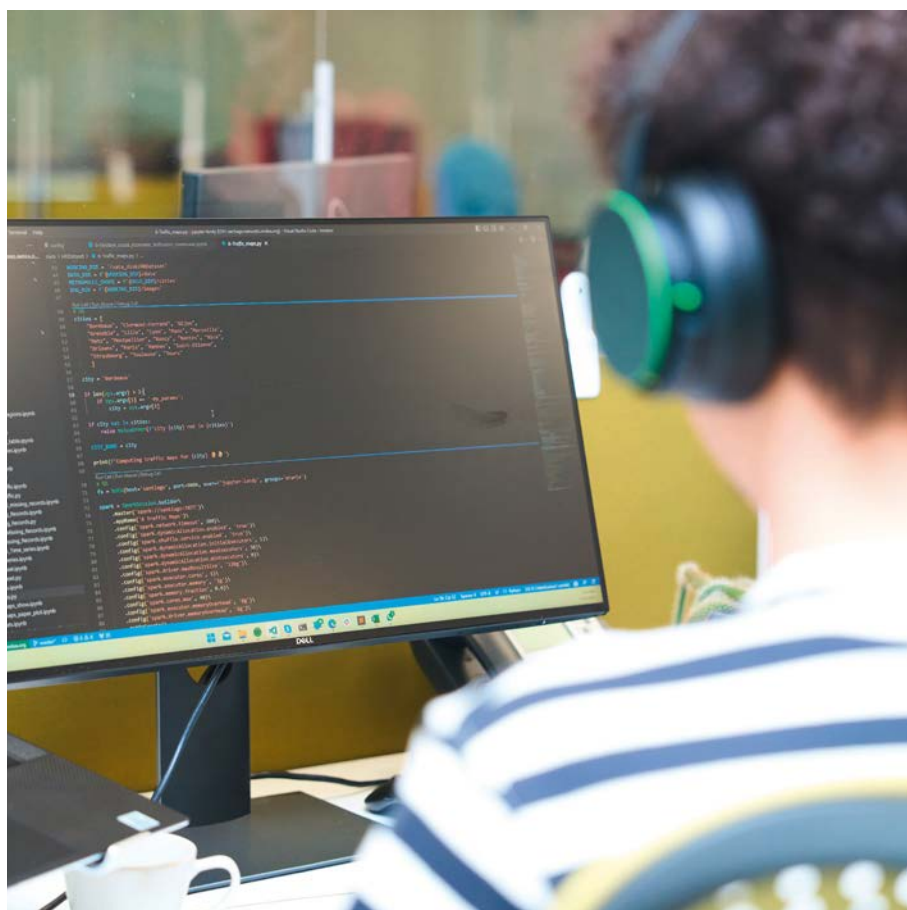
about us

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2.1. Profile

IMDEA Networks Institute is a research organization on computer and communication networks whose multinational team is engaged in cutting-edge fundamental science and technology. As an English-speaking institute located in Madrid, Spain, IMDEA Networks offers a unique opportunity for pioneering scientists to develop their ideas. IMDEA Networks has established itself internationally at the forefront in the **development of future network principles and technologies.** Our **team** of highly reputed researchers is designing and creating today the networks of tomorrow.

Some keywords that define us: *5G, 6G, Big Data, blockchains and distributed ledgers, cloud computing, content-delivery networks, data analytics, energy-efficient networks, fog and edge computing, indoor positioning, Internet of Things (IoT), machine learning, millimeter-wave communication, mobile computing, network economics, network measurements, network security, networked systems, network protocols and algorithms, network virtualization (software defined networks – SDN and network function virtualization – NFV), privacy, quantum communication, social networks, vehicular networks, wireless networks and more…*

2.2. Our Strategic Goals

- Conduct first class research on an international level in the area of computer networking.
- Transfer technology to the industrial sector, in order to improve its capacity for innovation and competitiveness.
- Transfer technology to spin-off-companies in order to promote the release of new products and services to the global market.
- Attract and retain human capital of excellence with the aim to internationalize research in the Madrid region.
- Collaborate with Madrid's industrial sector, research centers and educational institutions.

2.3. Our Vision

IMDEA Networks focuses on an area that has a profound impact on people's lives. Over the last decades, the Internet, smartphones, Wi-Fi and social networks transformed society and the economy. Indeed, the **widespread access to networks** has dramatically changed the way manufacturers produce and supply their goods, how public administrations operate, how professionals work and in general how individuals and society are shaped. **The Internet socio-economic phenomenon** continues to transform our lives at an amazing pace, and will continue to do so in the future with the deployment of new communication technologies and paradigms.

2.4. Our Mission

Our mission is to create value by **leading research in protocol, algorithm and systems developments** that enable the **Digital Knowledge Society.** We do this by conducting research and developing innovative and useful scientific and technical advances in the above areas, while actively **promoting their successful transfer to market.** The Institute strives to provide optimal working conditions and the most attractive and best-equipped environment in which researchers can focus on this process of innovation and scientific advance.

RESEARCH GROUPS
- Global Computing Group [Antonio Fernández Anta]
- Internet Analytics Group [Narseo Vallina-Rodríguez]
- NETCOM Lab [Albert Banchs]
- NetEcon Group [Sergey Gorinsky]
- Opportunistic Architectures Lab [Marco Ajmone Marsan and Vincenzo Mancuso]
- Pervasive Wireless Systems Group [Domenico Giustiniano]
- Wireless Networking Group [Joerg Widmer]
- Data Transparency Group (DTG) [Nikolaos Laoutaris]
- Networks Data Science Group [Marco Fiore]
- Edge Networks Group [Jaya Prakash Varma Champati]
- Cybersecurity Group [Guillermo Suárez-Tangil]

2.5. The Institute in figures

The core strength of the Institute is its international **research team, consisting of talented researchers from 24 different nationalities,** which carries out new scientific discoveries in Computer Networks, and foster the development of emerging technologies.

65	24	56,25%	75%	11
researchers	nationalities	PhDs	foreign researchers	research groups
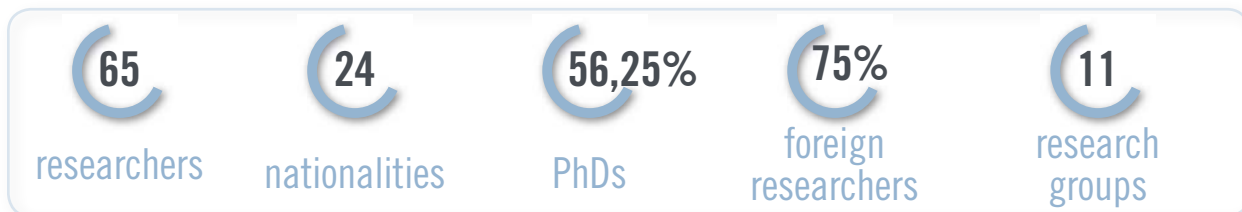
The facilities of IMDEA Networks Institute
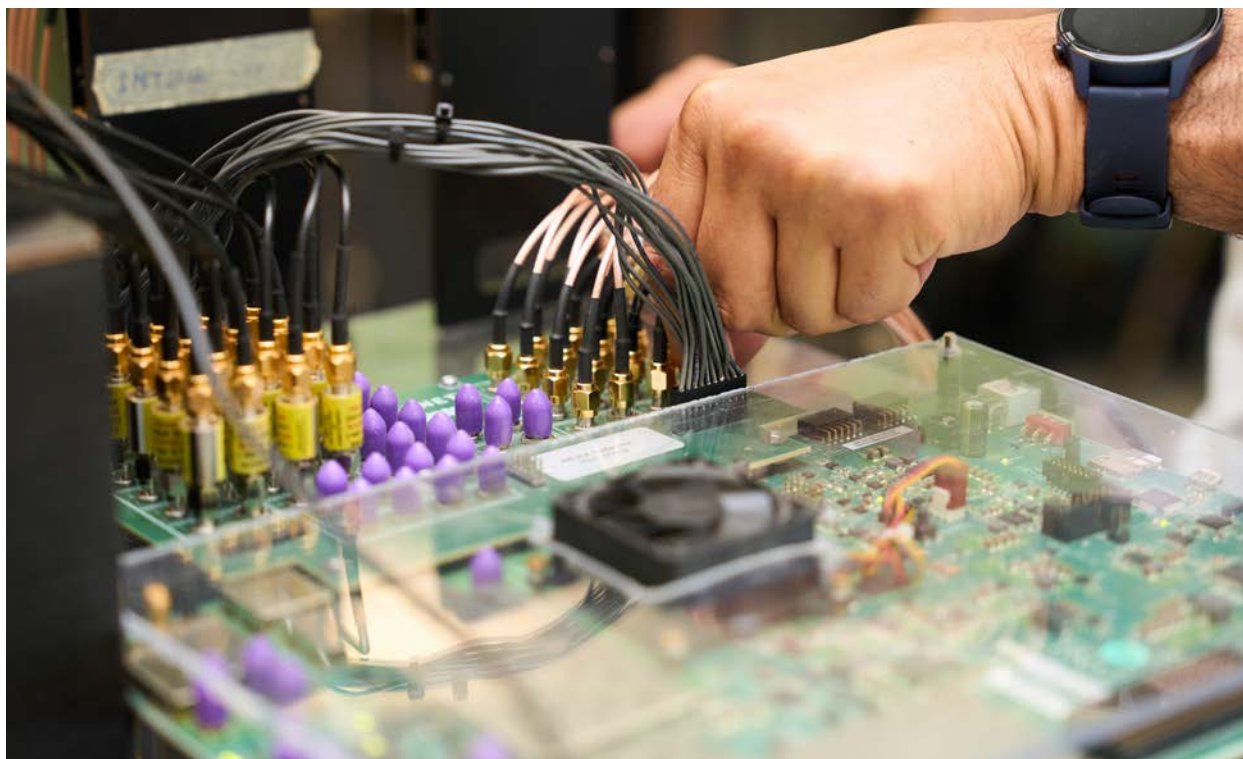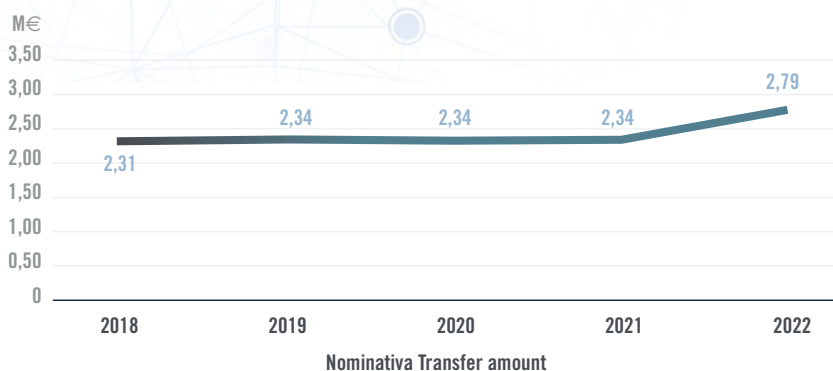
The building and laboratories of IMDEA Materials Institute are located at Leganés, Madrid.
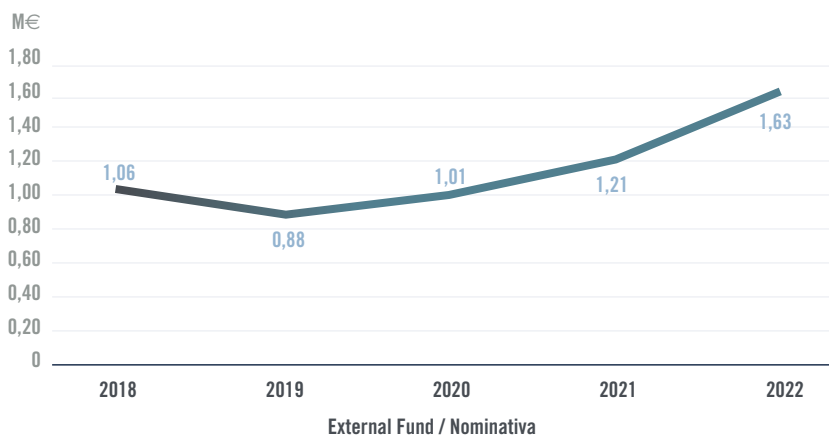
402 m² of research labs

In order to support cutting-edge research, IMDEA Networks invests in the latest, **state-of-the-art laboratories and laboratory test equipment,** endowing the Institute with the capacity of transforming research into high added value products and services.

Direct Funding by the Madrid Regional Government

M€

3,50
3,00
2,50
2,00
1,50
1,00
0,50
0

2,31   2,34   2,34   2,34   2,79

2018   2019   2020   2021   2022

Nominativa Transfer amount

We bring Money to Madrid: Self Funding

M€

1,80
1,60
1,40
1,20
1,00
0,80
0,60
0,40
0,20
0

1,06   0,88   1,01   1,21   1,63

2018   2019   2020   2021   2022

External Fund / Nominativa

We improve the Competitiveness of Madrid: Projects & Contracts with Industry

1,0
0,9
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0

0,48   0,48   0,65   0,7   0,62

2018   2019   2020   2021   2022

Funds from projects & contracts with industry / Nominativa
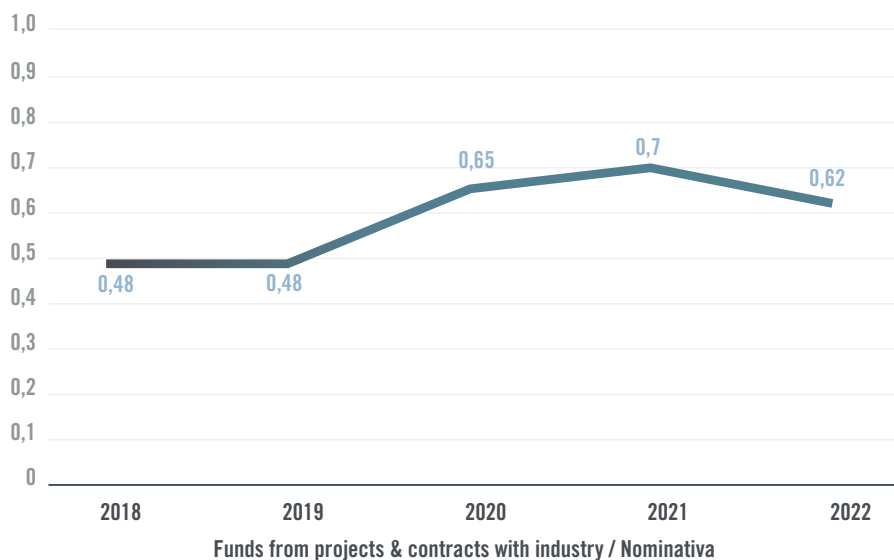
We produce [Talent](#) for Madrid: Doctors graduated/year

Doctors graduated

0,80
0,70
0,67
0,60
0,51
0,50
0,43
0,40
0,30
0,27
0,20
0,10
0

0,80

2018   2019   2020   2021   2022

Doctors/year per Faculty member (FTE)
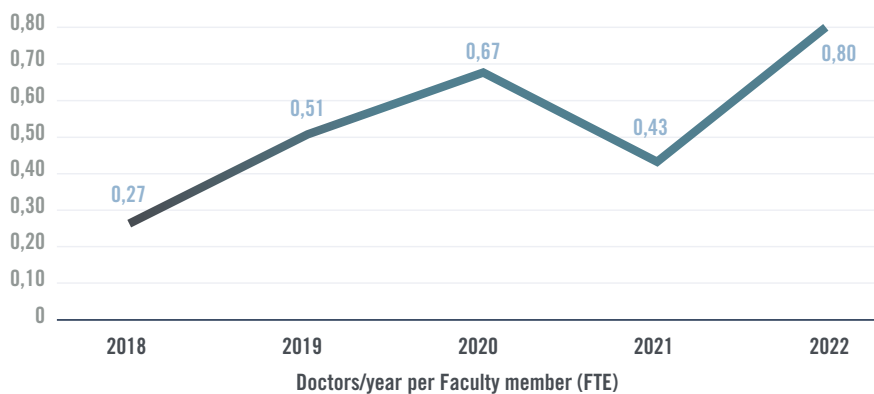
We produce [Internationalization](#) of Madrid: Nationalities (Cumulative & Current)

45
42
40
39
37
35
35
30
25
24
20
21   21
18   18
15
10
5
0

2018   2019   2020   2021   2022

━━ Nationalities per year   ━━ Cumulated nationalities
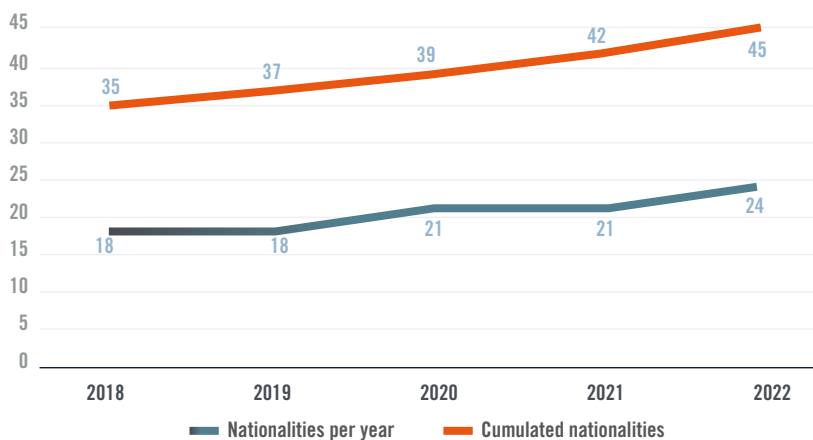
We produce [Science](#) in Madrid:Journal and Conference Publications

Scientific Publications

12
10,06
10
8,31
8
7,86
7,83
6
7,43
4
2
0

2018   2019   2020   2021   2022

Scientific Publications per Faculty member (FTE)
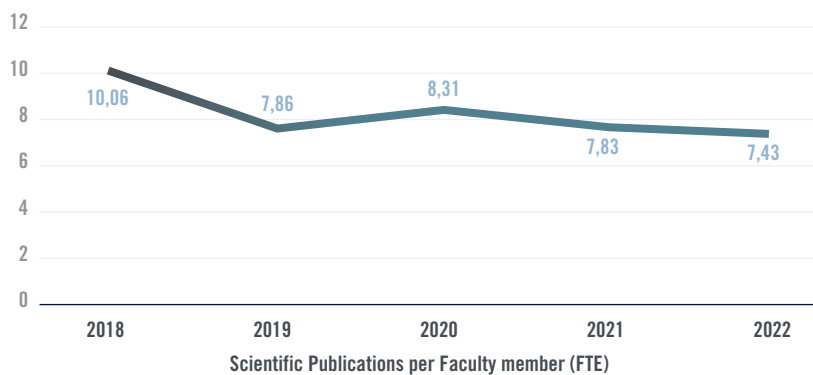
We produce Leadership for Madrid: Citations

Citations and h-index

- No. Citations per Faculty member
- h-index

7.179,34 — 2018
7.366,20 — 2019
8.967,04 — 2020
8.634,41 — 2021
9.279,29 — 2022

Citations per Faculty member (FTE)
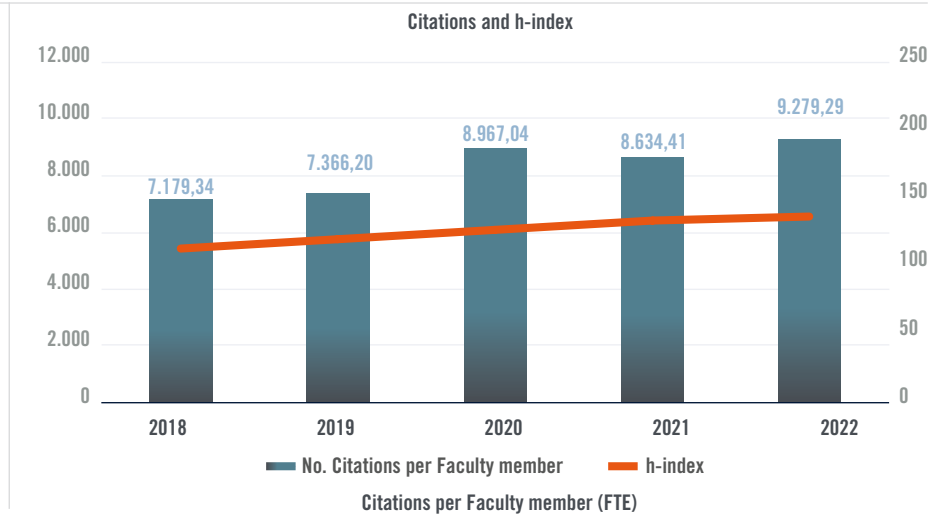
We produce Leadership for Madrid: CS-Rankings European Position

	2014-2018	2015-2019	2016-2020	2017-2021	2018-2022
Measurement & perf. analysis	3	2	1	1	2
Mobile computing	8	3	2	3	2
Computer networks	16	17	18	15	19

- **Computer networks**
- **Mobile computing**
- **Measurement & perf. analysis**
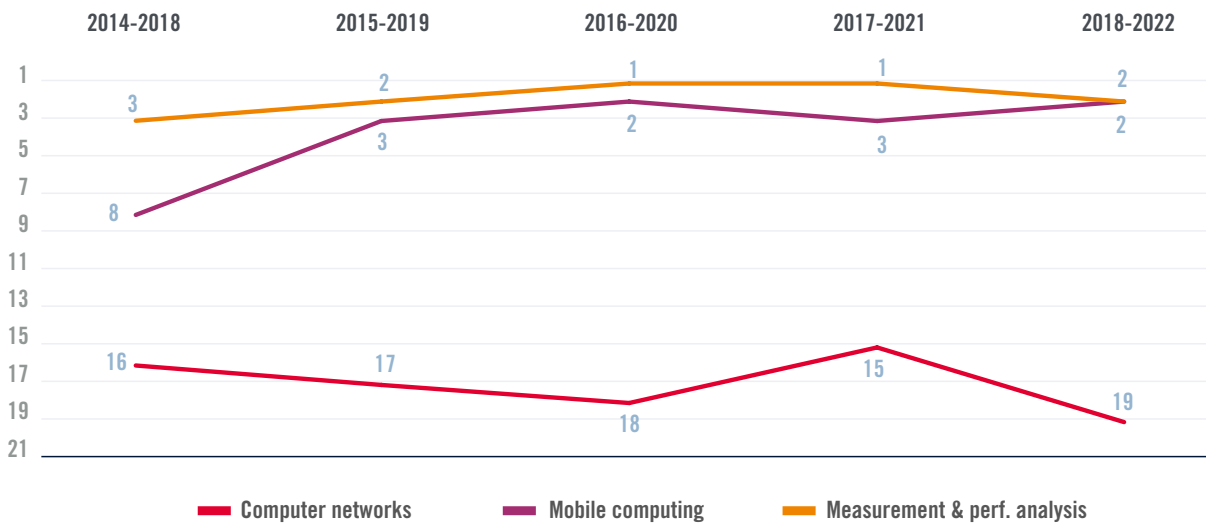
Measurement & Performance Analysis
CS-Rank 2018-2022

1 ▶ TU Delfte
2 ▶ IMDEA Networks Institute
3 ▶ ETH Zurich
4 ▶ EPFL
5 ▶ Max Planck Society
6 ▶ TU Munich
6 ▶ University College London
8 ▶ Queen Mary University of London
9 ▶ TU Berlin
10 ▶ Freie Universitaet Berlin

2.6. Organizational Structure

```
                          BOARD OF
                          TRUSTEES

     SCIENTIFIC                              DELEGATE
     COUNCIL                                 COMMITTEE

                          DIRECTOR
                          (vacancy)

  DEPUTY DIRECTOR
  A. BANCHS
  (acting Director)

            RESEARCH                    RESEARCH SUPPORT
            J. WIDMER                    R. GIRONA

  RESEARCH                                              ADMINISTRATION
  PROFESSORS
                  NETWORKED
  RESEARCH        SYSTEMS             RESEARCH
  ASSOCIATE       & ALGORITHMS        ENGINEERING
  PROFESSORS                          & SUPPORT
                  WIRELESS
  RESEARCH        NETWORKING                            SCIENTIFIC
  ASSISTANT                                             INFRASTRUCTURE
  PROFESSORS      NETWORK
                  MEASUREMENTS
  POST-DOC        & ANALYTICS
  RESEARCHERS

  VISITING
  PROFESSORS

  PRE-DOC
  RESEARCHERS
```

2.6.1. Board of Trustees

The Board of Trustees of IMDEA Networks Institute is its highest organ of governance, representation and administration. In accordance with the Institute's statutes, the Board of Trustees is composed of Ex Officio Members representing the Regional Government of Madrid and Elective Members who are recognized leaders in the scientific matters of the Institute. The Director and General Manager of the Institute also participate in the Board of Trustees.

President
Prof. Dr. Ralf Steinmetz

Vice-President
Excmo. Sr. D. Enrique Ossorio Crespo

Ex Officio Trustees

Excmo. Sr. D. Enrique Ossorio Crespo
Vice-President of the Board of Trustees
Regional Minister of Education, Universities, Science and Spokesmanship
Department of Education, Universities, Science and Spokesmanship
Regional Government of Madrid
(Madrid, Spain)

Ilma. Sra. Dña. Ana Isabel Cremades Rodríguez
Director General of Research and Innovation
Directorate General of Research and Technological Innovation
Department of Education, Universities, Science and Spokesmanship
Regional Government of Madrid
(Madrid, Spain)

Sra. Dña. Bárbara Fernández-Revuelta Fernández-Durán
Deputy Director of Research
Sub-directorate General of Research
Directorate General of Universities and Research
Department of Education, Universities, Science and Spokesmanship
Regional Government of Madrid
(Madrid, Spain)

Sr. D. Fidel Rodríguez Batalla
Vice-Minister of Universities Science and Research
Vice-Ministry of Universities, Science and Innovation
Department of Education, Universities, Science and Spokesmanship
Regional Government of Madrid
(Madrid, Spain)

Ilmo. Sr. D. Ricardo Díaz Martín
Director General of Universities and Higher Arts Education
Directorate General of Universities and Higher Arts Education
Department of Education, Universities, Science and Spokesmanship
Regional Government of Madrid
(Madrid, Spain)

Sr. D. José Antonio Sánchez Serrano
Vice-Minister of Local Administration and Digitalization
Vice-Ministry of Local Administration and Digitization
Department of Local Administration and Digitalization
Regional Government of Madrid
(Madrid, Spain)

Sr. D. José de la Sota Ríus
Scientific-Technical Coordinator
Madrimasd Foundation for Knowledge
(Madrid, Spain)

Elective Trustees - Prestigious Scientists

Prof. Dr. Ralf Steinmetz
President of the Board of Trustees
Full Professor & Managing Director of Multimedia Communications Laboratory (KOM)
Technische Universität Darmstadt
(Darmstadt, Germany)

Prof. Dr. Gustavo de Veciana
Cullen Trust Professor, Department of Electrical and Computer Engineering
The University of Texas at Austin
(Austin, Texas, USA)

2.6.2. Scientific Council

The Scientific Council is a very important organ of IMDEA Networks, advising us on all aspects of the Institute's scientific activities. Among many other things, the Council proposes the incorporation and renewal of Scientific Expert members of the Board of Trustees; reviews and approves scientific appointments, and generally provides support to the Director (on leave) – Dr. Arturo Azcorra and the Deputy Director (acting Director) – Dr. Albert Banchs – in determining scientific research strategy and policies.

The Institute's Scientific Council is composed of internationally prestigious researchers in the field of Telematics and Internet technologies. IMDEA Networks is greatly strengthened by the participation of these eminent scientists. The current members are:

Dr. Gonzalo CAMARILLO

Position: Head of Implementation Components, Ericsson. Finland

PhD: Aalto University. Helsinki. Finland

Research: Signaling; Multimedia applications; Transport protocols; Network security; Networking architectures

Prof. Dr. Carla Fabiana CHIASSERINI

Position: Full Professor, Department of Electronics and Telecommunications, Politecnico di Torino. Torino. Italy

PhD: Electronic Engineering and Telecommunications. Politecnico di Torino. Italy

Research: Wireless and mobile networks

Prof. Dr. Jon CROWCROFT

Position: Marconi Professor of Communication Systems at University of Cambridge. Cambridge. UK

PhD: Computer Science, University College London (UCL) (England, UK)

Research: Opportunistic Communications; Privacy in the Cloud; Carbon Neutral Networking

Prof. Dr. Gustavo DE VECIANA

Position: Cockrell Family Regents Chair in Engineering Professor and Associate Chair of Electrical and Computer Engineering at the University of Texas at Austin. USA.

PhD: Electrical Engineering, University of California at Berkeley. USA

Research: Analysis and Design of Wireless and Wireline Telecommunication Networks; Architectures and Protocols to Support Sensing and Pervasive Computing; Applied Probability, Queuing and Information Theory

Prof. Dr. Jim KUROSE

Position: Distinguished University Professor of Information and Computer Sciences at the University of Massachusetts at Amherst. MA. USA.

PhD: Columbia University. United States

Research: Computer network protocols and architecture, network measurement, sensor networks, multimedia communication, development of asynchronous learning materials and pedagogy (particularly the use of Internet-based multimedia material)

Prof. Dr. Edward KNIGHTLY

Position: Sheafor-Lindsay Professor and Department Chair of Electrical and Computer Engineering at Rice University. Houston. Texas. USA

PhD: University of California at Berkeley. Berkeley. USA

Research: Wireless Networks and Protocols; Wireless Access for Developing Regions; Dynamic Spectrum Access Networks

Dr. Pablo RODRIGUEZ RODRIGUEZ

Position: Director, CTO Office at Google. CA. USA.

PhD: École Polytechnique Fédérale de Lausanne (EPFL). Lausanne. Switzerland

Research: Networking; Distributed Systems; Information Theory; Wireless and Mobile; Network Economics; Social Networks

Prof. Dr. Ralf STEINMETZ

Position: President of Board of Trustees of IMDEA Networks Institute; Full Professor & Managing Director of Multimedia Communications Lab (KOM) at Technische Universität Darmstadt. Darmstadt. Germany

PhD: Electrical Engineering. Technische Universität Darmstadt. Darmstadt. Germany

Research: Scalable Quality of Service; Content Distribution Networks; Context Aware Communications; Adaptive Mobile Networking; Knowledge Media; Serious Games

Prof. Dr. Ioannis STAVRAKAKIS

Position: Full Professor & Head Department of Informatics and Telecommunications. National and Kapodistrian University of Athens. Athens. Greece

PhD: Electrical Engineering. University of Virginia. Charlottesville. USA

Research: Analysis and Design aspects of Networking Technologies ranging from Link to Application Layers: Social, Mobile, Ad Hoc, Autonomic, Information Centric, Delay-tolerant and Future Internet Networking; Network Resource Allocation Algorithms & Protocols, Traffic Management & Performance Evaluation; Content Dissemination, Placement & (Cooperative) Replication in Unstructured P2P and Social Networks; (Human-Driven) Decision Making in Competitive Environments

Dr. Heinrich J. STÜTTGEN

Position: Independent consultant

PhD: Computer Science, Associative Memory Architecture, University of Dortmund. Germany

Research: Network Architecture and Protocols; Software Defined Networking; Internet of Things (IoT)

research areas

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As illustrated by **our motto – Developing the Science of Networks –** IMDEA Networks identifies and addresses major scientific and engineering challenges in communications and computer networks, and also aims to develop these results by bringing them into practical deployments. The nature of these challenges varies with ever-greater rapidity. To ensure the relevance of our research activities, we continuously adjust our research agenda to stay at the forefront of technological innovation. We organize our scientific activities into research areas that reflect our current working priorities, ensuring sufficient flexibility to allow us to respond to emerging technological challenges. The research mission of our Institute also adapts to the strengths of our growing research team and our external collaborators.

The research work at IMDEA Networks is led by **Joerg Widmer**, who is the **Research Director** of the Institute and therefore responsible for its research direction.

Currently, our scientific work focuses on the following three general areas:

3.1. Networked Systems and Algorithms

Any network has a structure and needs protocols to achieve its objectives. The researchers of IMDEA Networks Institute have an extensive expertise in architectures and protocols for communication networks, e.g., for network topology design, routing, forwarding, packet classification, in-network storage, congestion control, and media access control. Besides, we have research interests in other networking domains such as social networks, energy networks, and transportation networks.

Our research takes a multi-disciplinary approach to the design and understanding of network protocols and architectures. We go beyond technological constraints and account also for social and economic factors. For example, our research on Internet routing and forwarding accounts for the multitude of Internet service providers and their individual economic interests. In working on either centralized or decentralized solutions to problems, we assume that perfect information is never available. To deal with such uncertainty as well as selfishness of individual entities, our analysis adopts game-theoretic techniques and online algorithms. Our protocol design assumes that behavior of counterparts is always unpredictable to some extent. Hence, the designed protocols rely on continuous learning and adaptation as the main modes of operation.

Practicality is another distinguishing aspect of our research. Real data serves as a departing point for our analytical efforts as well as a basis for validating our analytical conclusions. For instance, our large-scale simulation studies of Internet routing rely on real Internet topologies. Furthermore, we implement our theoretical ideas and make the prototypes available to the public, either directly or through our commercial partners.

An important focus of our work is on the systems side of networks. For example, we explore tradeoffs between simplicity and expressiveness of packet processing engines, new abstractions for heterogeneous control planes, and network virtualization techniques. We also work on networking aspects that pertain to cloud computing.

3.2. Wireless Networking

Given the scarcity of wireless spectrum resources and the rising demand for mobile applications, optimizing wireless communication and improving wireless network architectures is currently one of the most important and challenging research topics in networking. The proliferation of inexpensive, high-rate mobile devices and ubiquitous connectivity opens up a vast spectrum of possible new services but also poses unique challenges concerning scalability, interference and the unpredictability of the wireless medium.

IMDEA Networks is involved in a number of different wireless research areas. We are investigating emerging wireless technologies such as extremely high frequency com-

munication for 5G and wireless LAN and Visible Light Communication, which promise to increase wireless data rates by an order of magnitude or more. Our work on capacity improvements also focuses on topics such as ultra-dense networks, intelligent interference management, cooperative coding and network coding, improved medium access control mechanisms that make use of advanced physical layer technologies such as MIMO, successive interference cancellation, etc.

At the same time, mobile network architectures need to support these new technologies as well as new use cases, and thus become more flexible. We perform research on network architectures for 5G and beyond, specifically focusing on software-defined networks (SDN)-based architectures and network function virtualization (NFV). In addition, wireless networks are becoming more heterogeneous as they are gaining traction in more diverse use cases such as the Internet of Things (IoT) and intermittently connected or delay-tolerant networks, unmanned aerial vehicular networks. The research activities span medium access control (MAC), routing, error control and transport protocols, both as standalone entities and as part of cross-layer design frameworks. To improve the flexibility and programmability of future wireless technologies, we also explore novel programmable interfaces that expose low-level operations to foster network evolution and enable performance optimization and service customization. For a number of the above use case scenarios, efficient and accurate device localization is highly useful.

We recognize the importance of bridging the gap between theoretic results and applied wireless research and have deployed a range of wireless testbeds (for mm-wave, visible light communication, 5G, IEEE 802.11, and others) on which we implement and evaluate our ideas.

network
measurements&analytics

3.3. Network Measurements and Analytics

The rapid evolution of the Internet, comprising the fixed network, mobile portable systems and the Internet of Things (IoT) has given birth to a rich ecosystem of applications, personalization and services that is changing the way billions of users communicate and interact with their environment. This digitalization of the world has allowed new innovative applications with new levels of personalization and the ability to interact the environment. However, this trend is also producing large volumes of data, which may raise privacy and security threats unseen in previous networked technologies while also generating unknown traffic patterns and performance bottlenecks which can have a negative impact on the network and user experience.

At IMDEA Networks, we are involved in novel research efforts to empirically illuminate how users, networks, devices and applications interact, behave and perform in the wild.

Our research is particularly focused on conducting analytical measurements of real-world networked systems, with a strong interest in understanding their use (and abuse) as well

as the performance, privacy and security challenges present in emerging networking technologies. Our research team also develops Big Data solutions to analyze and process large-scale traffic-, network- and application-generated data fast and correctly.

At IMDEA Networks, we engage and collaborate with users, cyber-activists, industry and regulators to identify and address important problems of societal, industrial and academic interest from a practical angle. Often times, our researchers are responsible for developing practical tools to assist the different stakeholders to understand how users, devices, networks, services, and applications interconnect, perform and behave behind the scenes.

3.4 Headquarters and research laboratories infrastructure

3.4.1 Headquarters

IMDEA Networks includes in its goals the provision of the highest international level of research and technology development capabilities geared to the advancement of future Internet technologies. Our headquarters aim to fulfill the functional requirements of a leading-edge research center and to attract researchers from around the World. The main objective of our office and lab space is to provide a high quality-working environment for researchers.

We are continuously refurbishing our site at Avenida del Mar Mediterráneo in Leganes (Madrid) in order to furnish it with renovated and extended facilities. The new spaces are conceived

primarily with researchers' needs and preferences in mind, including spacious premises with state-of-the-art facilities and equipment, labs adapted to the needs of our lines of research, with excellent communications and ICT infrastructure, and specific research equipment.

The area of the building already remodeled in 2022 amounted to 2.764 m^2.
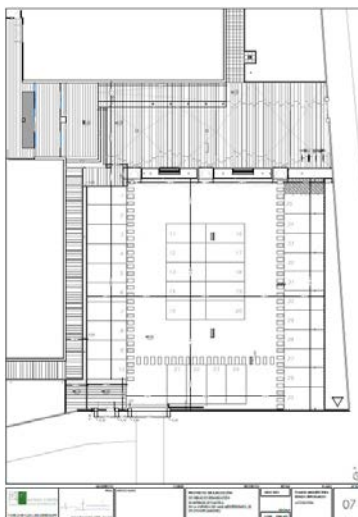
- **Generator set:** the works to extend the protection of the generator set against power outages to all the institute's main services have been completed (until now only the DPC and the rest of the 5TONIC lab was under its protection).

- **Main entrance, parking and backyard refurbishments:** the refurbishment works of the main entrance, the parking lot and the backyard of the institute have been completed, where the following actions have been carried out among others: re-asphalting the parking lot, installation of new lighting in all areas, openening of a new pedestrian access, replacement of the pavement, construction of planters in the entrance area, reconstruction of the access ramps to comply with regulations, installation of 2 charges for electric vehicles,… The garden of the backyard includes a new area for outdoor meetings and events.

- **Restoration of the perimeter fence and wall:** the defects in the perimeter fence and wall have been fixed and they have been cleaned and repainted.

- **Refurbishment of the first floor of the west wing:** the project for the refurbishment of the first floor of the west wing of the institute has been completed and will provide more office and laboratory spaces for the growth of the organization and its research activity. The contract for this works has been already awarded, so the works will begin in 2023 and should be completed during the second quarter of the year.

3.4.2 Research laboratories

At our scientific laboratories we aim to transform our research results into high value added products and services. They allow us to perform:

- The measurements and prototypes of the devices, protocols and algorithms developed by our researchers.

- Simulations of highly complex baseband and medium access control systems, as well as sophisticated radio subsystems.

- Radio parameter measurements involved in mobile and fixed communications and evaluation of effects on the radio spectrum of the new protocols and algorithms designed in the Institute.

- The development and deployment of reliable, high-performance networked systems, of software defined networking, and of novel architectures and protocols for behavioral networking and for network economics.

In order to support cutting-edge research, IMDEA Networks invests in the latest, state-of-the-art laboratory test equipment, endowing the Institute with the capacity of transforming research into high added value products and services.

The laboratories are used for:

- Constructing prototypes and measuring the devices, protocols and algorithms developed by the researchers.

- Simulating complex base-band and medium access systems, as well as sophisticated radio subsystems.

- Measuring radio parameters involved in mobile, fixed and satellite communications, designing and characterizing radiating elements, and measuring the effects on the radio electric spectrum of new protocols and algorithms designed by the Institute.

IMDEA Networks is aware of the importance of having the best equipment to perform experimental work. We invest in the latest technologies.

In the scope of the project COMODIN-CM (part of the REACT-EU initiative), a Dell PowerEdge R7525 server has been purchased, which is a multicore server for regular shared-memory parallel computing, complemented with the latest generation of GPU units, specially design for Deep Learning. This system will significantly reduce the time required to develop and test new algorithms and will contribute to achieve the goal of generating new estimates of the main parameters of the COVID-19 pandemic on a daily basis.

In the scope of the the project CONTACT-CM (part of the REACT-EU initiative), a 5G core composed of a server Dell PowerEdge XE 8545, a Dell PowerEdge R750 and an USRP N310 has been deployed to provide an infrastructure focusedin Machine Learning and Deep Learning techniques towards network intelligence based in 6G data.

The acquisition of a Zynq UltraScale+ RFSoC ZCU208 will allow the implementation of a system operating with the bandwidth capabilities (4GHz) established in the most current standars for millimeter communications systems (IEEE 802.11ay), as well as future wireless systems operating at frequencies of THz.

A Dell PowerEdge R650 has been purchased to deploy the DNN and the programming algorithms of DIME project, and the acquisition of two DellPowerEdge R7515 servers will allow the implementation of the mobile networks control plane, the mobile traffic emulation and the monitorization of the operation and performance of the NetSense project systems.

Investments have been made in several WiGig evaluation kits, signal analysis equipment and a network software defined radio system that provides reliability and fault tolerance to be deployed in large-scale, distributes wireless systems.

The 5TONIC Laboratory

The 5TONIC Laboratory provides infrastructure to support a wide range of systems, functionality, services and applications allowing the deployment, analysis, testing, trial and demonstration of choice technologies driving the 5G and 6G development.

The objective of 5TONIC is to create a global open environment where members from industry and academia work together in specific research and innovation projects related to 5G and 6G technologies with a view to boost technology and business innovative ventures.

In 2022, 5TONIC activities pursued three objectives:

1. Supporting the development of new technological solutions for 5G and 6G.

2. Assisting in the implementation and deployment of new use cases that take advantage of 5G capabilities.

3. Expanding the lab's reach and scope.

Regarding the first objective, 5TONIC members Telefónica and Ericsson demonstrated pioneering end-to-end automated network slicing in 5G Standalone, including Dynamic Radio Resource Partitioning. In the first phase, they achieved full automated end-to-end

network slicing based on 5G SA. The proof-of-concept showed end-to-end orchestration for full slicing life cycle support and radio resources partitioning, offering a key differential user experience to customers.

In terms of new use cases, the lab continued to support testing activities carried out by its members in the context of European projects such as 5G Induce, AI@Edge, and Hexa-X. It will also support experimental activities for new SNS projects like Predict-6G, Hexa-X-II, DESIRE6G, and TrialsNet that were approved during the year. Additionally, 5TONIC will be involved in supporting several UNICO projects approved during 2022, such as 6G-DATADRIVEN, 6G-EDGET, and 6G-INTEGRATION.

For expanding its network, 5TONIC submitted a proposal to the UNICO I+D program to acquire equipment for deploying its network at the UC3M campus in Leganés, making 5TONIC a multi site lab.

Internally, 5TONIC has been working to establish its objectives for the next five years in an environment where 5G technology is already implemented in major markets in its non-standalone version. The goal is to have all elements in place to facilitate the deployment of the following 5G stand-alone. The main challenge for 5TONIC in this context is to offer all technological value to all productive sectors and society in an efficient, scalable, and sustainable way.

The conclusions of this work will serve as the foundation for a new White Paper, which is set to be published in 2023.

During 2022, 5TONIC also has incorporated the Spanish start up YerbaBuena VR as a new collaborator.

research projects, grants and fellowships

4

a n n u a l   r e p o r t
2022
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4.1. Funding awards

We dedicate extensive resources to obtaining external funding to support our research team and in particular those members who excel in their capacities, with the objective to promote the scientific and technical potential of our human capital and, as a direct result, the outreach of the Institute's activities.

The funding of our individual researchers takes the form of awarded grants, scholarships and fellowships. These awards are similar to externally funded research in their openness and the strict selection processes used, and they confer prestige on the awardee as well as on the organization he/she is affiliated to.

4.1.1 International

Google Fellowship in Privacy and Security

Awardee
- Julien GAMBA, PhD Student.

Funded by
Google

4.1.2 European

MAESTRO MSCA Individual Fellowship Grant

Awardee
- Augusto GARCÍA-AGÚNDEZ, Post-Doc Researcher.

Funded by
European Union

4.1.3 National

Ramón y Cajal Grants
Programa de Ayudas para contratos Ramón y Cajal

Awardees
- Dr. Narseo VALLINA-RODRÍGUEZ, Research Associate Professor
- Dr. Guillermo SUÁREZ-TANGIL, Research Assistant Professor

Funded by
Spanish Ministry of Science and Innovation *(Ministerio de Ciencia e Innovación - MICINN)*

Ramón y Cajal Grants

Programa Ramón y Cajal - Ayudas para la creación de puestos de trabajo de carácter permanente

Awardee

• Dr. Vincenzo MANCUSO, Research Associate Professor

Funded by

Spanish Ministry of Economy, Industry and Competitiveness *(Ministerio de Economía, Industria y Competitividad - MINECO)*

José Castillejo Research stays abroad for young postdocs (2021) - Fulbright Program

Awardee

• Dr. Claudio FIANDRINO, Post-Doc Researcher
• Country of stay: USA (Northeastern University)
• Duration of the stay: 4 months

Funded by

Spanish Ministry of Universities *(Ministerio de Universidades - MIU)*
This research stay was also supported by the Fulbright Commission

Juan de la Cierva Incorporation Grants 2019

Awardee

• Dr. Claudio FIANDRINO, Post-Doc Researcher

Funded by

Spanish Ministry of Science and Innovation (MICINN), National Programme for the Promotion of Talent and its Employability, part of the National Plan for Scientific and Technical Research and Innovation 2017-2020

Juan de la Cierva Training Grants 2019

Awardee

• Dr. Borja GENOVÉS, Post-Doc Researcher

Funded by

Spanish Ministry of Science and Innovation (MICINN), National Programme for the Promotion of Talent and Its Employability, part of the National Plan for Scientific and Technical Research and Innovation 2017-2020

Grants for training university teachers – FPU

Ayudas para la Formación del Profesorado Universitario

Awardees

- Dolores GARCÍA, PhD Student
- Yago LIZARRIBAR, PhD Student

Funded by

Spanish Ministry of Universities *(Ministerio de Universidades)*

Grants to promote youth employment and the implementation of the Youth Guarantee system in R&D+I (2018)

Ayudas para la promoción de empleo joven e implantación de la garantía juvenil en I+D+I (2018)

Awardees:

- Elvira CONTI, Junior Project Administrator
- Marta DORADO, Junior Science Communicator
- Rubén RUPÉREZ, R&D laboratory technician

Funded by:

Ministry of Economy and Competitiveness (MINECO)

4.1.4 Regional

Youth Employment Initiative (YEI) – Programa de Empleo Juvenil

Convocatoria de ayudas para la contratación de Ayudantes de Investigación y técnicos de laboratorio cofinanciadas por Fondo Social Europeo a través del Programa Operativo de Empleo Juvenil y la Iniciativa de Empleo Juvenil (YEI)

Awardee

- Gustavo SEGARRA, Laboratory Technician

Funded by

European Social Fund (Youth Employment Initiative), Department of Science, Universities and Innovation of the Regional Government of Madrid

Talent Attraction Grant – Modality 1: Researchers with Experience

Awardee

- Marco FIORE, Research Associate Professor

Funded by

Department of Science, Universities and Innovation of the Regional Government of Madrid

Talent Attraction Grant – Modality 2: Young Postdoctoral Researchers

Awardee

• Dr. Antonio BAZCO-NOGUERAS, Post-Doc Researcher

Funded by

Department of Science, Universities and Innovation of the Regional Government of Madrid

4.2 Ongoing projects

Externally funded research projects enable us to collaborate with researchers from other organizations and backgrounds. Research funding is awarded following an open competitive selection process in which project proposals, and the private or public sector organizations presenting them, are subject to rigorous scrutiny. Such thoroughness helps to ensure that research undertaken with those funds is relevant, well managed and with high probabilities of success in achieving its stated goals.

DATABRI-X

Data Process & Technological Bricks for expanding digital value creation in European Data Spaces
Funded by: European Union HORIZON-CL4-2021-DATA-01 (Work Leading Data and Computing Technologies).
Duration: October 2022 to September 2025

The emergent European Data Economy relies on the availability of data as a basis for further innovation and exponential development of technologies, especially the development of trustworthy 'made in Europe' AI that reflects European values. Data Spaces, platforms and marketplaces are enablers, key to unleash the potential of such data. However, data sharing and data interoperability are still at their infancy. Through DataBri-X, European Data Spaces, platforms and marketplaces and their wide range of business, governmental and public, research and civil society stakeholders will be equipped with a holistic and flexible data governance process and a seamless integrated standards based toolbox for data- and metadata management which can be assembled along relevant requirements, provides open source as well as commercial tools (the bricks / bri-X), and mechanisms to load 3rd party resources like language resources or AI models, and can be easily deployed into Data Spaces and thereby will contribute to make Europe the most successful area in the world in terms of data sharing and data re-use, to gain the full benefit from the value of data, while respecting the legal framework relating to security and privacy. The project's objective is to provide a holistic, energy-efficient and user-friendly toolbox

of practical, robust and scalable bricks/Bri-X (processes, technologies and tools) that improve the interoperability, usability, discoverability, quality, and integrity of data and metadata, with the aim of making data sets ready for expanded digital value creation in the context of European Data Spaces. The DataBri-X toolbox will be offered in compliance with accountability, fairness, privacy, and confidentiality regulations as well as FAIR principles and will build on existing and emerging initiatives. The DataBri-X consortium comprises 14 partners from 6 EU members and 1 associated country (UK), that together form a complete value chain of actors.

More info

BRAIN

Explainable and robust AI for integration in next generation networked systems
Funded by: Ministry of Science and Innovation.
Duration: September 2022 to August 2025

Fifth-generation (5G) networks are now entering a stable phase in terms of system architecture and commercial release, and the identification of the advanced features that will shape the evolution of 5G into the sixth generation (6G) of mobile network systems has already started. Despite being at early stages of conceptualization, some key aspects of the future infrastructure have been identified by the community: 6G will bring a paradigm shift from connected things to connected intelligence, supporting even more stringent KPI requirements than 5G, and global coverage (air, ground, and underwater). Therefore, there are strong expectations that Artificial Intelligence (AI) will permeate the 6G network infrastructure, allowing for much swifter and more effective decision-making in scheduling, control and orchestration operations of the end-to-end communication systems. Ultimately, this will allow 6G to support ambitious performance targets such as near-zero latency, apparent infinite capacity, or 100% reliability and availability, so as to support new and diverse classes of innovative mobile services.

The BRAIN project will contribute to making this vision of 6G as a network augmented via pervasive artificial intelligence a reality, by addressing the two main roadblocks. On the one hand, existing AI models employed for network management are black boxes, and their complete lack of transparency is a clear barrier for adoption: here, BRAIN aims at proposing new AI tools for network management that are explainable and trustworthy by design and specifications on robustness that allow to benchmark existing AI models. On the other hand, the disruptive softwarization of the network architecture has opened new opportunities for a deep integration of AI into the future 6G infrastructure that have yet to be explored: here, BRAIN will investigate novel approaches for the design, implementation and evaluation of in-band network intelligence, i.e., AI models that run directly into the user-plane programmable switches, operating at line rate over the transiting data traffic, and laying the foundations to a truly AI-native 6G network..

More info

GREENEDGE

Energy-efficient Monitoring in the era of Edge Intelligence

Funded by: Ministry of Science and Innovation.
Duration: September 2022 to August 2025

Monitoring a process/phenomenon of specific interest at the network edge is prevalent in Cyber-Physical Systems (CPS), remote healthcare, smart buildings, intelligent transport, etc., that are essential building blocks of smart cities. Todays monitoring systems extensively use Internet-of-Things (IoT) sensors. In the era of the Edge Intelligence, there is a major research thrust for deploying small Machine Learning (ML) models on the IoT sensors making them capable of doing local inference on the collected data. The small ML models consume lower energy at the cost of lower inference accuracy compared to large ML models, namely, Deep Neural Netowrks (DNNs) that run on edge servers. In this context, there are several unanswered questions on the Total System Energy (TSE) consumption in the monitoring systems. A natural question is: where should the inference be performed for a data sample so that TSE is reduced? Another impending question is: when should the sensors smaple in order to further reduce the TSE? The latter question is inspired by the fact that in today's system, the data collected sensors has high redundancy.

The GreenEdge project answers the above questions by exploring the TSE savings that can be achieved in a monitoring application using intelligent sampling and scheduling the inference between the edge server and the IoT sensors. GreenEdge will achieve this while respecting the applications' Quality of Service (QoS) requirements. This will be conducted in three stages: (1) performing measurements of energy consumption, processing times, and communication times on the IoT sensor and the edge server, (2) establishing models and algorithmic solutions that schedule the sampling and the inference by exploiting the trade-offs between the TSE consumption, inference accuracy, IoT battery limitation, delay in detecting essential events etc., and (3) applying the new findings and validating the efficacy of the proposed algorithms in two exemplary applications with varied characteristics, namely, a cognitive assistance application and a wildfire monitoring testbed.

More info

QUANNET-CM

MADQuantum-CM. Quantum Communication in the Autonomous Region of Madrid

Funded by: The Regional Government of Madrid through the Spanish Plan for Recovery, Transformation and Resilience and the NextGeneration EU Funds from European Union.
Duration: January 2022 to March 2025

The overall objective of the project is to structure and coordinate Quantum Communications R+D+i capacities of the Community of Madrid (CM), among themselves and with other Autonomous Communities with common interests, within the framework of the

Complementary Plan for Quantum Communication whose main objective is the alignment of Spain with the key European initiatives in the field of Quantum Communication, both the Quantum Flagship and the EuroQCI. MADQuantum-CM project develops the participation of the Community of Madrid in the Complementary Plan for Quantum Communication, contributing to its scientific-technological objectives as well as the creation of talent and the industrial ecosystem, through 7 scientific-technical lines:
• Line 1: EuroQCI – Towards a European Quantum Communications Infrastructure
• Line 2: Hardware for quantum communications
• Line 3: Software for quantum communications
• Line 4: Hardware for quantum processing
• Line 5: Software for quantum processing
• Line 6: Human Resources and training for innovation and entrepreneurship
• Line 7: Innovation and industrial ecosystem, dissemination and exploitation of results

The main line of the project is line 1, in which technological developments and deployments will be carried out to contribute to the first objectives defined in the European programs: the creation of a high-security communications network, resistant to any computer attack, orchestrated either through classical or quantum means.

Line 2 will contribute to the development of line 1 through hardware developments for quantum communication, first for fiber systems, considering both technologies easier to integrate in the network and to industrialize (Continuous Variables), as well as those more optimal for long distances/rates (Discrete Variables) and secondly for free space, which includes satellites, foreseeing the space segment that will be necessary in the EuroQCI for very long-distance communications in the short/medium term, and communications with an unmanned aerial vehicle (UAV). Likewise, within this line, technology based on entanglement will be developed, including quantum repeaters for Quantum Communications for long distances (>300 km) over optical fibers.

Line 3 will focus on systems and new protocols with advantages in terms of security, distance and functionality, as well as security studies of experimental systems and their integration into the networks.

Quantum Communications, however, not only produce secure systems, their ultimate goal is the ability to create quantum correlations between any two points in the network. These quantum processing technologies will be developed in lines 4 and 5. The main applications of these developments may be: ultra-precise distribution of time signals, quantum sensors, distributed quantum computing, etc.

Finally, lines 6 and 7 aim to educate and train researchers, by hiring research personnel in their different stages of training, and generate human capacities for the development of a national industry that covers the entire value chain around quantum communications.
More info

ECOMOME

Energy consumption measurements and optimization in mobile networks

Funded by: European Union through the NextGenerationEU/PRTR Funds and the Spanish Scientific Agency/Ministry of Science and Innovation.

Duration: Febrero 2022 to Enero 2025

The energy consumption of mobile networks has been the source of animated debates in the recent period, with the deployment of 5G technologies. However, the energy consumption estimations put forward by the different parties in the debate showed significant differences, up to two orders of magnitude. This is a result of a lack of accurate models and meaningful metrics in this field. More precisely, the control plane of a mobile network represents a significant share of the traffic exchanged between the user and the network infrastructure, much more than in any other network technology, and this role will become even more important with the development of network function virtualisation and orchestration. Models focusing on the application-level traffic are bound to make harsh approximations, leading to results that can not really help the involved parties.

Project ECOMOME addresses this problem of accurately modelling and optimising the energy consumption of a mobile network, with a focus on 4G and 5G technologies. This will be achieved through three main research axes. The first contribution will be represented by the first independent measurement study of energy consumption in a mobile network. We will address both user equipment and the radio access network, conducting a network metrology study on real operational networks and on experimental testbeds. The measurement data collected in this campaign will represent the input for other contributions in the project, but it will also be made openly available to the research community.

The second objective of the project is to use this measurement data in order to design accurate energy consumption models for mobile networks. In this sense, we take an original approach with respect to the literature, by focusing on modelling the impact of the building blocks of the mobile network, a series of "atomic" network mechanisms and functions which practically compose any service scenario and any user context. Modelling these atomic network mechanisms requires a detailed knowledge of the way a mobile network functions, but then allows the accurate modelling of any general scenario.

Finally, the project also targets the proposal of energy efficient networking solutions. Indeed, the measurement data and the energy consumption models will allow us to detect the most energy-hungry phases in a mobile network. To reduce their impact, we will propose network intelligence solutions, which are based on observing the traffic transported by the network, detecting whenever the network settings are over-consuming, and adapting the network configuration with energy efficiency metrics in mind.

More info

MAP-6G

Machine Learning-based Privacy Preserving Analytics for 6G Mobile Networks

Funded by: Ministry of Economic Affairs and Digital Transformation, European Union NextGeneration-EU

Duration: January 2022 to December 2024

Although there is not a unique understanding of what 6G will be, several initiatives are ongoing that have put forward highly advanced visions of potential concepts and preliminary technologies that will form 6G networks. With the current deployment of 5G networks, high data rate and low latency are provided for communication, in addition to some first steps towards deployments that also provide commercial localization services. 6G mobile networks, however, will go far beyond the use cases that can be covered by 5G, enabling not only significantly improved network performance but also substantially more complex services that rely on location and context information gathered by the network. In particular, 6G mobile networks will enable orders of magnitude higher localization accuracy and lower latency than prior technologies. This will be a unique opportunity to design new services and analytics, but also a threat for privacy. For this reason, this project will design native privacy-preserving machine learning mechanisms for 6G networks in order to manage the massive amount of data generated by services in 6G networks, based on emerging Federated Learning techniques. The final demonstrator will integrate the developed modules within the mobile network and will be demonstrated using testbeds comprising data servers, edge nodes and end-user devices.

More info

RISC-6G

Reconfigurable Intelligent Surfaces and Low-power Technologies for Communication and Sensing in 6G Mobile Networks

Funded by: Ministry of Economic Affairs and Digital Transformation, European Union NextGeneration-EU.

Duration: January 2022 to December 2024

The mobile communication industry is one of the few industry sectors that has been growing at a very fast pace for more than three decades. 5G mobile networks promised to change our modern society and vertical industries and are now gradually being rolled out commercially. The research focus is now shifting towards sixth generation (6G) mobile systems and architectures. While 5G is largely used for communications, 6G mobile networks will go far beyond 5G use cases, involving a vastly larger number of connected devices, significantly higher performance requirements, and support for detailed object and environment sensing in addition to communication. To this end, 6G networks will need to embrace new concepts and capabilities. The overall objective of this project is to integrate such crucial new technologies into 6G to improve wireless communications, provide environmental sensing, and significantly lower the per-device energy footprint to avoid a vast increase in overall network power consumption. We will take a holistic approach, harnessing reconfigurable

intelligent surfaces, visible light communication, and RF backscatter, that 6G networks will use. This project is timely, as the solutions that we will design during the project (concluding in December 2024) can be incorporated in the pre-6G systems that are expected to be ready for deployment around the same time, and in line with the roadmap proposed by the 5G Infrastructure Association (5GIA) and the Sustainable Development Goals set by the United Nations. We plan to provide one final demonstrator in collaboration with industry partners of the consortium, integrating communication, sensing and low-power design for the important and emerging use case of the Internet of Everything.

More info

PROMIN

IMDEA Network's plan for attracting talent and promoting degrees related to telecommunications, at national and international leve

Funded by: Ministry of Economic Affairs and Digital Transformation, European Union NextGeneration-EU.

Duration: January 2022 to December 2024

The main objective of the Plan for the Promotion of Telecommunications Studies (PPET) is to attract talent to telecommunications studies, thus helping to solve the shortage of talent in technologies such as advanced 5G and 6G, which are essential for research centers and industries.

This plan will deploy a series of actions for the dissemination of these studies among the different levels of students, so as to improve the attraction of good students to them, while emphasizing the incorporation of female talent, currently at very low levels, and international students for the master's and doctoral levels.

This promotion plan is considered unique, and the deployment of actions to be carried out will be developed throughout Spain, beyond the geographical scope or action of each of the beneficiary entities of the PPTE.

More info

SOCIALPROBING

Scalable and Cost Competitive Data Collection and Analysis Techniques for Social Probing

Funded by: Ministry of Science and Innovation

Duration: December 2022 to Noviembre 2024

SocialProbing brings together an interdisciplinary group of researchers who will combine their knowledge and skills to develop techniques, technologies and tools that allow probing fundamental aspects of society in a scalable and affordable way.

Probing a certain population group provides information to be able to evaluate and improve their situation. The rapid digital deployment and the success of social networks have notably increased the possibility of probing society through these new channels. But to the same extent, problems have arisen in conducting digital surveys, due to the sense of lack of privacy on the part of the participants and the lack of incentives to participate. All this is aggravated if the information to be collected is of a sensitive nature (social, gender, economic, health, …). Furthermore, by leaving out of the survey a segment of the population that does not use digital platforms, it is possible that there is bias in the conclusions obtained.

SocialProbing proposes a new methodology to alleviate these issues, and at the same time to advance in the acquisition of data through digital channels. This methodology is based on the massive and continuous use of surveys by digital means in which information is collected indirectly. The use of this type of survey has two great advantages over direct surveys. On the one hand, with the same number of participants, a much larger fraction of the population is reached, with the consequent increase in scalability and reduction in costs. On the other hand, it reaches segments of the population that do not use digital platforms.

In SocialProbing, a Computer Science group and a Statistics group have joined knowledge and skills. The first will be in charge of developing the computational aspects, proposing and deploying computer systems that serve for efficient storage and processing, while the second will propose the appropriate statistical techniques to generate knowledge of the new type of data that is generated via digital channels, which requires the development of new theory and techniques to ensure the consistency and reliability of the results. To show the utility and expand the potential impact of the project, the development of technological and methodological tools will be completed with their application to three timely problems of great relevance in society: (1) the COVID-19 pandemic, (2) social inequalities (such as gender), and (3) climate change (such as visibility and potential impact on society). These three are, indisputably, three of the most important problems in our society today, so their study is of great relevance both for scientific advancement and for the implementation of new technologies, transferable to the business fabric.
More info

COMET

Understanding the Trail of the Malware Ecosystem from the Underground Markets to the Surface
Funded by: Ministry of Science and Innovation.
Duration: September 2022 to September 2024

Supported by an underground economy, cyber-dependent crimes have rocketed in recent years. Knowledge, but more importantly, tools are exchanged in online markets. An

example is crypto-mining malware, which has permeated from these underground communities to illicitly produced over 57M USD of revenues as shown later in a case-study that is as part of an on-going measurement. This income fuel the underground economy and gear other cyber-criminal activities.

The goal of this project is to better understand cyber-dependent crimes that are enabled by malware from a software development perspective. The purpose is threefold: a) to profile malware developers, b) to understand their business model, and c) to measure the support offered by online markets and forums. A central aspect of the project will be developing technology for malware characterization.

This is, ascribing malware to a given campaign, seller or author (namely, miscreant). This will be used to measure the trail left by malware developers and hacking groups when trading software through anonymous markets. Malware characterization is a difficult task because it deals with active adversaries in a context where partial code reuse is common. Two separate communities have tackled the problem of malware characterization: the malware analysis community study malware found in the wild, while the cyber-crime community look at marketplaces where actors share malware. However, market places are not echoed chambers and the tools produced permeate through to the wild. This project aims to bridge the gap between these two disparate approaches, measuring the commonalities, and then delivering a new approach to understand this ecosystem through malware characterization which is stronger than the sum of its parts. As a key novelty, we will be looking at the exchange of malware source code together with binaries found on the wild. More info

RISE-MM

Reconfigurable Intelligent Surface-Enabled millimeter Wave Communication for Beyond 5G Cellular Networks
Funded by: European Union HORIZON-MSCA-2021-PF.
Duration: September 2022 to September 2024

The 5G mobile communication era has just started, and we are already experiencing the dominance of various new applications with enhanced broadband connectivity requirements. These requirements will become even more critical with the integration of cellular networks in different sectors of society. Conventional sub-6 GHz-based cellular networks represent a short-term solution, where available spectral opportunities are limited and will unquestionably dry up soon. To this end, RISE-MM aims to set the ground for the THz spectrum-based cellular networks. Combining the researcher's experience on reconfigurable intelligent surfaces (RIS)- enabled networks and the expertise on mmWave communication and its practical implementation of IMDEA Networks, in RISE-MM, we will develop channel models for RISE-MM communication in indoor and outdoor deployment

settings. Moreover, the project aims to develop an algorithm for joint communication and sensing (JCAS) through RISE-MM using machine learning techniques.

RISE-MM aims to validate the proposed channel models and the algorithm using system-level simulations (SLS) and software-defined radios (SDR)-based mmWave experimentation platforms. It will also implement the proposed channel models using a large testbed with tens of 60 GHz off-the-shelf devices, which will provide a more realistic performance analysis for large-scale deployments to complement the SLS and SDR-based results. The practical deployment of RISE-MM will also help formulate the optimal RIS placement policy, which is a critical factor for RIS-enabled network planning.

RISE-MM is a unique scientific advance because it capitalises on communication theory, machine learning, and practical experimentation to propose new networking models to design and characterise RISE-MM communication for beyond 5G/6G cellular networks. In addition, the specifically developed JCAS algorithm can be the basis of novel developments for passive object detection and identification.

More info

DIME

Distributed Inference for Energy-efficient Monitoring at the Network Edge Note
Funded by: European Union HORIZON-MSCA-PF.
Duration: June 2022 to May 2024

Today, Internet of Things (IoT) sensors are being extensively used for monitoring processes/phenomena in smart cities. The data samples generated by these IoT sensors are wirelessly transmitted to servers at the network edge where compute-intensive Machine Learning (ML) models, specifically Deep Neural Networks (DNNs), are used for providing inference. However, a large percentage of data samples are redundant because they do not (significantly) improve inference. This leads to an excessive and unjustified carbon footprint of these systems as each redundant data sample will contribute to the Total System Energy (TSE) consumption. However, there is a lack of research on the design of these systems to reduce the TSE by considering the redundancy in the data. In DIME, we explore the TSE energy savings in a distributed inference setup by envisaging the deployment of the emerging small DNN models on the IoT sensors. My objective is to maximize TSE energy savings by answering two key questions: 1) when should an IoT sensor sample the process (to reduce redundant samples) and 2) where to do the inference on the sample, on the IoT sensor or at the edge server (to reduce TSE)? I will develop a general modelling framework and subsequently design and validate scheduling algorithms and sampling techniques that minimize the TSE by reducing the redundant data and maximize accuracy in ML-based monitoring systems. To achieve the objective, I will leverage my theoretical research experience on modelling and design and analysis of algorithms and the expertise of IMDEA Networks in applied machine learning and

systems research. DIME directly contributes to reducing the carbon footprint of monitoring in smart cities, which is in line with the goal of Horizon Europe to achieve 100 climate-neutral smart cities by 2030

More info

Funded by the European Union NextGenerationEU

GOBIERNO DE ESPAÑA MINISTERIO DE ASUNTOS ECONÓMICOS Y TRANSFORMACIÓN DIGITAL

Plan de Recuperación, Transformación y Resiliencia / AGENCIA ESTATAL DE INVESTIGACIÓN

AEON-ZERO

Network Intelligence for zero-touch orchestration and anomaly detection
Funded by: the programme "UNICO 5G I+D" funded by the European Union-NextGenerationEU and the Ministry of Economic Affairs and Digital Transformation through the Spanish Recovery, Transformation and Resilience Plan.
Duration: December 2021 to December 2024

To meet the ambitious goals set for 5G evolution and 6G systems, the mobile network architecture is being redesigned for end-to-end softwarization and cloudification, completing the decoupling of network functions from the underlying hardware, and granting an unprecedented flexibility to the communication infrastructure. NI will play a paramount role in the effective operation of future softwarized and cloudified mobile networks.

Both industry and academia are making substantial efforts to accelerate the integration of solutions for automated network management into the mobile network environment. However, even in presence of a full ZSM deployment where a plethora of NI instances takes resource and VNF management decisions in a completely autonomous manner, interactions with network managers will still be needed at multiple levels.

Building upon the experience and results of the ongoing DAEMON project, funded by the European Commission, AEON-ZERO will focus on developing NI solutions that are in fact usable by mobile network operators. The target models will embed and present interfaces that make the interactions above as simple and smooth as possible and render final decisions that are interpretable and clearly explainable. In this way, AEON-ZERO will contribute to closing the current gap between the competences of network experts and the skills needed to configure the increasingly complex AI algorithms that underpin such NI.

More info

Funded by the European Union NextGenerationEU

GOBIERNO DE ESPAÑA MINISTERIO DE ASUNTOS ECONÓMICOS Y TRANSFORMACIÓN DIGITAL

Plan de Recuperación, Transformación y Resiliencia / AGENCIA ESTATAL DE INVESTIGACIÓN

AEON-CPS

Network Intelligence for cyber-physical system support
Funded by: the programme "UNICO 5G I+D" funded by the European Union-NextGenerationEU and the Ministry of Economic Affairs and Digital Transformation through the Spanish Recovery, Transformation and Resilience Plan.
Duration: December 2021 to December 2024

AEON-CFS will focus on the monitoring and control operated by Network Intelligence (NI) on cyber-physical systems (CPSs) relying on 5G networks and their 6G evolutions. In AEON-CPS, we will study fundamental properties of automated machine learning (AutoML) and explainable artificial intelligence (XAI) to support the prompt and automatic identification of performance anomalies of CPSs and the associated corrective actions (intelligent troubleshooting). We will use specific CPS applications for NI in CPS environments, and in particular for what concerns future solutions for intelligent transportation, i.e., assisted and automatic driving applications. The work will result in the design of novel interpretable and explainable automatic ML/AI technologies and SW tools. The validation of methodologies and tools will be carried out in realistically emulated cellular environments. AEON-CPS will benefit the society by making CPSs more controllable and optimizable in an automatic way, while at the same time offering the opportunity to support quick, precise and human-understandable troubleshooting actions.

More info

TRUST aWARE

Enhancing Digital Security, Privacy and TRUST in softWARE
Funded by: European Union H2020-SU-DS-2020 (Digital Security).
Duration: June 2021 to May 2024

Users often get exposed to security and privacy (S&P) threats when they use digital services for social networking, entertainment, banking, education, health, or home security. The factors behind digital S&P threats are numerous and interconnected, as a combined result of inappropriate software practices, bad user habits, and lack of regulatory enforcement and certification methods, among others. To define effective digital S&P policies and to establish a long-term vision, it is needed to have data, information, and a body of knowledge on privacy, data protection and the associated ethical, legal and socio-economic aspects.

TRUST aWARE aims to address this situation by providing actionable intelligence and tools for the different connected stakeholders, to offer effective mechanisms to protect the freedom, security, and privacy of citizens, enhancing TRUST on SoftWARE, cybersafety, and EU's market position. TRUST aWARE will facilitate this by delivering:

• User-friendly tools to protect consumers against S&P cyberthreats (attacks, abusive practices, inappropriate behaviours of digital services) to enable them to better understand, control, detect and respond to S&P threats in a timely manner, and configuring their own S&P protection settings.

• Collective intelligence for CERTs and Authorities in collaboration with citizens, CISOs and DPOs to ensure and audit that digital products and their S&P practices are transparent, secure and compliant with regulation.

• Knowledge to foster S&P-by-design in software engineering by supporting developers and operators with standards and certification methods for compliance with S&P regulations.

By providing tools for key stakeholders along the whole cycle (TRUST aWARE virtuous cycle), and supporting cooperation and intelligence sharing, TRUST aWARE will minimize the impact of cyberthreats, empowering users, promoting collective awareness, and encouraging trustworthy S&P-preserving digital products in compliance with regulation. More info

SLICES-SC

Scientific Large-scale Infrastructure for Computing/Communication Experimental Studies – Starting Community

Funded by: European Union H2020-INFRAIA-2020-1 (Integrating and opening research infrastructures of European interest. Integrating Activities for Starting Communities)
Duration: March 2021 to February 2024

Today we are experiencing the digital transformation happening with an unprecedented pace, with the community constantly researching on new solutions to support this transformation with ample computational power and connectivity. Towards addressing such research efforts, Research Infrastructure (RI) specific to addressing Digital Sciences research efforts have been deployed worldwide, towards trying to address key aspects contrary to off-the shelf commercial infrastructure:
1) Full control over the parameters of an experiment,
2) Repeatable experiments regardless of the physical infrastructure,
3) Valid experimental results, which are easy to cross-reference and replicate.

As such, several RIs have emerged, offering experimentation services with bleeding edge resources, that otherwise are only offered only in industrial R&D laboratories, with limited functionality. Towards combating these issues, SLICES Research Infrastructure is about to be deployed, aiming to provide high quality experimentation services with emerging technologies around the area of digital sciences (5G/6G, NFV, IoT and Cloud Computing), in an Internet scale setup.

With SLICES-SC, we aspire to foster the community of researchers around this ecosystem, create and strengthen necessary links with relevant industrial stakeholders for the exploitation of the infrastructure, advance existing methods for research reproducibility and experiment repeatability, and design and deploy the necessary solutions for providing SLICES-RI with an easy to access scheme for users from different disciplines.

A set of detailed research activities has been designed to materialize these efforts in tools for **providing transnational (remote and physical) access to the facility**, as well as virtual access to the data produced over the facilities. The respective networking activities of the project aspire in fostering the community around these infrastructures, as well as open up to new disciplines and industrial stakeholders.

More info

SOMIRO

Soft Milli-robots
Funded by: European Union H2020-ICT-2020-2 (Information and Communication Technology)
Duration: January 2021 to December 2023.

Precision agriculture for rice farming and smart methods such as aquaponics are vital to ensure a safe supply of fresh food for Europe while reducing our environmental footprint. In line with the Digitising European Industry initiative under their description of smart agriculture, the SOMIRO project will develop a flat-worm-inspired mm-scale swimming robot with month-long energy autonomy, local intelligence, and ability to continuously generate data and optically communicate to reduce farming's environmental impact in terms of carbon footprint, over fertilization, pesticide use, and overfeeding. Swimming robots would cover a much larger area than stationary systems and could be rapidly deployed and self-redistribute where most needed. They may serve as a stand-alone monitoring solution for indoor farming or complement drone-based remote sensing in outdoors scenarios.

Until today, no energy autonomous (untethered and with local intelligence) milli-robot capable of hours of continuous operation has been demonstrated. The major reason for this is power limitation: locomotion requires much power and small robots have very limited energy storage and energy harvesting. Our milli-robot will be less than 1 cm long and show how soft and stretchable systems, with undulating swimming like flat worms, require far less energy for locomotion than other systems of comparable size. For power, it will not rely on any dedicated infrastructure but only on ambient light.

The design of SOMIRO focuses on its industry transfer: industrial partners will use cutting-edge assembly technologies that can scale up to production volumes with no change in process. The bulk materials are low-cost elastomers and polymers and the electronic circuits will be based on commercial components. Throughout the project, all application scenarios and exploitation plans will be developed in close collaboration among the SOMIRO partner enterprises and end-users, and external industrial stakeholders.

More info

DAEMON

Network intelligence for aDAptive and sElf-Learning MObile Networks

Funded by: European Union H2020-ICT-2020-2 (Information and Communication Technology)

Duration: January 2021 to December 2023

The success of Beyond 5G (B5G) systems will largely depend on the quality of the Network Intelligence (NI) that will fully automate network management. Artificial Intelligence (AI) models are commonly regarded as the cornerstone for NI design; indeed, AI models have proven extremely successful at solving hard problems that require inferring complex relationships from entangled and massive (e.g., traffic) data. However, AI is not the best solution for every NI task; and, when it is, the dominating trend of plugging 'vanilla' AI into network controllers and orchestrators is not a sensible choice.

Departing from the current hype around AI, DAEMON will set forth a pragmatic approach to NI design. The project will carry out a systematic analysis of which NI tasks are appropriately solved with AI models, providing a solid set of guidelines for the use of machine learning in network functions. For those problems where AI is a suitable tool, DAEMON will design tailored AI models that respond to the specific needs of network functions, taking advantage of the most recent advances in machine learning. Building on these models, DAEMON will design an end-to-end NI-native architecture for B5G that fully coordinates NI-assisted functionalities.

The advances to NI devised by DAEMON will be applied in practical network settings to: (i) deliver extremely high performance while making an efficient use of the underlying radio and computational resources; (ii) reduce the energy footprint of mobile networks; and (iii) provide extremely high reliability beyond that of 5G systems. To achieve this, DAEMON will design practical algorithms for eight concrete NI-assisted functionalities, carefully selected to achieve the objectives above. The performance of the DAEMON algorithms will be evaluated in real-world conditions via four experimental sites, and at scale with data-driven approaches based on two nationwide traffic measurement datasets, against nine ambitious yet feasible KPI targets.

More info

BANYAN

Big dAta aNalYtics for radio Access Networks

Funded by: European Union H2020-MSCA-ITN-2019 (Marie Skłodowska-Curie Innovative Training Networks)

Duration: April 2020 to November 2023.

As mobile services consumed by people and machines become increasingly diversified and heterogeneous, 4G/5G networks are asked to meet a growing variety of Quality of Service (QoS) requirements. Network slicing, enabled by Network Function Virtualization (NFV), is a promising paradigm to increase the agility and elasticity of the mobile network via logical slices that can be formed and composed dynamically, so as to adapt to the fluctuations in the demands for different mobile services. BANYAN pursues a tight academic-industrial cooperation, which will allow developing key tools for data-driven 5G RAN, as well as properly training early-stage researchers who are urgently needed by industry, academia, etc.
More info

DISCOLEDGER

DiStributed COmputation by LEarning from Data and Gathering Edge-Cloud Resources
Funded by: Spanish Ministry of Science and Innovation (MICINN) and the European Union through the Next GenerationEU / PRTR program (Proof-of-Concept call 2021).
Duration: December 2021 to November 2023

In DiscoLedger, we build on top of the results of the DiscoEdge project. There, we have studied how to share resources in today's mobile networks that are populated by all sorts of devices that offer ubiquitous sensing capabilities and disparate categories of online services to mobile users, as well as a wealth of processing power, inexpensive storage and a wide range of computational and networking resources. In contrast with the traditional Cloud computing model in which the vast majority of online services and applications offload computationally expensive tasks to centralised and large-scale Cloud infrastructure services, we have shown the convenience of relying on network, storage and computational resources available in the proximity of users, i.e., in the Edge. These novel paradigms can effectively leverage an ecosystem of resources distributed all over the communication devices at the edge of the network (e.g., base stations and MEC hosts) and in the user devices (e.g., smartphones and IoT devices). In that context, we also explored economic and sociological challenges to guarantee user trust, fairness and security when accessing resources from third-party services.

How to concretely use Cloud/Edge resources efficiently within a communication network framework represents the next challenge. Indeed, little has been said about how to deploy, access and manage such resources in operational scenarios where the complexity of network, storage and computer systems imposes many operational and functional constraints. In addition, with the advent of machine learning, the need to integrate resource management interfaces and automatic intelligent decision processes has become of paramount importance and promises to offer novel classes of solutions to the resource efficiency problem. A major problem of applying machine learning to Cloud/Edge networked environments is that making and enforcing decisions automatically needs to be

tracked and logs need to be secured. The rationale is twofold: (i) provisioning online services needs to be monitored towards the need of maintaining the service level high, according to service-level agreements, and (ii) the legal and economic responsibility of users, network and service operators needs to be determined in case of disputes, which might be cumbersome in case of applying machine learning decision making algorithms. Therefore, proposing the DiscoLedger project, we have identified the need of making the use of Cloud/Edge resources traceable and auditable in a framework in which the different players are not necessarily trustable. The deployment of distributed ledger technologies will be therefore explored. In particular, we consider that lightweight ledgers need to be provided in the Cloud/Edge as virtual network functions, which we call microledgers.

Specifically, in DiscoLedger, we will tackle both efficiency and traceability/auditability of services in the Cloud/Edge in a cellular network context, with network slicing features. To do so, we will evolve the results of DiscoEdge and build a proof of concept on (a) scaling/migrating online services in the Cloud/Edge by means of self-tuning and possibly interpretable machine learning algorithms and (b) embedding distributed ledgers technologies in the architecture, in the form of microledgers, with the associated support for their virtualization and management through intelligent algorithms.

More info

MINTS

Millimeter-wave Networking and Sensing for Beyond 5G
Funded by: European Union H2020-MSCA-ITN-2019 (Marie Skłodowska-Curie Innovative Training Networks)
Duration: November 2019 to October 2023

The global telecommunications market has become tremendously competitive due to the emergence of new Asian players and saturation of traditional products (e.g., mobile broadband), which has decelerated the growth of the EU's telecommunications market. Thus, without dramatic innovation to open up new markets, EU's telecommunications industry is at risk. However, new markets such as industry 4.0 and autonomous driving demands extremely high data rates which can only be provided at mmWave frequen- cies. To successfully overcome mmWave challenges, a closely integrated, skilled and multi-disciplinary team is needed to co-create innovative technology and applications. The ETN for MIllimeter-wave NeTworking and Sensing for Beyond 5G (MINTS) offers the first training program on mmWave networks that covers the full stack from physical layer to application.

More info

ENLIGHT'EM

European Training Network in Low-energy Visible Light IoT Systems

Funded by: European Union H2020-MSCA-ITN-2018 (Marie Skłodowska-Curie Innovative Training Networks) Grant.

Duration: June 2019 to May 2023

An Innovative Training Networks (ITN) project, type which aims to train a new generation of creative, entrepreneurial and innovative early-stage researchers, able to face current and future challenges and to convert knowledge and ideas into products and services for economic and social benefit. Light Emitting Diodes (LEDs) are driving a revolution in lighting systems (superior energy efficiency), and are already entering the Internet of Things (IoT) market with embedded sensory functionalities. By bringing connectivity to every LED bulb, Visible Light Communication (VLC) offers the opportunity to write the next chapter of the LED revolution with the language of ubiquitous networks VLC systems for the IoT to design and demonstrate sustainable networking solutions. ENLIGHT'EM will train a new generation of innovators and provide them with the know-how to contribute to the development of the IoT in the world of 5G and beyond.

More info

ECID

Edge Computing for Intelligent Driving

Funded by: Spanish Ministry of Science and Innovation MICINN (2019 Call «Proyectos I+D+i», modality «Retos Investigación»)

Duration: June 2020 to May 2023.

Assisted driving encompasses a number of technical challenges, from requiring connectivity with ultra-high reliability and imperceptible delays, and disposing of powerful and flexible (migrable) storage and computing engines for coordinated and distributed road traffic control, to imposing legal privacy-preserving attributes and the possibility of logging traffic events and assisted driving decisions in an auditable way (for instance, in case of legal disputes upon traffic accidents). Considering the complexity of making assisted driving control decisions for several coordinated players, and the need to actuate them at sub-second timescales, ECID proposes to leverage on edge/cloud computing and artificial intelligence spread and federated in the context of wireless access network infrastructures, and will develop decentralized and secure architectures of distributed ledgers (offer the capability of logging events and the responsibility of actions in a trustworthy way and with minimum risk of malicious tampering).

More info

ODIO

The Open Digital Identity Observatory

Funded by: Spanish Ministry of Science and Innovation MICINN (2019 Call «Proyectos I+D+i», modality «Retos Investigación»)
Duration: June 2020 to May 2023.

The ODIO coordinated project aims at addressing the challenge posed by the widespread access, dissemination and abuse of users' personal attributes and behavioral data in Internet services. The risks of such practices go beyond privacy issues and include identity theft, discrimination, fraud, extortion, and manipulation. The MOOSE subproject focuses on assessing the privacy and security risks associated to the use and abuse of end-users' digital identity in the web and mobile devices. The project aims to develop transparency tools to perform a multi-dimensional characterization of the online tracking industry present in these services, and the dynamics and relationships between companies for the creation and dissemination of user profiles and identities for advertising purposes and data brokerage.
More info

COMODIN-CM

COVID-19 Monitoring via Data-Intensive Analysis

Funded by: Regional Government of Madrid. Funded by FEDER –REACT-UE
Duration: February 2020 to December 2022

In this project we propose the intensive use of data in order to monitor the evolution of the COVID-19 pandemic over the world. The biggest challenge of the project is to have reliable data. For that reason, it is very important to collect data from multiple sources, so that they complement each other. In addition to open repositories available to everyone, in this project we will have access to extensive global data from several sources (surveys promoted by Facebook, mobile traffic data, etc.). Finally, we will generate our own data in the project via anonymous surveys with indirect reporting in a new and scalable way.

Having this collection of heterogeneous data, we will devise methods to estimate the most important pandemic parameters, like the evolution in the number of cases, or the future need of hospital beds. Among these techniques we will propose completely new methods of using the indirect reporting data we will generate via surveys, advancing the state of the art of the, so-called, Network Scale-up Method, since this method never considered indirect reporting being collected over time and at different geographical scales as we do.

Beyond the data-centric techniques that will be proposed in the project to monitor the pandemic, as part of this project we want to identify important social and behavioral aspects that were unveiled by the pandemic. These include how we as individuals and

the whole society have changed during the pandemic, and how much of that change will stay when it is finished. It is important to understand these aspects because they will be influential in the future of our society, and in the presence of a future global crisis. More info

CONTACT-CM

Contact Tracing with 5G and Beyond Networks
Funded by: Regional Government of Madrid. Funded by FEDER –REACT-UE
Duration: February 2020 to December 2022

The COVID-19 pandemic vastly amplified the need for scalable technological solutions that can provide location-based analytics to trace people and their contacts in a privacy preserving manner. Several countries have adopted proximity-based technologies based on Bluetooth Low Energy, which, however, are hindered by deployment issues, data leakages, lack of reliability and limited analytics capabilities. CONTACT-CM posits that 5G and beyond cellular networks can play a primary role in contact tracing. Solutions based on 5G and beyond location-based analytics benefit from the pervasive deployment and increasing computing power of cellular networks, the many years of effort designing comprehensive cellular standards for localization and analytics, the ongoing integration of multiple technologies in the incoming releases, and the well-established best practices and prior experience of cellular operators to handle and protect large volumes of sensitive data. Leveraging these factors, CONTACT-CM will investigate all the core research areas related to localization, privacy and analytics to enable 5G and beyond-based contact tracing. The primary objective is to demonstrate with an experimental platform that 5G and beyond cellular networks can play a pivotal role for contact tracing during a pandemic. The team of CONTACT-CM has substantial international experience in the core topics of the proposal, guaranteeing a smooth start and successful execution of the project. The short-term impact of CONTACT-CM will be an experimental system for pervasive, accurate and privacy-preserving contact-tracing analytics that can become part of the current roll out of 5G and beyond networks and help counteract the ongoing COVID-19 pandemic. More info

EDGEDATA-CM

An infrastructure for highly decentralized hybrid systems

Funded by: Department of Education and Research of the Regional Government of Madrid, through the 2018 R&D technology program for research groups, co-financed by the Operational Programs of the European Social Fund (ESF) and the European Regional Development Fund (ERDF).

Duration: January 2019 to December 2022

Innovation technologies, cloud computing, IoT, big data and high speed WIFI networks have made possible applications that were inconceivable few decades ago. As a result, the quality of life is improving and better commercial decisions are taken thanks to data analysis. In recent years, as a result of the innovation and new needs there was a boom in distributed systems applied to different contexts such as IoT that has led to new computational paradigms (fog computing, edge computing, cloud computing, blockchain…). Its main goal is to go beyond the state of the art in terms of new architectures for these technologies as well as to propose hybrid solutions combining them.

More info

TAPIR-CM

Advanced techniques to enhance the intelligence of 5G networks

Funded by: Department of Education and Research of the Regional Government of Madrid, through the 2018 R&D technology program for research groups, co-financed by the Operational Programs of the European Social Fund (ESF) and the European Regional Development Fund (ERDF)

Duration: January 2019 to December 2022

Its aim is to design architectural solutions for 5th generation (5G) and beyond mobile networks. To this end, the project will leverage as enablers SDN (Software Defined Networking) and network functions virtualization (NFV) to boost the transformation of current networks into software-centric paradigm, enabling flexibility and agility in the whole system lifecycle. The evolution of the SDN architecture itself enables high scalability and programmability and, therefore, it is an important objective of the project. The second enabler component will resort to is machine learning. The capability to forecast with high accuracy the behavior and characteristics of data traffic that mobile users will consume through machine learning techniques is pillar to improve the performance of multiple of network functions, including scheduling, mobility management, orchestration and resource allocation, among the others.

More info

LOCUS

LOCalization and analytics on-demand embedded in the 5G ecosystem, for Ubiquitous vertical applicationS

Funded by: European Union H2020-ICT-2018-2020 (Information and Communication Technology) Grant.

Duration: November 2019 to October 2022

Context-awareness is essential for many existing and emerging applications. Context information greatly relies on location information of people and things. But navigation satellite systems are denied in indoor environments, current cellular systems fail to provide high-accuracy localization, other local localization technologies (e.g. WI-FI or BT) imply high deployment/maintenance/integration costs. Raw spatiotemporal data are not sufficient by themselves and need to be integrated with tools for the analysis of the behaviour of physical targets, to extract relevant feature of interests. LOCUS will improve the functionality of 5G infrastructures to: i) provide accurate and ubiquitous location information as a network-native service and ii) derive more complex features and behavioural patterns out of raw location and physical events, and expose them to applications via simple interfaces.

More info

PIMCITY

Building the next generation personal data platforms

Funded by: European Union H2020-ICT-2018-2020 (Tecnología de la información y la comunicación).

Duration: December 2019 to August 2022.

Web economy has been revolutionized by unprecedented possibility of collecting massive amounts of user personal data, which lead the web to become the largest data market and created the biggest companies in our history.

Unfortunately, this change has deep consequences for users, who, deprived of any negotiation power, are compelled to blindly provide their data for free access to services. Data collection is opaque, fragmented and disharmonic, so that users have no control over their personal data, and, thus, on their privacy. Personal Information Management Systems (PIMS) aim to give users back control over their data, while creating transparency in the market. However, so far, they have failed to reach business maturity and sizeable user bases. PIMCity offers tools to change this scenario.

More info

scientific activities

5

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IMDEA Networks Institute monitors and evaluates its scientific results in order to obtain a sound appraisal of the degree of fulfillment of its strategy and objectives, optimizing the management of its resources and maximizing its impact. The pursuit of excellence is at the core of all of our activities.

5.1. Awards

5.1.1. Paper Awards

BEST STUDENT PAPER AWARD
IEEE Conference on Network Function Virtualization and Software Defined Networks (November 2022)
Andrea Pinto, Giuseppe Santaromita, Claudio Fiandrino, Domenico Giustiniano, Flavio Esposito
Characterizing Location Management Function Performance in 5G Core Networks

BEST PAPER AWARD
ACM Workshop on Wireless Network Testbeds, Experimental evaluation & Characterization 2022 (ACM WINTECH 2022) (October 2022)
Francesco Gringoli, Marco Cominelli, Alejandro Blanco, Joerg Widmer
AX-CSI: Enabling CSI extraction on commercial 802.11ax Wi-Fi platforms'

MARIO GERLA BEST PAPER AWARD
MedComNet 2022 (June 2022)
J. M. Ramirez, P. Rojo, F. Díez Muñoz, V. Mancuso, A. Fernández Anta
Cleaning Maters! Preprocessing-Enhanced Anomaly Detection and Classification in Mobile Networks

BEST STUDENT PRESENTATION AWARD
IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks (WOWMOM 2022) (June 2022)

Nina Grosheva, Hany Assasa, Tanguy Ropitault, Pablo Jimenez Mateo, Joerg Widmer, Nada Golmie
A Comprehensive Analysis and Performance Enhancements for the IEEE 802.11ay Group Beamforming Protocol

CNIL-INRIA PRIVACY PROTECTION AWARD 2022
(USENIX Security 2019)
Joel Reardon, Álvaro Feal, Primal Wijesekera, Amit Elazari Bar On, Narseo Vallina-Rodríguez, Serge Egelman
50 Ways to Leak Your Data: An Exploration of Apps' Circumvention of the Android Permissions System

5.1.2. Researcher Awards

INTEL CONNECTIVITY RESEARCH PROGRAM'S (ICRP) FAST FORWARD INITIATIVE (FFI) 2022
Marco Fiore, Michele Gucciardo (December 2022)
This grant is designed to help researchers by expanding the number of P4-programmable devices in their labs.

ACM SENIOR MEMBER
Narseo Vallina Rodríguez (February 2022)
IMDEA Networks' Research Associate Professor has demonstrated performance through technical leadership. In addition, this distinction recognizes outstanding technical and professional contributions.

5.1.3. R&D Awards

1ST PRIZE OF THE EIT JUMPSTARTER AWARD

Dayrene Frómeta, Javier Talavante, Domenico Giustiniano, Borja Genovés (November 2022)

An IMDEA Networks research team has won first prize in the food category of the competitive European EIT Jumpstarter program for its business idea LiFi4Food, which seeks to provide solutions for digital and precision agriculture. The prize valued at €10,000 is earmarked for the creation of this revolutionary startup. LiFi4Food offers an integrated, innovative, and sustainable communication system formed by self-sustainable and battery-free IoT (Internet of Things) devices to monitor and control environmental parameters in high-tech agri-food facilities such as vertical farms and greenhouses. It takes advantage of the LED lamps already installed in such sites to deploy a LiFi network that supplies the battery-free sensors (equipped with solar cells) with both power and data.

IEEE EURO S&P 2022 DISTINGUISHED REVIEWERS AWARD

Guillermo Suárez-Tangil (June 2022)

IEEE EUROPEAN SYMPOSIUM ON SECURITY AND PRIVACY 2022

This award is a recognition given to the most committed reviewers among the 2022 TPC for the quality and timelines of the reviews delivered by the researcher and the engagement in the discussions before, during and after the PC meeting.

DISTINGUISHED TPC MEMBER AWARD AT IEEE INFOCOM 2022

Domenico Giustiniano, Sergey Gorinsky (January 2022)

IEEE INFOCOM 2022

Domenico Giustiniano and Sergey Gorinsky, Research Associate Professors at IMDEA Networks, are among a select few of the TPC members whom the TPC chairs awarded as Distinguished Members of the committee. The TPC chairs recognized the Distinguished Members based upon ratings by peer TPC members, fairness in review scores, and promptness in meeting various deadlines during the review process.

5.2. Publications

IMDEA Networks presented its scientific work in various formats and venues during 2022. There were 100 publications, out of which 86 were peer reviewed. This is how they are structured:

1 Book | 27 Journal Articles | 2 Magazine Articles | 49 Conference and Workshop Papers | 7 Conference and Workshop Posters & Demos | 4 Invited Papers, Keynotes, Invited Talks, Tutorials, Lectures, etc.

As well as the previous there were:

9 PhD Theses

According to **Google Scholar**, IMDEA Networks' researchers have received around **104.856 citations in total** along their research career, which corresponds to an **aggregated H-index of 137**.

publications

number of publications (peer-reviewed)

Year	Value
2006	8
2007	16
2008	11
2009	37
2010	45
2011	70
2012	76
2013	95
2014	79
2015	111
2016	99
2017	123
2018	115
2019	94
2020	87
2021	91
2022	86

all publications by type

Technical Reports 3

Books 12

Book Chapters 24

Standardization Contributions 35

Theses 108

Journal Articles 393

Invited Papers, keynotes, Invited Talks, Tutorials, Lectures, etc 231

Magazine Articles 53

Conference and Workshop Poster & Demos 74

Conference and Workshop Papers 685

2022

total number of publications per month

Total = 100
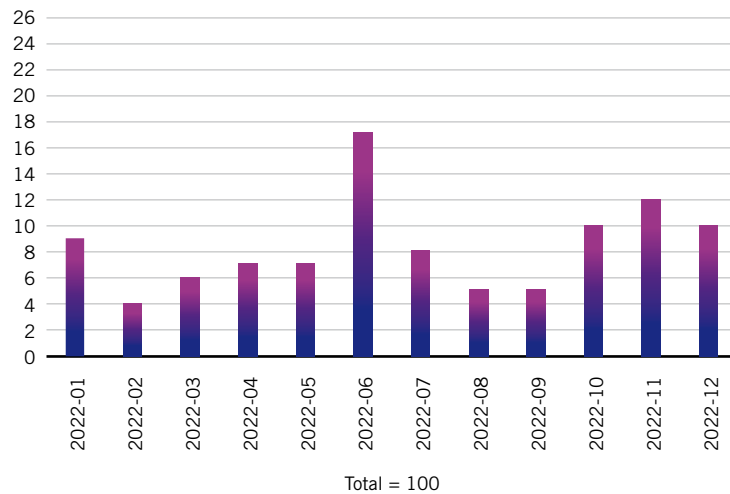
publications by type (peer reviewed)

Conference and Workshop Poster & Demos
7

Books
1

Book Chapters
0

Journal Articles
27

Conference and Workshop Papers
49

Magazine Articles
2

Total = 86
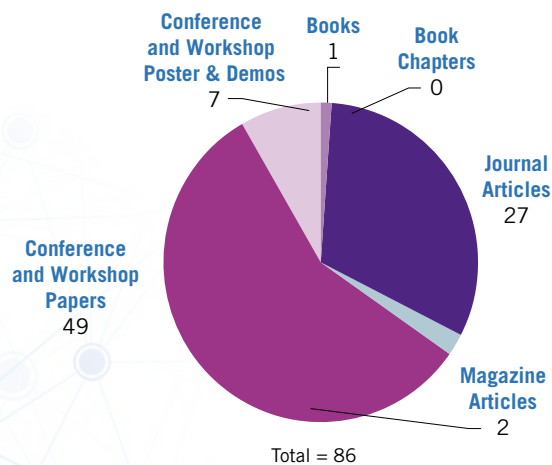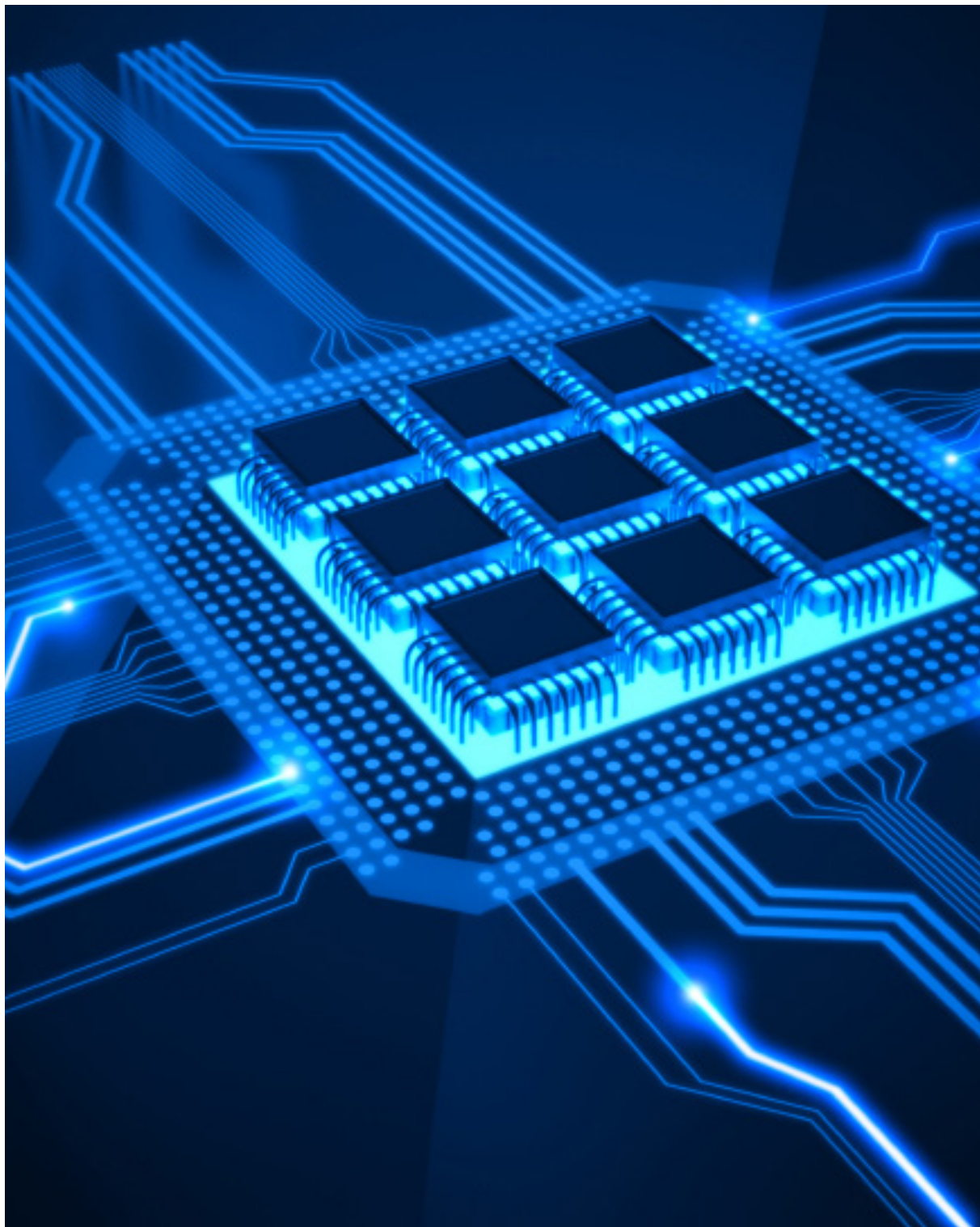
Publications 2022

Books [1]

1. Antonio Fernandez Anta (November 2022)

Stabilization, Safety, and Security of Distributed Systems - 24th International Symposium, SSS 2022, Clermont-Ferrand, France, November 15-17, 2022, Proceedings
Volume 13751, Springer Nature. ISBN: 9783031210174.

Journal Articles [27]

1. Héctor D. Menéndez, Guillermo Suarez-Tangil (December 2022)

ObfSec: Measuring the Security of Obfuscations from a Testing Perspective
Expert Systems with Applications.

2. Giulia Attanasio, Claudio Fiandrino, Marco Fiore, Joerg Widmer, Norbert Ludant, Bastian Bloessl, Konstantinos Kousias, Ozgu Alay, Lise Jacquot, Razvan Stanica (December 2022)

In-depth Study of RNTI Management in Mobile Networks: Allocation Strategies and Implications on Data Trace Analysis
Computer Networks.

3. Luis Morales, Frank Ruiz, Christian Moreno, Jose Aguilar (December 2022)

Performance analysis of the LAMDA fuzzy algorithm improvements in different case studies
Soft Computing. 10.1007/s00500-022-07665-w. Springer.

4. Javier Carrillo-Mondejar, Hannu Turtiainen, Andrei Costin, Jose Luis Mart, Guillermo Suarez-Tangil (November 2022)

HALE-IoT: HArdening LEgacy Internet-of-Things devices by retrofitting defensive firmware modifications and implants
IEEE Internet of Things Journal.

5. Constantine Ayimba, Michele Segata, Paolo Casari, Vincenzo Mancuso (October 2022)

Driving Under Influence: Robust controller migration for MEC-enabled platooning
Computer Communications. 10.1016/j.comcom.2022.07.014. Volume 194, Elsevier. ISSN: 0140-3664.

6. Hui Zhao, Antonio Bazco-Nogueras, Petros Elia (October 2022)

Vector Coded Caching Multiplicatively Increases the Throughput of Realistic Downlink Systems
IEEE Transactions on Wireless Communications. IEEE.

7. Santiago Andrés, Nikolaos Laoutaris (October 2022)

A Survey of Data Marketplaces and Their Business Models
SIGMOD Record. Volume 51, ACM.

8. Chuanhao Sun, Kai Xu, Marco Fiore, Mahesh Marina, Yue Wang, Cezary Ziemlicki (August 2022)

AppShot: A Conditional Deep Generative Model for Synthesizing Service-Level Mobile Traffic Snapshots at City Scale
IEEE Transactions on Network and Service Management. 10.1109/TNSM.2022.3199458. IEEE. ISSN: 1932-4537.

9. Francesco Spinelli, Antonio Bazco-Nogueras, Vincenzo Mancuso (August 2022)

Edge Gaming: a Greening Perspective
Computer Communications. https://doi.org/10.1016/j.comcom.2022.05.022. Volume 192, ISSN: 0140-3664.

10. Stefanos Bakirtzis, Kehai Qiu, Ian Wassell, Marco Fiore, Jie Zhang (July 2022)

Deep Learning-based Multivariate Time Series Classification for Indoor/Outdoor Detection
IEEE Internet of Things Journal. 10.1109/JIOT.2022.3190555. ISSN: 2327-4662.

11. **Mohamed Lamine Moulay, Rafael García, Pablo Rojo, Fernando Díez, Vincenzo Mancuso, Antonio Fernández Anta (July 2022)**
Automated Identification of Network Anomalies and Their Causes with Interpretable Machine Learning: the CIAN Methodology and TTrees Implementation
Computer Communications. Elsevier.

12. **Nikhil Jha, Martino Trevisan, Luca Vassio, Marco Mellia, Stefano Traverso, Álvaro García-Recuero, Nikolaos Laoutaris, Santiago Andrés, Amir Mehrjoo, Amir Reza Mehrjoo, Rubén Cuevas, Kleomenis Katevas, Panagiotis Papadopoulos, Nicolas Kourtellis, Roberto González, Xavi Olivares, George-Marios Kaltzantonakis-Jullien (June 2022)**
A PIMS Development Kit for New Personal Data Platforms
IEEE Internet Computing. 10.1109/MIC.2022.3157356. Volume 26, IEEE.

13. **Claudio Fiandrino, Giulia Attanasio, Marco Fiore, Joerg Widmer (June 2022)**
Toward Native Explainable and Robust AI in 6G Networks: Current State, Challenges and Road Ahead
Computer Communications. https://doi.org/10.1016/j.comcom.2022.06.036. Elsevier.

14. **Marius Paraschiv, Ricardo Padrino, Paolo Casari, Eyal Bigal, Aviad Scheinin, Dan Tchernov, Antonio Fernández Anta (May 2022)**
Classification of Underwater Fish Images and Videos via Very Small Convolutional Neural Networks
Journal of Marine Science and Engineering. https://doi.org/10.3390/jmse10060736. Volume 10, MDPI. ISSN: 2077-1312.

15. **Antonio Albanese, Vincenzo Sciancalepore, Albert Banchs, Xavier Costa-Perez (April 2022)**
LOKO: Localization-aware Roll-out Planning for Future Mobile Networks
IEEE Transactions on Mobile Computing. 10.1109/TMC.2022.3168076.

16. **Vishnu Narayanan Moothedath, Jaya Prakash Varma Champati, James Gross (April 2022)**
Energy Efficient Sampling Policies for Edge Computing Feedback Systems
IEEE Transactions on Mobile Computing. 10.1109/TMC.2022.3165852. IEEE.

17. **Samuele Zoppi, Jaya Prakash Champati, James Gross, Wolfgang Kellerer (March 2022)**
Scheduling of Wireless Edge Networks for Feedback-Based Interactive Applications
IEEE Transactions on Communications. 10.1109/TCOMM.2022.3163761.

18. **Jaya Prakash Champati, Mikael Skoglund, Magnus Jansson, James Gross (March 2022)**
Detecting State Transitions of a Markov Source: Sampling Frequency and Age Trade-off
IEEE Transactions on Communications. 10.1109/TCOMM.2022.3160563. IEEE. ISSN: 1558-0857.

19. **Alexis Dowhuszko, Borja Genovés Guzmán (March 2022)**
Closed form approximation of the actual spectral power emission of commercial color LEDs for VLC
Journal of Lightwave Technology. 10.1109/JLT.2022.3158188.

20. **Ramón Pérez, Priscilla Benedetti, Matteo Pergolesi, Jaime García-Reinoso, Aitor Zabala, Pablo Serrano, Mauro Femminella, Gianluca Reali, Kris Steenhaut, Albert Banchs (February 2022)**
Monitoring Platform Evolution towards Serverless Computing for 5G and Beyond Systems
IEEE Transactions on Network and Service Management. IEEE.

21. **Juan Echagüe, Vicent Cholvi, Antonio Fernández Anta (February 2022)**
Factors affecting congestion-aware routing in complex networks
Physica A: Statistical Mechanics and its Applications. https://doi.org/10.1016/j.physa.2021.126483. Volume 587, pp. 126483, Elsevier. ISSN: 0378-4371.

22. Jorge Ortin, Pablo Serrano, Jaime García-Reinoso, Albert Banchs (January 2022)
Analysis of scaling policies for NFV providing 5G/6G reliability levels with fallible servers
IEEE Transactions on Network and Service Management. IEEE.

23. Hui Zhao, Antonio Bazco-Nogueras, Petros Elia (January 2022)
Wireless coded caching can overcome the worst-user bottleneck by exploiting finite file sizes
IEEE Transactions on Wireless Communications. IEEE.

24. Javier Carrillo-Modejar, Jose Luis Martinez, Guillermo Suarez-Tangil (January 2022)
On how VoIP attacks foster the malicious call ecosystem
Computers & Security. 10.1016/j. cose.2022.102758.

25. Christian Quadri, Vincenzo Mancuso, Marco Ajmone Marsan, Gian Paolo Rossi (January 2022)
Edge-based Platoon Control
Computer Communications. 10.1016/j.comcom.2021.09.021. Volume 181, Elsevier. ISSN: 0140-3664.

26. Antonio Bazco-Nogueras, Paul De Kerret, David Gesbert, Nicolas Gresset (January 2022)
Asymptotically achieving centralized rate on the decentralized Network MISO Channel
IEEE Transactions on Information Theory. 10.1109/TIT.2021.3121752. Volume 68, IEEE. ISSN: 1557-9654.

27. Mohammed Rashed, Guillermo Suarez-Tangil (January 2022)
An Analysis of Android Malware Classification Services
Sensors.

Magazine Articles [2]

1. Falko Dressler, Carla Fabiana Chiasserini, F.H.P. Fitzek, Karl Holger, Renato Lo Cigno, Antonio Capone, Claudio Casetti, Francesco Malandrino, Vincenzo Mancuso, Florian Klingler, Gianluca Rizzo (May 2022)
V-Edge: Virtual Edge Computing as an Enabler for Novel Microservices and Cooperative Computing
IEEE Network. Volume 36.

2. Jesus Omar Lacruz, Rafael Ruiz, Joerg Widmer (March 2022)
MIMORPH: A General-Purpose Experimentation Platform for sub-6 GHz and mmWave Frequency Bands
GetMobile: Mobile Computers and Communications. https://doi.org/10.1145/3539668.3539670. Volume 26, ACM SIGMOBILE.

Conference or Workshop Papers [49]

1. Aristide Tanyi Jong Akem, Beyza Bütün, Michele Gucciardo, Marco Fiore (December 2022)
Henna: hierarchical machine learning inference in programmable switches
International Workshop on Native Network Intelligence. Rome, Italy.

2. Yassin Alkhalili, Thomas Gruczyk, Tobias Meuser, Antonio Fernández Anta, Ahmad Khalil, Andreas Mauthe (December 2022)
Content-Aware Adaptive Point Cloud Delivery
IEEE International Conference on Multimedia Big Data. Naples, Italy. December 2022

3. Domenico Scotece, Claudio Fiandrino, Luca Foschini (December 2022)
A Practical way to Handle Service Migration of ML-based Applications in Industrial Analytics
IEEE Global Communications Conference. Rio de Janeiro, Brazil.

4. Miguel Camelo, Marco Gramaglia, Paola Soto, Lidia Fuentes, Joaquín Ballestreros, Antonio Bazco-Nogueras, Ginés García, Steven Latré, Andres Garcia-Saavedra, Marco Fiore (December 2022)

DAEMON: A Network Intelligence Plane for 6G Networks

The 2nd Workshop on Architectural Evolution toward 6G Networks (6GArch).

5. Stefanos Bakirtzis, Ian Wassell, Marco Fiore, Jie Zhang (December 2022)

Stochastic Evaluation of Indoor Wireless Network Performance with Data-Driven Propagation Models

IEEE Global Telecommunications Conference. Rio de Janeiro, Brazil.

6. Stavros Eleftherakis, Giuseppe Santaromita, Maurizio Rea, Timothy Otim, Domenico Giustiniano (December 2022)

Covid-19 Contact Tracing through Multipath Profile Similarity

ACM International Conference on Emerging Networking Experiments and Technologies. Rome, Italy.

7. Aniketh Girish, Vijay Prakash, Serge Egelman, Joel Reardon, Juan Tapiador, Danny Yuxing Huang, Srdjan Matic, Narseo Vallina-Rodríguez (December 2022)

Challenges in inferring privacy properties of smart devices: Towards scalable multi-vantage point testing methods

ACM International Conference on Emerging Networking Experiments and Technologies. Rome, Italy.

8. Santiago Andrés, Costas Iordanou, Nikolaos Laoutaris (November 2022)

Measuring the Price of Data in Commercial Data Marketplaces

ACM Data Economy Workshop. Rome, Italy.

9. Santiago Andrés, Nikolaos Laoutaris (November 2022)

Try Before You Buy: a Practical Data Purchasing Algorithm for Real-World Data Marketplaces

ACM Data Economy Workshop. Rome, Italy.

10. Andrea Pinto, Giuseppe Santaromita, Claudio Fiandrino, Domenico Giustiniano, Flavio Esposito (November 2022)

Characterizing Location Management Function Performance in 5G Core Networks

IEEE Conference on Network Function Virtualization and Software Defined Networks.

11. Elisa Cabana, Andra Lutu, Enrique Frias-Martinez, Nikolaos Laoutaris (November 2022)

Using mobile network data to color epidemic risk maps

ACM International Conference on Advances in Geographic Information Systems. Seattle, Washington, USA.

12. Elisa Cabana, Andra Lutu, Enrique Frias-Martinez, Nikolaos Laoutaris (November 2022)

Improving Epidemic Risk Maps Using Mobility Information from Mobile Network Data

ACM International Conference on Advances in Geographic Information Systems. Seattle, Washington, USA.

13. Arun Dunna, Katherine Keith, Ethan Zuckerman, Narseo Vallina-Rodríguez, Brendan O'Connor, Rishab Nithyanand (November 2022)

Paying Attention to the Algorithm Behind the Curtain. Bringing Transparency to YouTube's Demonetization Algorithms

ACM Conference on Computer Supported Cooperative Work. Online Event.

14. Santiago Andrés, Marius Paraschiv, Nikolaos Laoutaris (November 2022)

Computing the Relative Value of Spatio-Temporal Data in Data Marketplaces

ACM International Conference on Advances in Geographic Information Systems. Seattle, Washington, USA.

15. Orlando E. Martínez-Durive, Theo Couturieux, Cezary Ziemlicki, Marco Fiore (October 2022)

VoronoiBoost: Data-driven Probabilistic Spatial Mapping of Mobile Network Metadata

IEEE International Conference on Sensing, Communication and Networking. Virtual.

16. Andrea Fresa, Jaya Prakash Champati (October 2022)

An Offloading Algorithm for Maximizing Inference Accuracy on Edge Device in an Edge Intelligence System

ACM/IEEE International Conference on Modelling, Analysis and Simulation of Wireless and Mobile Systems. Montreal, Canada.

17. Amogh Pradeep, Muhammad Talha Paracha, Protick Bhowmick, Ali Davanian, Razaghpanah Abbas, Taejoong Chung, Martina Lindorfer, Narseo Vallina-Rodríguez, Dave Levin, David Choffnes (October 2022)

A Comparative Analysis of Certificate Pinning in Android & iOS

Internet Measurement Conference. Nice, France.

18. Jide Edu, Cliona Mulligan, Fabio Pierazzi, Jason Polakis, Guillermo Suarez-Tangil, Jose Such (October 2022)

Exploring the Security and Privacy Risks of Chatbots in Messaging Services

Internet Measurement Conference. Nice, France.

19. Claudio Fiandrino, David Juarez Martinez-Villanueva, Joerg Widmer (October 2022)

Uncovering 5G Performance on Public Transit Systems with an App-based Measurement Study

ACM/IEEE International Conference on Modelling, Analysis and Simulation of Wireless and Mobile Systems. Montreal, Canada.

20. Livia Elena Chatzieleftheriou, Iordanis Koutsopoulos (September 2022)

Jointly Learning Optimal Task Offloading and Scheduling Policies for Mobile Edge Computing

International Symposium on Modeling and Optimization in Mobile, Ad hoc, and Wireless Networks (Wiopt 2022) Workshop on Resource Allocation and Cooperation in Wireless Networks (RAWNET 2022). Turin, Italy.

21. Livia Elena Chatzieleftheriou, Chen-Feng Liu, Iordanis Koutsopoulos, Mehdi Bennis, Merouane Debbah (September 2022)

Online Learning for Industrial IoT: The Online Convex Optimization Perspective

Mediterranean Conference on Communications and Networking. Athens, Greece.

22. Margarita Capretto, Martín Ceresa, Antonio Fernández Anta, Antonio Russo, César Sánchez (August 2022)

Setchain: Improving Blockchain Scalability with Byzantine Distributed Sets and Barriers

IEEE International Conference on Blockchain. Espoo, Finland.

23. Constantine Ayimba, Vincenzo Sciancalepore, Paolo Casari, Vincenzo Mancuso (August 2022)

I move U move: V2X-enabled wireless towing

AI6G 2022: First International Workshop on Artificial Intelligence in Beyond 5G and 6G Wireless Networks. Padova, Italy.

24. Jesús Rufino, Carlos Baquero, Davide Frey, Christin Glorioso, Antonio Ortega, Nina Reš i , Julian C Roberts, Rosa Elvira Lillo, Raquel Menezes, Jaya Prakash Champati, Antonio Fernández Anta (August 2022)

Using Survey Data to Estimate the Impact of the Omicron Variant on Vaccine Efficacy against COVID-19 Infection

epiDAMIK 5.0: The 5th International workshop on Epidemiology meets Data Mining and Knowledge discovery. Washington DC, USA.

25. Michal Tereszkowski-Kaminski, Sergio Pastrana, Jorge Blasco, Guillermo Suarez-Tangil (July 2022)

Towards Improving Code Stylometry Analysis in Underground Forums

Proceedings on Privacy Enhancing Technologies (PETS). Sydney, Australia.

26. Hui Zhao, Antonio Bazco-Nogueras, Petros Elia (July 2022)

Vector Coded Caching Greatly Enhances Massive MIMO

IEEE International Workshop on Signal Processing Advances in Wireless Communications (SPAWC). Oulu, Finland.

27. Mary Bispham, Clara Zard, Suliman Sattar, Xavier Ferrer-Aran, Guillermo Suarez-Tangil, Jose Such (July 2022)

Leakage of Sensitive Information to Third-Party Voice Applications

Conversational User Interfaces (CUI). Glasgow, UK.

28. Alejandro Blanco, Pablo Jiménez Mateo, Francesco Gringoli, Joerg Widmer (July 2022)

Augmenting mmWave Localization Accuracy Through Sub-6 GHz on Off-the-Shelf Devices

ACM SIGMOBILE International Conference on Mobile Systems, Applications and Services. Portland, Oregon, USA.

29. Sergi Alcalá-Marín, Aravindh Raman, Weili Wu, Andra Lutu, Marcelo Bagnulo, Ozgu Alay, Fabián Bustamante (June 2022)

Global Mobile Network Aggregators: Taxonomy, Roaming Performance and Optimization

ACM SIGMOBILE International Conference on Mobile Systems, Applications and Services. Portland, OR, USA.

30. Marius Paraschiv, Nikolaos Laoutaris, Nikos Salamanos, Costas Iordanou, Michael Sirivianos (June 2022)

A Unified Graph-Based Approach to Disinformation Detection using Contextual and Semantic Relations

International AAAI Conference on Web and Social Media (ICWSM). Atlanta, Georgia, USA.

31. Vincenzo Mancuso, Paolo Castagno, Matteo Sereno, Marco Ajmone Marsan (June 2022)

Stateful Versus Stateless Selection of Edge or Cloud Servers Under Latency Constraints

IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks. Belfast, UK.

32. Leonardo Lo Schiavo, Marco Fiore, Marco Gramaglia, Albert Banchs, Xavier Costa-Perez (June 2022)

Forecasting for Network Management with Joint Statistical Modelling and Machine Learning

10.1109/WoWMoM54355.2022.00028. IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks. Belfast, UK.

33. Francesco Spinelli, Vincenzo Mancuso (June 2022)

A Migration Path Toward Green Edge Gaming

IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks. Belfast, UK.

34. Michalis Pachilakis, Panagiotis Papadopoulos, Nikolaos Laoutaris, Evangelos Markatos, Nicolas Kourtellis (June 2022)

YourAdvalue: Measuring Advertising Price Dynamics without Bankrupting User Privacy

Measurement and Modeling of Computer Systems. Mumbai, India.

35. Juan Marcos Ramirez, Fernando Díez, Pablo Rojo, Vincenzo Mancuso, Antonio Fernández Anta (June 2022)

Cleaning Matters! Preprocessing-enhanced Anomaly Detection and Classification in Mobile Networks

Mediterranean Communication and Computer Networking Conference (MedComNet 2022). Paphos, Cyprus.

36. Matthias Götze, Srdjan Matic, Costas Iordanou, Georgios Smaragdakis, Nikolaos Laoutaris (June 2022)

Measuring Web Cookies in Governmental Websites
ACM WebSci. Barcelona, Spain.

37. Jacopo Pegoraro, Jesus Omar Lacruz, Michele Rossi, Joerg Widmer (May 2022)

SPARCS: A Sparse Recovery Approach for Integrated Communication and Human Sensing in mmWave Systems
Information Processing in Sensor Networks. Milan, Italy.

38. Alan Collet, Albert Banchs, Marco Fiore (May 2022)

LossLeaP: Learning to Predict for Intent-Based Networking
IEEE International Conference on Computer Communications. Virtual.

39. André Zanella, Orlando E. Martínez-Durive, Sachit Mishra, Zbigniew Smoreda, Marco Fiore (May 2022)

Impact of Later-Stages COVID-19 Response Measures on Spatiotemporal Mobile Service Usage
IEEE International Conference on Computer Communications. Virtual.

40. Hui Zhao, Antonio Bazco-Nogueras, Petros Elia (May 2022)

Coded Caching in Land Mobile Satellite Systems
IEEE International Conference on Communications. Seoul, South Korea.

41. Ahmad Khalil, Tobias Meuser, Yassin Alkhalili, Antonio Fernández Anta, Lukas Staecker, Ralf Steinmetz (April 2022)

Situational Collective Perception: Adaptive and Efficient Collective Perception in Future Vehicular Systems
International Conference on Vehicle Technology and Intelligent Transport Systems. Online.

42. Sachit Mishra, Zbigniew Smoreda, Marco Fiore (April 2022)

Second-level Digital Divide: a Longitudinal Study of Mobile Traffic Consumption Imbalance in France
https://doi.org/10.1145/3485447.3512125. International World Wide Web Conference. Lyon, France.

43. Jide Edu, Xavier Ferrer-Aran, Jose Such, Guillermo Suarez-Tangil (April 2022)

Measuring Alexa Skill Privacy Practices across Three Years
International World Wide Web Conference.

44. Francesco Gringoli, Marco Cominelli, Alejandro Blanco, Joerg Widmer (April 2022)

AX-CSI: Enabling CSI extraction on commercial 802.11ax Wi-Fi platforms
ACM Workshop on Wireless Network Testbeds, Experimental evaluation & CHaracterization (ACM WiNTECH), held in conjunction with ACM MobiCom. New Orleans, United States.

45. Muhammad Sarmad Shahab Mir, Behnaz Majlesein, Borja Genovés Guzmán, Julio Rufo, Domenico Giustiniano (March 2022)

RGB LED bulbs for communication, harvesting and sensing
IEEE International Conference on Pervasive Computing and Communications. Pisa, Italy.

46. Kai Xu, Rajkarn Singh, Hakan Bilen, Marco Fiore, Mahesh Marina, Yue Wang (March 2022)

CartaGenie: Context-Driven Synthesis of City-Scale Mobile Network Traffic Snapshots
IEEE International Conference on Pervasive Computing and Communications. Pisa, Italy.

47. Imran Khan, Moinak Ghoshal, Shivang Aggarwal, Dimitrios Koutsonikolas, Joerg Widmer (February 2022)

Multipath TCP in smartphones equipped with millimeter wave radios
ACM International Workshop on Wireless Network Testbeds, Experimental evaluation & CHaracterization (WiNTECH), co-located with MobiCom 2021. New Orleans, United States.

48. Arani Bhattacharya, Maji Abhishek, Jaya Prakash Champati, James Gross (January 2022)
Fast and Efficient Online Selection of Sensors for Transmitter Localization
International Conference on COMmunication Systems & NETworkS.

49. Nina Grosheva, Hany Assasa, Tanguy Ropitault, Pablo Jiménez Mateo, Joerg Widmer, Nada Golmie (January 2022)
A Comprehensive Analysis and Performance Enhancements for the IEEE 802.11ay Group Beamforming Protocol
IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks. Belfast, UK.

Conference and Workshop Posters & Demos [7]

1. Iqbal Waleed, Gareth Tyson, Vahid Ghafouri, Guillermo Suarez-Tangil, Ignacio Castro (November 2022)
Exploring Online Manifestations of Real-World Inequalities (Poster)
Internet Measurement Conference. Nice, France.

2. Andrea Pinto, Giuseppe Santaromita, Claudio Fiandrino, Domenico Giustiniano, Flavio Esposito (October 2022)
Experimenting with Localization Management Functions in 5G Core Networks (Demo)
ACM International Conference on Mobile Computing and Networking. Sydney, Australia.

3. Aniketh Girish, Juan Tapiador, Srdjan Matic, Narseo Vallina-Rodríguez (October 2022)
Towards an extensible privacy analysis framework for Smart Homes (Poster)
Internet Measurement Conference. Nice, France.

4. Giulia Attanasio, Serly Moghadas Gholian, Claudio Fiandrino, Marco Fiore, Joerg Widmer (June 2022)
Towards Native Explainable and Robust AI in 6G Networks (Poster)
12th IMDEA Networks Annual International Workshop. Madrid, Spain.

5. Álvaro García-Recuero, Nikolaos Laoutaris (June 2022)
FL-Torrent: decentralised AI for the masses (Poster)
12th IMDEA Networks Annual International Workshop. Madrid, Spain.

6. Orlando E. Martínez-Durive, Theo Couturieux, Cezary Ziemlicki, Marco Fiore (June 2022)
Beyond Voronoi: Plain Probabilistic Spatial Coverage Inference from Base Station Deployments (Poster)
12th IMDEA Networks Annual International Workshop. Madrid, Spain.

7. Aristide Tanyi Jong Akem, Michele Gucciardo, Marco Fiore (June 2022)
Implementation and Scalability Evaluation of Random Forests for In-Switch Inference (Poster)
12th IMDEA Networks Annual International Workshop. Madrid, Spain.

Invited Papers, Keynotes, Invited Talks, Tutorials, Lectures, etc. [4]

1. Elisa Cabana, Rosa Elvira Lillo (September 2022)
Robust multivariate control chart based on shrinkage for individual observations (Invited Talk)
3rd Spanish Young Statisticians and Operational Researchers Meeting. University Miguel Hernandez, Elche, Spain.

2. Elisa Cabana, Rosa Elvira Lillo (June 2022)
Robust multivariate control chart based on shrinkage for individual observations (Invited Talk)
ISBIS CONFERENCE 2022 on "Statistics and Data Science in Business and Industry". University of Naples Federico II, Italy.

3. Antonio Fernández Anta (June 2022)
Using indirect reporting surveys to monitor the COVID-19 pandemic (Invited Talk)
X International Scientific and Practical Conference "From Weber to Wallerstein: Historical Sociology of States and World-systems". Kyiv, Ukraine, Online.

4. Antonio Fernández Anta (April 2022)

Building Byzantine-tolerant Systems with Distributed Ledgers and Distributed Sets (Invited Talk)

J on the Beach. Malaga, Spain.

PhD Theses [9]

1. Oluwasegun Ojo (November 2022)

Scalable Outlier Detection Methods for Functional Data

PhD thesis: Departamento de Ingeniería Matemática – Universidad Carlos III de Madrid, Spain

Director: Antonio Fernández Anta, IMDEA Networks Institute, Madrid, España

2. Álvaro Feal (November 2022)

"And all the pieces matter..." Hybrid Testing Methods for Android App's Privacy Analysis

PhD thesis: Departament de Ingeniería Telemática – Universidad Carlos III de Madrid, Spain

Director: Narseo Vallina Rodríguez, IMDEA Networks Institute, Madrid, España

3. Dolores García (September 2022)

Optimizing network control and resource allocation in large scale ultra dense mm-wave networks

PhD thesis: Departamento de Ingeniería Telemática – Universidad Carlos III de Madrid, Spain

Director: Joerg Widmer, IMDEA Networks Institute, Madrid, España

4. Julien Gamba (September 2022)

"Do Android Dream of Electric Sheep?" On Privacy in the Android Supply Chain

PhD thesis: Departamento de Ingeniería Telemática – Universidad Carlos III de Madrid, Spain

Directores: Narseo Vallina Rodríguez, IMDEA Networks Institute, Madrid, España

5. Mohamed Moulay (July 2022)

Performance Evaluation and Anomaly detection in Mobile BroadBand Across Europe

PhD thesis: Departamento de Ingeniería Telemática – Universidad Carlos III de Madrid, Spain

Directores: Vincenzo Mancuso, IMDEA Networks Institute, Madrid, España - Matilde Pilar Sánchez, Universidad Carlos III de Madrid, Madrid, España

6. Víctor Sánchez Agüero (July 2022)

Enabling Unmanned Aerial Vehicles for the near future applications

PhD thesis: Departamento de Ingeniería Telemática – Universidad Carlos III de Madrid, Spain

Directores: Francisco Valera, Universidad Carlos III de Madrid, Madrid, España

7. Alejandro Blanco (June2022)

Algorithms for robust indoor localization and sensing using off-the-shelf devices

PhD thesis: Departamento de Ingeniería Telemática – Universidad Carlos III de Madrid, Spain

Director: Joerg Widmer, IMDEA Networks Institute, Madrid, España

8. Constantine Ayimba (May 2022)

Machine learning algorithms for provisioning cloud/edge applications

PhD thesis: Departamento de Ingeniería Telemática – Universidad Carlos III de Madrid, Spain

Director: Vincenzo Mancuso, IMDEA Networks Institute, Madrid, España - Paolo Casari, University of Trento, Italy

9. Noelia Pérez Palma (February 2022)

Infrastructure-less D2D Communications through Opportunistic Networks

PhD thesis: Departamento de Ingeniería Telemática – Universidad Carlos III de Madrid, Spain

Director: Vincenzo Mancuso & Marco Ajmone, IMDEA Networks Institute, Madrid, España

5.3. Scientific service

IMDEA Networks conducts its scientific activities with the final objective of ensuring the widest possible dissemination of the results of the work carried out by the Institute, both within the scientific community and towards the general public. Our scientific service includes participation by our researchers at different levels of involvement in leading conferences and journals in the field, R&D committees, standardization bodies, awards, publications, projects or sponsorships.

Marco AJMONE

Professional posts & activities
• Scientific Committee Member: LINCS - Paris, France

Journal editorial boards
• Editorial Board member: Computer Networks Journal (Elsevier)
• Advisory Board member: Performance Evaluation Journal (Elsevier)
• Editorial Board member: The ACM Transactions on Modeling and Performance Evaluation of Computing Systems Journal (ACM ToMPECS)

Organization committees
- General Co-Chair: 20th International Symposium on Modeling and Optimization in Mobile, Ad hoc, and Wireless Networks (WiOpt 2022), 19-22 September, Turin, Italy
- General Co-Chair: IEEE International Conference on Communications 2023, 28 May – 1 June 2023, Rome, Italy

TPC memberships
- IEEE International Conference on Computer Communications (IEEE INFOCOM 2022), 2-5 May, Virtual Conference
- IEEE Wireless Communications and Networking Conference (WCNC 2022), 10–13 April 2022, Austin, TX, USA
- Green Communications Systems and Networks Symposium at IEEE ICC 2022
- Wireless Communications Symposium at IEEE ICC 2022
- 34th International Teletraffic Engineering for Smart Networking Conference (ITC 2022), 14-16 September 2022, Shenzhen
- 20th International Symposium on Modeling and Optimization in Mobile, Ad hoc, and Wireless Networks (WiOpt 2022), 19-22 September, Turin, Italy
- IEEE International Conference on Industry 4.0, Artificial Intelligence, and Communications Technology (IAICT 2022), 28-30 July 2022
- The 29th International Conference on Computers in Education (ICCE 2022), 28 November – 2 December 2022, Kuala Lumpur
- Asia Pacific Conference on Communications (APCC 2022), 19-21 October 2022, Jeju Island, Korea

Constantine AYIMBA

TPC memberships
- IEEE International Conference on Sensing, Communication, and Networking (IEEE SECON 2023), 11-14 September 2023, Madrid, Spain

Albert BANCHS

TPC memberships
- IEEE International Conference on Computer Communications (IEEE INFOCOM 2022), 2-5 May, Virtual Conference
- IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks (WoWMoM), 14-17 June 2022, Belfast, Northern Ireland

Suman BANERJEE

Organization committees
- Panel Co-Chair: IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks (IEEE WoWMoM 2023), 12-15 June 2023, Boston, Massachusetts, USA

TPC memberships
- IEEE Conference on Computer Communications (IEEE INFOCOM 2022), area chair, 2-5 May 2022, Virtual Conference

Antonio BAZCO-NOGUERAS

TPC memberships
- 20th International Symposium on Modeling and Optimization in Mobile, Ad hoc, and Wireless Networks (WiOpt 2022), 19-22 September, Turin, Italy
- International Workshop on Autonomous Network Management in 5G and Beyond Systems (ANMS 2022), 29 April 2022, Budapest, Hungary

Jaya Prakash Varma CHAMPATI

Professional posts & activities
- Organization of IMDEA Networks Seminars: since February 2022.
- Organization of IMDEA Networks Distinguished Seminars: March-July, 2022.
- Co-organization (20% effort) IMDEA Networks Workshop with Guillermo Suárez-Tangil on June 8th, 2022.

Organization committees
- TPC Co-Chair: Workshop on Trustworthy Edge Computing (TEC), organized in conjunction with ACM SEC 2022, 8 December 2022, Seattle, USA

TPC memberships
- IEEE International Conference on Computer Communications (IEEE INFOCOM 2022), 2-5 May 2022, Virtual Conference
- Workshop on Age of Information (AoI), IEEE International Conference on Computer Communications, 2-5 May 2022, Virtual Conference
- IEEE International Conference on Communication Systems & Networks (COMSNET), 3-8 January 2022, Hybrid Conference | Bengaluru, India
- IFIP Networking Conference 2022, 13-16 June 2022, Catania, Italy
- IEEE/ACM International Symposium on Quality of Service (IEEE/ACM IWQoS 2022), 10-12 June 2022, Virtual Conference
- IEEE International Conference on Communications (IEEE ICC 2022), 16-20 May 2022, Seoul, South Korea | Hybrid Conference
- IEEE Vehicular Technology Conference (VTC), 19-22 June 2022, Helsinki, Finland

Livia Elena CHATZIELEFTHERIOU

TPC memberships
- 2nd International Workshop on Autonomous Network Management in 5G and Beyond Systems (ANMS 2023), 8 or 12 May, 2023, Miami, FL, USA
- IEEE Wireless Communications and Networking Conference (WCNC 2022), 10–13 April 2022, Austin, TX, USA
- ID3C at the IEEE International Mediterranean Conference on Communications and Networking (MeditCom), 5-8 September 2022, Athens, Greece

Antonio FERNÁNDEZ ANTA

Professional posts and activities
- External member of the committee for the definition of Grado en Matemática Aplicada, UC3M.
- Member of the Board of the Social Computing Research Center, Cyprus University of Technology, since July 2019.
- Member of the International Advisory Board of the Byblos project (BeYond BLOck-chainS, Modular Building Blocks for Large-Scale Trustless Multi-user Apps), funded by ANR, the French Research Funding Agency, since February 2021.

Journal editorial boards
- Deputy Editor of The Computer Journal, Oxford Journals

Organization committees
- Chair of Track B (Concurrent and Distributed Computing: Foundations, Fault-tolerance, and Security): the 24th International Symposium on Stabilization, Safety, and Security of Distributed Systems, SSS 2022, November 15-17, 2022, Clermont-Ferrand.

TPC memberships
- ACM PODC 2022, 25-29 July, Salerno, Italy
- 3rd KDD Workshop on Data-driven Humanitarian Mapping, August 15, 2022, Hybrid Conference (Zoom + Washington DC)

Claudio FIANDRINO

Professional posts and activities
- Chair of the IEEE ComSoc EMEA Awards Committee
- Membership Development and Website Management of the IEEE Communications Systems Integration and Modeling Technical Committee
- Invited Talk: TRY IT! Congress – "Pillars of Future 6G Networks: Challenges and Research Directions", March 2022, Madrid, Spain

Journal editorial boards
- IEEE Networking Letters

Organization committees
- Symposia Co-Chair CQRM at IEEE International Conference on Communications 28 May – 01 June 2023, Rome, Italy

TPC memberships
- IEEE Global Communications Conference (IEEE GLOBECOM 2022), 4–8 December 2022, Rio de Janeiro, Brazil
- IEEE International Conference on Communications, 16–20 May 2022, Seoul, South Korea
- IEEE Consumer Communications & Networking Conference, 8–11 January 2023, Las Vegas, NV // USA

Marco FIORE

Professional posts & activities
- Co-founder and CTO at Net AI Tech Ltd

Journal editorial boards
- Area Editor, Elsevier Computer Networks
- Technical Editor, IEEE Network Magazine

Organization committees
- General Chair: Passive and Active Measurement Conference (PAM) 2023
- Co-chair: 1st International Workshop on Native Network Intelligence (NativeNI) at ACM Conference on emerging Networking EXperiments and Technologies (CoNEXT) 2022
- Publicity Co-chair: ACM International Conference on Mobile Systems, Applications, and Services (MobiSys) 2022, 27 June – 1 July 2022, Portland, Oregon
- Steering Committee member: ACM Wireless of the Students, by the Students, and for the Students (S3) Workshop
- Steering Committee member: Network Traffic Measurement and Analysis (TMA) Conference, 27-30 June 2022, The Netherlands

TPC memberships
- IEEE Vehicular Networking Conference (VNC), 26-28 April 2023, Istanbul, Türkiye
- IEEE International Conference on Computer Communications (IEEE INFOCOM 2023), 17-20 May 2023, New York, USA
- IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks (IEEE WoWMoM 2023), 12-15 June 2023, Boston, Massachusetts, USA
- IEEE/IFIP Networking Conference 2023, 12-15 June 2023, Barcelona, Spain
- IEEE International Conference on Sensing, Communication, and Networking (IEEE SECON 2023), 11-14 September 2023, Madrid, Spain

Domenico GIUSTINIANO

Organization committees

- General vice-chair: the 29th Annual International Conference On Mobile Computing And Networking (ACM Mobicom), 2-6 October 2023, Madrid, Spain

Journal editorial boards

- Editorial Board of Computer Networks (Elsevier) as Area Editor

TPC memberships

- IEEE International Conference on Computer Communications (IEEE INFOCOM 2022), 2-5 May, Virtual Conference
- The 28th Annual International Conference on Mobile Computing and Networking (ACM MOBICOM 2022), 17–21 Oct 2022, InterContinental Sydney, Australia
- ACM Workshop on Wireless Network Testbeds, Experimental evaluation & Characterization 2022 (WiNTECH 2022), 17 October 2022, Sydney, Australia (Hybrid mode)

Michele GUCCIARDO

TPC Memberships

- Network Intelligence workshop (NI 2022), co-located with IFIP Networking Conference 2022, 13 June 2022, Catania, Italy.
- IEEE International Symposium on a World of Wireless, Mobile, and Multimedia Networks (WoWMoM 2022), 14-17 June 2022, Belfast, Ireland.
- Workshop on Mobility in the Evolving Internet Architecture (MobiArch 2022), co-located with ACM MobiCom 2022, 21 October 2022, Sydney, Australia.

Sergey GORINSKY

Professional posts & activities

- Networking and Communication Subcommittee Member: ACM/IEEE Computing Curricula Task Force

Journal editorial boards

- Editorial Board Member: ACM SIGCOMM Computer Communication Review

Organization committees

- Steering Committee Member: COMSNETS Association
- Treasurer: ACM Conference on Applications, Technologies, Architectures, and Protocols for Computer Communication (SIGCOMM 2022), 22-26 August, Amsterdam, The Netherlands
- Student Research Competition Judge: ACM Conference on Applications, Technologies, Architectures, and Protocols for Computer Communication (SIGCOMM 2022), 22-26 August, Amsterdam, The Netherlands

TPC memberships

- ACM Conference on Applications, Technologies, Architectures, and Protocols for Computer Communication (SIGCOMM 2022), 22-26 August, Amsterdam, The Netherlands
- IEEE International Conference on Network Protocols (ICNP 2022), 30 October - 2 November, 2022, Lexington, Kentucky, USA (Area Chair)
- USENIX Symposium on Networked Systems Design and Implementation (NSDI 2024), 16-18 April, 2024, Santa Clara, California, USA
- ACM International Conference on Emerging Networking Experiments and Technologies (CoNEXT 2023), 5-8 December 2023, Paris, France
- IEEE International Conference on Computer Communications (INFOCOM 2023), 17-20 May 2023, Hoboken, New Jersey, USA
- ACM Web Conference (WWW 2023), 30 April - 4 May, 2023, Austin, Texas, USA
- IEEE International Conference on Network Softwarization (NetSoft 2022), 27 June – 1 July, Milan, Italy
- ACM CoNEXT Workshop on Design, Deployment, and Evaluation of Network-assisted Video Streaming (ViSNext 2022), 9 December 2022, Rome, Italy

Nikolaos LAOUTARIS

Organization committees

- Workshop Chair: the first ACM Data Economy Workshop co-located with ACM CoNEXT 2022, 9 December 2022, Rome, Italy

TPC memberships

- ACM International Conference on Emerging Networking Experiments and Technologies (ACM CONEXT 2022), 6-9 December 2022, Rome, Italy
- IEEE International Conference on Network Protocols (ICNP 2022), 30 October – 2 November, Lexington, Kentucky, USA

Vincenzo MANCUSO

Professional posts & activities

- Joined 3 PhD thesis committees

Journal editorial boards

- Guest editor for Elsevier Computer Communications, Special Issue title: Best articles from MedComNet 2021

Organization committees

- General Chair: IEEE International Conference on Sensing, Communication, and Networking (IEEE SECON 2023), 11-14 September 2023, Madrid, Spain

TPC memberships

- IFIP Networking Conference 2022, 13-16 June 2022, Catania, Italy
- 17 th Wireless On-demand Network systems and Services Conference (WONS 2022), 30 March – 1 April 2022
- The 25th International Conference on Modeling, Analysis and Simulation of Wireless and Mobile Systems (MSWiM 2022), 24-28 October, Montreal, Canada
- IEEE International Conference on Computer Communications (IEEE INFOCOM 2023), 17-20 May 2023, New York, USA
- IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks (IEEE WoWMoM 2023), 12-15 June 2023, Boston, Massachusetts, USA
- IEEE/IFIP Networking Conference 2023, 12-15 June 2023, Barcelona, Spain

Marius PARASCHIV

Journal editorial boards

- Reviewer: Quantum Information Processing Journal
- Reviewer: QIP 2023

TPC memberships

- Network Science and Quantum Communications Workshop, co-located with IEEE INFOCOM 2023, 17-20 May 2023, New York, USA
- The 17th International AAAI Conference on web and social media (ICWSM 2023), 5-8 June 2023, Limassol, Cyprus
- 9th International Symposium on Security and Privacy in Social Networks and Big Data (SocialSec 2023), 14-16 August, University of Kent, Canterbury, UK

Guillermo SUÁREZ-TANGIL

TPC memberships

- IEEE Europeam Symposium on Security and Privacy, 6-10 June 2022, Genoa
- IEEE Conference on Dependable and Secure Computing (DSC 2022), 22-24 June, Edinburgh, UK
- International Conference on Availability, Reliability and Security (ARES 2022), 23-26 August 2022, Vienna, Austria
- European Workshop on Systems Security (EuroSec 2022), 5-8 April 2022, Rennes, France
- Conference on Detection of Intrusions and Malware & Vulnerability Assessment (DIMVA 2022), June 29 – 1 July 2022, Cagliari, Italy

Narseo VALLINA-RODRÍGUEZ

Professional posts & activities
- Jury member: CNIL-INRIA Privacy Award
- Chair of IMDEA Networks' Ethical Board
- Member of RENIC's Electoral Board
- IMDEA Networks representative at RENIC
- Member of experts of the EU Data Protection Board (EDPB)

Organization committees
- IMDEA Networks' Faculty Retreat 2022
- Chair: ACM CoNEXT Student Workshop 2022, 9 December, Rome, Italy

TPC memberships
- ACM Internet Measurement Conference (IMC 2022), 25-27 October, Nice, France
- USENIX Security Symposium, 10-12 August 2022, Boston, MA, USA
- USENIX Security Symposium, 9 -11 August 2023, Anaheim, CA, USA

Joerg WIDMER

Professional posts & activities
- Chair of working group IFIP TC 6 WG 6.2 - Network and Internetwork Architectures

Journal editorial boards
- Associate Editor: IEEE Transactions on Mobile Computing
- Editor: Computer Networks Journal (Elsevier)

Organization committees
- TPC co-chair: IEEE Conference on Computer Communications (IEEE INFOCOM 2022), area chair, 2-5 May 2022, Virtual Conference
- Steering committee member: ACM CONEXT Emerging Wireless Workshop Steering Committee member: IFIP Networking Conference 2022, 13-16 June 2022, Catania, Italy
- Member of the Sigmobile Test-of-Time (ToT) award committee 2022
- Reviewer for the Athene Young Investigator Programme of TU Darmstadt
- Evaluator for the DFG Heinz Maier-Leibnitz-Prize
- Member of the Experts Group of the EU H2020 Coordination and support action EU-IoT

TPC memberships
- IEEE Conference on Computer Communications (IEEE INFOCOM 2022), TPC chair, 2-5 May 2022, Virtual Conference
- The 28th Annual International Conference on Mobile Computing and Networking (ACM MOBICOM 2022), 17–21 Oct 2022, InterContinental Sydney, Australia

- ACM International Symposium on Theory, Algorithmic Foundations, and Protocol Design for Mobile Networks and Mobile Computing (MobiHoc 2022), 17-20 October, Seoul, South Korea
- ACM International Conference on Emerging Networking Experiments and Technologies (ACM CONEXT 2022), 6-9 December 2022, Rome, Italy
- IFIP Networking Conference 2022, 13-16 June 2022, Catania, Italy
- 17 th Wireless On-demand Network systems and Services Conference (WONS 2022), 30 March – 1 April 2022
- ACM Workshop on Wireless Network Testbeds, Experimental evaluation & Characterization 2022 (WiNTECH 2022), 17 October 2022, Sydney, Australia (Hybrid mode)

dissemination events
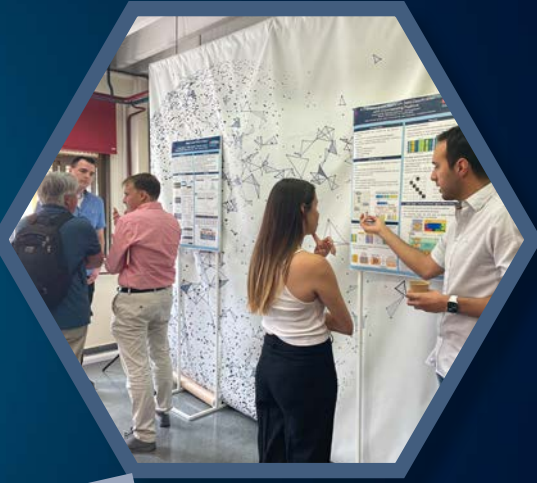
5.4. Outreach

5.4.1 Major events

IMDEA Networks: 15 years developing the science of networks

12 December 2022

In 2022 we experienced two major milestones at IMDEA Networks: we celebrated 15 years doing cutting-edge science and technology and our Alumni network reached 50 people. To celebrate we decided to hold an event on December 12th from 10:30-13:30h. More info

Science and Innovation Week of Madrid 2022

10-11 November 2022

As every year, IMDEA Networks participated in Science and Innovation Week, a science outreach event organized by the Fundación para el Conocimiento madri+d with the aim of bringing science closer to society and awakening scientific vocations. On November 10 and 11, around 120 students of the 4th ESO of the IES Siglo XXI of Leganés (Madrid) and 28 students of the Middle-Level Training Cycle of Microcomputer Systems and Networks and high school of the IES Cañada Real of Valmojado (Toledo) visited our headquarters.

The students learned how communication technology can help to improve the transportation of the future thanks to a talk in English by Dr. Markus Fidler. The researcher talked

NEWS

semana de la **ciencia** y la **innovación** 2021

fundación para el **conocimiento** madri+d

institute **iMdea networks**

about SocialCars, the project that aims to answer the key question: "How can society's needs for a livable urban space be reconciled with individual needs for efficient and safe transport?".

More info

P4i – Patents for Innovation
26-27 October 2022

IMDEA Networks participated in the first edition of P4i – Patents for Innovation, an event that aims to become the largest European meeting point for Innovation and Technology Transfer. Marta Dorado, Deputy Operations & Communications Manager, and Elvira Conti, Project Manager, represented the institute from the innovation space of the Community of Madrid in the Nave (Madrid) on October 26 and 27.

More info

annual report 2022

The 5 EU missions as seen by IMDEA researchers (I) at the European Researchers' Night in Madrid 2022

30 September 2022

Our Research Assistant Professor Guillermo Suárez-Tangil participated on September 30 in the scientific café organized within the framework of the European Researchers' Night at the Residencia de Estudiantes in Madrid together with his colleagues from the IMDEA Institutes.

This annual event is promoted by the Vice-Presidency, Ministry of Education and Universities of the Community of Madrid, and coordinated by the Fundación para el Conocimiento madri+d since 2009, with funding from the European Commission, under the Marie Skłodowska-Curie Actions (MSCA).

More info

DES 2022

14-16 June 2022

IMDEA Networks attended the DES | Digital Enterprise Show 2022 for the first time from the Madrid Technology Transfer Zone (MTTZ). This is the largest European professional event on business digital transformation, an ideal environment in which to share knowledge, strategies and success stories. Marta Dorado, Deputy Operations & Communications Manager, was the Institute's representative at the fair, which took place from June 14 to 16 in FYCMA (Málaga, Spain).

More info

12th IMDEA Networks Annual International Workshop

8 June 2022

IMDEA Networks Institute resumed its traditional annual workshop. In addition to talks by Scientific Council members and Faculty Members, the workshop included a breakout session divided into three clusters: Networked Systems and Algorithms, Wireless Networking and Measurements, Privacy & Security. The workshop program presented recent research results of the participants, discussed and identified priorities and challenges for the research program, and explored new ways to make the networks of the future a true commodity for the needs of society.

More info

Researchers at Schools: Privacy risks in Android applications

17 May 2022

More than 100 students joined us in our "Researchers at Schools" activity, organized on May 17th (Internet and Telecommunications Day) in the framework of the European Researchers' Night 2022 project. The Leganés high schools IES Luis Vives, IES San Nicasio, and IES Siglo XXI attended the talk given by our PhD student Álvaro Feal on privacy risks in Android applications and then they were able to visit the 5TONIC lab.

More info

4ESO+Enterprise Program
5-6 April 2022

On April 5 and 6, 19 students from four different high schools in Madrid (IES Isaac Albéniz, IES León Felipe, IES Los Castillos and Colegio La Inmaculada Puerta de Hierro) enjoyed an educational training at IMDEA Networks. This is the fifth year that we have participated in the 4ESO+Enterprise program, promoted by the Community of Madrid with the aim of giving 16-year-old students a first contact with the working world they will be part of in the future.

More info

XI Madrid is Science Fair: LiFi and blockchain
2-5 March 2022

IMDEA Networks participated in the XI Madrid is Science Fair, a national event of reference for the dissemination of science and research, held from March 2 to 5 at IFEMA and organized by the Fundación para el Conocimiento madri+d. We shared a stand with the other IMDEA institutes. IMDEA Networks activities took place on Wednesday March 2nd and Thursday March 3rd from 10 am to 8 pm. The Institute presented two interactive demonstrations. The first showed a sustainable battery-free wireless communication

device, powered by LiFi technology. In addition, visitors participated in a blockchain-secured voting website.

More info

The Community of Madrid celebrates the 15th anniversary of the IMDEA Institutes

25 February 2022

The Community of Madrid celebrated the 15th anniversary of the creation of the IMDEA Institutes created by the regional government in 2007 and which have attracted more than 62 million euros thanks to nearly 2,000 R&D projects. These seven public research centers, including IMDEA Networks, develop cutting-edge science and technology with the aim of generating knowledge to transform society.

More info

Transfiere 2022, European Meeting on Science, Technology and Innovation

16-17 February 2022

IMDEA Networks participated, during the 16th and 17th of February, in Transfiere 2022, the 11th European Meeting on Science, Technology, and Innovation, held in FYCMA (Málaga, Spain). Marta Dorado, Deputy Operations & Communications Manager, and Borja Genovés, Postdoc researcher, represented the Institute in the Innovation Space of the Community of Madrid together with the other IMDEA institutes and the Foundation for Knowledge madri+d. From this Workstation, the different transfer agents of the region have had the opportunity to promote scientific dissemination and establish synergies.
More info

Students from the 2nd year of Bachillerato visited the IMDEA Networks facilities

13 January 2022

IMDEA Networks organized, on Thursday, January 13, a day of encounter with research for a group of high school students from the Colegio Sagrado Corazón de Jesús in Madrid. Under the pertinent preventive health security measures, the group was able to enjoy a morning of knowledge of various aspects of the work carried out in the institution.

More info

5.4.2. Workshops, seminars & lectures

Weekly seminars alternated invited talks with presentations by internal researchers. These events were organized together with prestigious institutions such as University Carlos III of Madrid, Northeastern University, Brown University, University of California, TU Berlin, Queen Mary University of London, and University of Padova. The topics ranged from scientific presentations to technology-transfer oriented talks. All events were held in Madrid. Out of the 45 total number of events in which the Institute participated during 2022, 19 of our events were conducted by invited speakers. We list the latter here:

A decade of IoT/embedded firmware security - a vision stretching from large-scale offensive analysis to scalable defensive techniques
Andrei Costin, Senior Lecturer/Assistant Professor in Cybersecurity at University of Jyväskylä
21 December 2022

Spatial Coverage Inference from Base Station Deployments
Orlando E. Martínez-Durive, PhD Student at IMDEA Networks Institute, Madrid, Spain
14 December 2022

Quantum Computation and Quantum Communication - Introduction and Future Prospects
Marius Paraschiv, Post-Doc Researcher at IMDEA Networks Institute, Madrid, Spain
13 December 2022

Building Smart and Fast Systems using Machine Learning and Computer Vision
Thaleia Dimitra Doudali, Assistant Professor at IMDEA Software Institute, Madrid, Spain
1 December 2022

Uncovering Hidden Pockets of Knowledge in a Multilingual Underground Forum
Mariella Mischinger, PhD Student at IMDEA Networks Institute, Madrid, Spain
23 November 2022

ImposTer: Towards an extensible privacy analysis framework for Smart Homes
Aniketh Girish, PhD Student at IMDEA Networks Institute, Madrid, Spain
16 November 2022

Cybersecurity and Privacy Law for Smart Products and related Digital Marketing: US and EU Perspectives
Dr. Raj Sachdev, Assistant Professor at PSU
8 November 2022

Towards Improving Code Stylometry Analysis in Underground Forums
Michal Tereszkowski-Kaminski, PhD Student at London King's College
2 November 2022

Machine learning and reasoning on a 4G/5G MAC scheduling policy

Nikolaos Apostolakis, PhD Student at IMDEA Networks Institute, Madrid, Spain

26 October 2022

Towards AI-based Control and Orchestration in the Open RAN: Architectures, Algorithms, Testbeds

Tommaso Melodia, Professor at Northeastern University, Boston

21 October 2022

Scalable Outlier Detection Methods for Functional Data: Methods and Software Applications

Oluwasegun Ojo, PhD Student at IMDEA Networks Institute, Madrid, Spain

19 October 2022

A decade of improving CDN performance and reliability

Theophilus Benson, Associate Professor of Computer Science at Brown University

5 October 2022

Getting the Best of Both Worlds (IoT and Edge) using Hierarchical Inference

Jaya Prakash Champati, Research Assistant Professor, IMDEA Networks Institute, Madrid, Spain

28 September 2022

Signaling in PHY preamble for mmWave WLAN systems

Sai Pavan Deram, PhD Student at IMDEA Networks Institute, Madrid, Spain

21 September 2022

Impact of transmission cost on Age of Information at Nash equilibrium in random-based medium access

Leonardo Badia, Associate professor at University of Padova, Italy

14 September 2022

Resource Optimization for Moving Target Tracking and Remote Sensing Using Minimum Flow Algorithm and Identifying Codes

Arunabha Sen, Professor at Arizona State University

27 July 2022

Intelligent explanations for mobile network traffic predictors

Serly Moghadas Gholian, PhD Student at IMDEA Networks Institute, Madrid, Spain

13 July 2022

Was mobility a good predictor of COVID cases in Havana's first wave?

Dr. Alejandro Lage Castellanos, Havana University, Cuba

12 July 2022

Domain-Specific Serverless Computing across Edge-to-Cloud Continuum

Mohsen Amini Salehi, Associate Professor of Computer Science, University of Louisiana

11 July 2022

Privacy-Preserving Machine Learning

Vittorio Prodomo, PhD Student at University Carlos III of Madrid, Madrid, Spain

6 July 2022

Towards a Human-centric Data Economy

Santiago Azcoitia, PhD Student at IMDEA Networks Institute, Madrid, Spain

29 June 2022

Who makes the Internet? A longitudinal analysis of the IETF

Ignacio Castro, Lecturer, Queen Mary University of London, UK

23 June 2022

Compact local certification of graph classes

Pedro Montealegre, Associate Professor in Universidad Adolfo Ibáñez, Santiago (Chile)

22 June 2022

Distinguished Seminar: The Machine Learning Data Center is a Cancer: What is the Cure?

Nicholas Lane, Cambridge University, Samsung AI, Cambridge

16 June 2022

Securing Federated Sensitive Topic Classification against Poisoning Attacks

Tianyue Chu, PhD Student, IMDEA Networks Institute and University Carlos III of Madrid

15 June 2022

Distinguished Seminar. The Quantum Internet: Recent Advances and Challenges

Don Towsley, Professor at University of Massachusetts, USA

24 May 2022

Global Mobile Network Aggregators: Taxonomy, Roaming, Performance and Optimization

Sergi Alcalá, PhD Student at IMDEA Networks Institute, Madrid, Spain

18 May 2022

Novel machine learning techniques to improve the forecasting of stroke postinterventive outcomes

Augusto Garcia-Agúndez, Post-Doc researcher at IMDEA Networks

12 May 2022

Distinguished Seminar: From Co-Existence to Resilience through Cross-Technology Communication

Falko Dressler, Professor and Chair for Telecommunication Networks at the School of Electrical Engineering and Computer Science, TU Berlin, Germany
4 May 2022

A Framework for Spectrum Data Classification using Crowdsensing Platform

Alessio Scalingi, PhD Student at IMDEA Networks Institute, Madrid, Spain
4 May 2022

Distinguished Seminar: Correctness Conditions for Cross-Chain Deals

Maurice Herlihy, Professor at Brown University, United States
22 April 2022

Second-level Digital Divide: A Longitudinal Study of Mobile Traffic Consumption Imbalance in France

Sachit Mishra, PhD Student at IMDEA Networks Institute, Madrid, Spain
20 April 2022

LossLeaP: Learning to Predict for Intent-Based Networking

Alan Collet, PhD Student at IMDEA Networks Institute, Madrid
13 April 2022

FreqyWM: Frequency WaterMarking for the New Data Economy

Devri€Isler, PhD Student at IMDEA Networks Institute, Madrid, Spain
6 April 2022

Taking Responsibility for Someone Else's Code: Studying the Privacy Behaviors of Mobile Apps at Scale

Serge Egelman, Research Director of the Usable Security and Privacy group at the International Computer Science Institute, University of California
30 March 2022

Strengthening the IoT Ecosystem: Privacy Preserving IoT Security Management

Anna Maria Mandalari, Research Associate at Dyson School of Design Engineering, Imperial College London
16 March 2022

Machine Learning in Radio Propagation Modeling

Stefanos Bakirtzis, Visiting PhD Student at IMDEA Networks Institute, Madrid, Spain
9 March 2022

Beyond Voronoi: Plain Probabilistic Spatial Coverage Inference from Base Station Deployments
Orlando E. Martínez-Durive, PhD Student at IMDEA Networks Institute, Madrid, Spain
2 March 2022

Resource control framework for 5G vRANs
Leonardo Lo Schiavo, PhD Student at IMDEA Networks Institute, Madrid, Spain
23 February 2022

Greening game sessions at the edge
Francesco Spinelli, PhD Student at IMDEA Networks Institute, Madrid, Spain
16 February 2022

Transmitter localization with crowdsourced low-cost SDR based sensor networks
Yago Lizarribar, PhD Student at IMDEA Networks Institute, Madrid, Spain
9 February 2022

Trouble Over-The-Air: An Analysis of FOTA Apps in the Android Ecosystem
Julien Gamba, PhD Student at IMDEA Networks Institute, Madrid, Spain
2 February 2022

Offloading Algorithms for Maximizing Inference Accuracy on Edge Device Under a Time Constraint
Andrea Fresa, PhD Student at IMDEA Networks Institute, Madrid, Spain
26 January 2022

Impact of Later-Stages COVID-19 Response Measures on Spatiotemporal Mobile Service Usage
André Zanella, PhD Student at IMDEA Networks Institute, Madrid, Spain
19 January 2022

PassiveLiFi: Rethinking LiFi for Low-Power and Long-Range RF Backscatter
Sarmad Mir, PhD Student at IMDEA Networks Institute, Madrid, Spain
12 January 2022

5.4.3. Media impacts

Media impact 2022

22
Web news

12
Press releases

629
Social networks posts

7.665

Social networks followers 2022

1.845 305 508 4.415 592

community growth

4.702 5.801 6.741 7.665

2019 2020 2021 2022

Impacts by coverage

International 36%
Local 4%
Regional 8%
National 52%

TOTAL
175

Impacts by content

General Interest 56%

TOTAL
175

Specialised 44%

AlphaGalileo Foundation

EurekAlert! AAAS
The Global Source for Science News

SINC
La ciencia es noticia

notiweb
Boletín de noticias de I+D+i

Globedia

EL MUNDO

10 años dcyt

total telecom

Newtral

ABC

Tech Xplore

EL PAÍS

Science X

LA VANGUARDIA

R&T REDES&TELECOM

fundación para el conocimiento madri+d

EFE:

ACTIVO LEGANÉS

europa press

SER

D+I
invertia EL ESPAÑOL

Some media impacts

EL MUNDO

**Comunicación sin baterías 'made in Madrid'
para tener un planeta más limpio**

More info

MEDIO AMBIENTE PARA TENER UN PLANETA MÁS SOSTENIBLE

Tecnología sin baterías 'made in Madrid'

Investigadores de IMDEA idean una comunicación más limpia

DANIEL SOMOLINOS MADRID
Investigadores del centro de investigación pública IMDEA Networks de la Comunidad de Madrid han creado un sistema de comunicación inalámbrica sostenible, bautizado como *PassiveLiFi*, que permitirá la eliminación de las baterías en el Internet de las Cosas (*Internet of Things, IoT*, como se le conoce en inglés). Para los no iniciados, este Internet de las Cosas es la interconexión digital de objetos cotidianos (desde utensilios domésticos, como frigoríficos o lavadoras, hasta escenarios más industriales) con Internet. Algo que cada vez tiene más peso en nuestra sociedad.

«Aprovechamos la infraestructura de iluminación con bombillas LED que existe en la ciudad, así como las señales de radiofrecuencia. Nuestro sistema permite capturar la energía y recibir los datos a través de la luz», dice Domenico Giustiniano, profesor de investigación y líder del proyecto. Su método supone un importante avance para eliminar el uso de baterías y así reducir el impacto ambiental que éstas producen por sus componentes químicos.

Tanto es así que se espera que en 2025 existan más de 64 billones de dispositivos *IoT* («cada uno con su batería, que cuando se estropean es muy complejo su reciclado, suponiendo un gran impacto medioambiental»). Gracias al descubrimiento de IMDEA Networks podrían eliminarse sustituyéndolas por energías limpias sin afectar al rendimiento de la comunicación y los servicios.

Estos nuevos dispositivos *made in Madrid* operan a través de cualquier fuente emisora de luz, captando su energía, y transmitiendo y recibiendo los datos necesarios para su funcionamiento. Además, el uso de la infraestructura existente permite un significativo ahorro de energía en los dispositivos móviles.

Este trabajo, que ha supuesto tres años de investigación, empezó en 2018 y se presentará este próximo enero en la prestigiosa conferencia internacional ACM MobiCom. «Muy pocos investigadores españoles han conseguido presentar sus trabajos aquí», concluye el investigador Domenico.

ABC

**Dime qué nivel educativo y
económico tienes y te diré
cómo usas las redes**

More info

Dime qué nivel educativo y económico tienes y te diré cómo usas las redes

Un estudio de la Universidad Carlos III e Imdea Networks descubre la 'brecha social' en las nuevas tecnologías

Diferentes juegos en teléfonos móviles // ÁNGEL DE ANTONIO

R&T REDES&TELECOM

ENABLE-6G: IMDEA Networks define la futura generación de redes móviles

More info

ENABLE-6G: IMDEA Networks define la futura generación de redes móviles

INFRAESTRUCTURAS

El proyecto consta de dos iniciativas: RISC-6G y MAP-6G centradas en la mejora de las comunicaciones inalámbricas para reducir su huella energética y el diseño de mecanismos nativos de aprendizaje automático que preserven la privacidad, respectivamente.

REDACCIÓN REDESTELECOM | 25/02/2022

IMDEA Networks ha sido recientemente galardonado con el proyecto coordinado **ENABLE-6G** de la convocatoria nacional UNICO 5G. El proyecto consta de dos subproyectos, **RISC-6G y MAP-6G**, y será desarrollado por un grupo de investigadores dirigido por el Dr. Domenico Giustiniano y el Dr. Joerg Widmer. Esta concesión de fondos permitirá al instituto seguir investigando de forma pionera en el campo de las redes y contribuir al desarrollo de la próxima generación de tecnología 6G.

SER

El centro IMDEA Networks de Leganés cumple 15 años con la mirada puesta en la tecnología móvil 6G

More info

Hoy por Hoy Madrid Sur

Ciencia y tecnología

El centro IMDEA Networks de Leganés cumple 15 años con l mirada puesta en la tecnología móvil 6G

Charlamos en Hoy por Hoy Madrid Sur con el director del IMDEA Networks Institute de Leganés, Albert Banchs

D + I
invertia | EL ESPAÑOL

Guillermo Suárez-Tangil, el investigador español que quiere sacar los mensajes maliciosos de las redes sociales

More info

Guillermo Suárez-Tangil.

INVESTIGACIÓN

Guillermo Suárez-Tangil, el investigador español que quiere sacar los mensajes maliciosos de las redes sociales

Experto en detección de 'malware', su trabajo se centra en comprender cómo funcionan los sistemas para encontrar mejores formas de asegurarlos.

D + I
invertia | EL ESPAÑOL

Narseo Vallina, el investigador español que vigila las 'apps' móviles para que ellas no nos vigilen a nosotros

More info

Narseo Vallina Rodríguez, investigador de IMDEA Network.

INVESTIGACIÓN / ENTREVISTA

Narseo Vallina, el investigador español que vigila las 'apps' móviles para que ellas no nos vigilen a nosotros

Vallina cree que "la Academia debería centrarse en entender qué está haciendo la industria digital y cuáles son sus repercusiones sociales".

10 marzo, 2022 - 02:04   GUARDAR

LA RAZÓN

Así se investiga en Madrid cómo mejorar la supervivencia de las personas que han sufrido un ictus

More info

LA RAZÓN 25

MADRID VIVA

PLANES EN MADRID

Así se investiga en Madrid cómo mejorar la supervivencia de las personas que han sufrido un ictus

Nuevas técnicas de aprendizaje automático para mejorar la previsión de los resultados después de intervenciones de pacientes con esta patología

▲ **Imdea Networks** Imdea Networks

ACTIVO LEGANÉS

«Leganés es un buen sitio para investigar en Inteligencia Artificial»

More info

ACTIVO LEGANÉS

Sucesos   Cultura   Deportes   Política   Sociedad   Reportajes   Entrevistas   Acceso   Suscribe

«Leganés es un buen sitio para investigar en Inteligencia Artificial»

IMDEA   Leganés   Entrevistas

Alberto Bachs, director adjunto de IMDEA Networks. Foto: Lito Lizana

The ◆INDEPENDENT

Up to nine in 10 government websites use tracking cookies without consent, study claims

More info

Independent Premium > UK news

❦ INDEPENDENT PREMIUM

Up to nine in 10 government websites use tracking cookies without consent, study claims

The study's authors say that tracking is a 'of great concern as governmental websites increasingly become the only interaction point with the government'

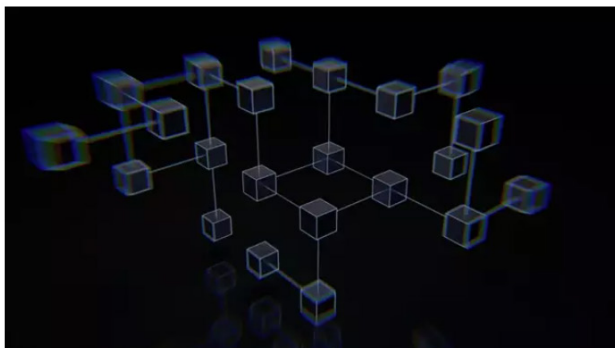Furvah Shah • Wednesday 06 July 2022 18:55 • ☐ Comments

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europa press

Setchain multiplica el número de transacciones por minuto en cualquier 'blockchain'

More info

europapress / portaltic / sector

Setchain multiplica el número de transacciones por minuto en cualquier 'blockchain'

Representación de una cadena de bloques o blockchain
- UNSPLASH

Europa Press PortalTIC   Actualizado: lunes, 26 septiembre 2022 10:32
ⓕ ⓨ ⓦ ✉ Newsletter   @portaltic

MADRID, 26 Sep. (Portaltic/EP) -

IMDEA Software e IMDEA Networks han presentado **Setchain**, una nueva estructura de datos que mejora la escalabilidad de las **cadenas de bloques o 'blockchains'**, permitiendo mayor número de transacciones por bloque y enfrentando el problema del 'front-running'.

TeleSemana

Los aprendizajes del Covid-19: los datos de una red móvil pueden servir para evitar la propagación de epidemias

More info

Tech Xplore
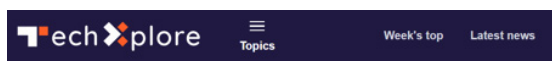
Researchers create an algorithm that maximizes IoT sensor inference accuracy using edge computing

More info

rtve

La protección y privacidad en los metaversos, un reto para las grandes tecnológicas

More info

Narseo Vallina
Investigador de Imdea Networks
Día Europeo de la Protección de Datos

5.5. Local Scientific Partnership

IMDEA Networks Institute has a strong scientific collaboration with a number of the local universities in the Madrid region. Among those, it is worth highlighting the partnerships with University Carlos III of Madrid (UC3M) and University of Alcalá (UAH) involving stable research collaboration in joint activities and projects. Furthermore, there is also an institutional collaboration in the form the participation of UC3M and UAH on the Institute's Board of Trustees.

Among other activities, the cooperation between IMDEA Networks and the local universities involve their joint participation in funded research projects. The regional project TAPIR-CM, which is currently ongoing, involves UC3M and UAH as participants under the coordination of IMDEA Networks. Furthermore, UC3M and IMDEA Networks jointly participate in several ongoing projects and they are both members of the 5TONIC laboratory.

With respect to teaching, IMDEA Networks is delivering, jointly with Ericsson and UC3M and with the participation of UAH, an M.Sc. degree on 5G, SDN and NFV. This Master is very successful and is strengthening the technological profile of the Madrid region.

Another important activity where IMDEA Networks is collaborating with the local universities is in the context of SCITEL, the Scientific Society of Telematic Engineering. IMDEA Networks, UC3M and UAH are very important members of this association, and are contributing to organize various activities in the framework of this association, such as the national conference on Telematics (JITEL).

Besides the above activities, IMDEA Networks, UC3M and UAH are also taking advantage of the physical proximity between the three institutions to share many of their daily activities, such as the scientific seminars organized by IMDEA Networks, which count with the participation of UC3M and UAH. Furthermore, it is also worth highlighting the personnel mobility between IMDEA Networks and University Carlos III and University of Alcalá. Recently a Professor from UAH has joined IMDEA as a visiting researcher.

Through these collaborations with local scientific partners, IMDEA Networks provides an important contribution to strengthening the scientific standing of the Madrid region in the area of Telematics.

impact and technology transfer

6

a n n u a l   r e p o r t

2022

6.1. Patents

Patents are important steps in the process of **transferring technology to marketplace**. Patent creation has strong implications for the Institute: patents are incentives for their creators, as they imply recognition for their creativity and material reward when these inventions are marketable. These incentives encourage innovation, the guarantee to the continuous improvement in the quality of research and, ultimately, of human life. It is IMDEA Networks Institute's policy to share a very high percentage of financial proceeds with inventors (our researchers) as reward for their excellence and hard work.

EP Patent Application (Filed in October 2021) and International (PCT) Patent Application (Filed in October 2022)

Title: *RF backscatter system based on light fidelity*

Inventors: Domenico GIUSTINIANO, Borja GENOVÉS GUZMÁN, Sarmad MIR

Rights: IMDEA Networks Institute

Overview: The present invention is related to a low-power backscatter system comprising a LiFi, "Light Fidelity", transmitter configured for generating and transmitting an optical signal comprising a sequence of a downlink data signal and a chirp signal and an IoT, "Internet of Things", tag.

Application number: EP4164143A1

Application number (International application No.): WO2023057618A1

6.2. Technology transfer

We direct our work towards strengthening collaboration ties with industry, particularly through joint participation in projects and technology transfer. We aim to develop technologies that have genuine socio-economic impact; that is to say, projects that deliver value and that can be transferred to industry and, ultimately, to society. In order to ensure that our focus remains on addressing real-world problems and that our development activities result in generating value, we continue to build on our strong links with the business community both in the Madrid region of Spain and in the rest of the World.

Our technology transfer strategy is aimed to ensure that the Institute's research activities remain relevant, that its innovations are diffused and their full value to society realized through various transfer processes such as licensing and the sale of patents, creation and

support of spin-off companies in the region that seek to commercialize products exploiting innovations developed within the Institute. We carry out several forms of collaboration, including direct contracts with industry, as well as participation in joint projects financed by public entities. Our projects include both types of partnerships with specific listings of those enterprises and organizations currently working with us.

Joint, funded research projects enable us to establish solid ties to business. We are engaged in various research projects with private sector collaborators:

6.2.1. Ongoing contracts

MIMORPH-5G

Funded by: Technische Universitat Darmstadt
Duration: October 2022 to December 2050

NR Computer Software Program Usage License Agreement

OPENQKD

Funded by: Telefónica Investigación y Desarrollo, S.A.
Duration: July 2022 to March 2023

Open European Quantum Key Distribution Testbed

5G-CLARITY

Funded by: Telefónica Investigación y Desarrollo, S.A.
Duration: April 2022 to March 2023

Beyond 5g multitenant private networks integrating cellular, wifi, and lifi, powered by artificial intelligence and intent based policy

NetPredict5

Funded by: Telefónica Investigación y Desarrollo, S.A.
Duration: April 2022 to October 2022

Adaptive Anomaly Detection and Classification

5GZORRO

Funded by: Telefónica Investigación y Desarrollo, S.A.
Duration: April 2022 to October 2022

Zero-touch security and trust for ubiquitous computing and connectivity in 5g networks

INSPIRE-5G PLUS

Funded by: Telefónica Investigación y Desarrollo, S.A.
Duration: April 2022 to October 2022

Intelligent security and pervasive trust for 5G and beyond

HYBRISDK-Digital Lab Fellowship

Funded by: Consumer Reports
Duration: February 2022 to August 2022

HybridSDK AppCensus-IMDEA 21-22

Armasuisse-BigLocator

Funded by: Armasuisse – Science and Technology
Duration: February 2022 to December 2022

Big Data-based Positioning of Rogue Transmitters.

Consumer Reports - Digital Lab Fellowship

Funded by: Consumer Reports
Duration: February 2021 to March 2022

Understanding the Android Open Source Project Supply Chain

NetPredict 4 - Interpretation of the evolution of network traffic

Funded by: NOKIA SPAIN S.A.
Duration: September 2021 to February 2022

Interpretation of the evolution of network traffic

Soporte al diseño e implementación de un modelo predictivo para el capacity planning de una arquitectura de telecomunicaciones

Funded by: SATEC
Duration: May 2021 to January 2022

Support to the design and implementation of the predictive model for the Capacity Planning of a Telecommunications architecture.

6.2.2. Other forms of collaboration with the private sector

Telefónica - IMDEA Networks Joint Research Unit in 5G technologies

IMDEA Networks and Telefónica Research and Development continue collaborating on their Joint Research Unit (JRU), which was created in May 2014. The JRU is also known under the name «Telefónica - IMDEA Networks Joint Research Unit in 5G technologies». The development of 5G has already become a landmark in the global competition for technologi- cal leadership. Over a period of seven years up to 2020, this private-public alliance will share a wealth of know-how and in-house capabilities to tackle the challenge of creating a blueprint for the new technology and the standards that are to define future ICT networks.

Located at IMDEA Networks' headquarters in Madrid, the aim of the JRU Telefónica I+D - IMDEA Networks is to establish a strategic partnership that provides an operational framework for close interaction in a varied set of scientific activities. In particular, the JRU brings together a team comprising highly specialized multidisciplinary profiles ready to work collaboratively on externally funded R&D projects. One of the main areas in which this collaboration is reflected is the program «Advanced 5G Network Infrastructure for Future Internet PPP», sponsored by the EU Commission within the Horizon 2020 program.

The private-public alliance shares a wealth of know-how and in-house capabilities to tackle the challenge of creating a blueprint for the new technology and the standards that are to define future ICT networks. Work led by experienced researchers Diego R. López from Telefónica I+D and Arturo Azcorra, Joerg Widmer and Albert Banchs, from IMDEA Networks, focuses on key 5G enablers such as flexible functional split, joint handover optimization, 60GHz wireless networks, network function operating systems, secure virtual computing and green networking.

5TONIC - An Open Research and Innovation Laboratory focusing on 5G technologies

5TONIC is an open research and innovation laboratory focusing on 5G technologies that was founded by Telefonica and IMDEA Networks Institute in 2015. The first laboratory of 5G excellence in Spain also counts with Ericsson Spain, INTEL, Commscope, University Carlos III of Madrid, InterDigital and Capgemini Engineering amongst its members. During 2020, Juan Carlos García, Innovaton VP at Telefónica, became the new 5TONIC Chairman, and Carlos Bernados, professor at Universidad Carlos III Madrid, the 5TONIC Vice-chairman, substituting David del Val and Arturo Azcorra, respectively.

The objective of 5TONIC is to create a global open environment where members from industry and academia work together in specific research and innovation projects related to 5G technologies with a view to boost technology and business innovative ventures. The laboratory promotes joint project development and entrepreneurial ventures, discussion fora, events and conference sites, all in an international environment oriented to achieve the highest technological impact in the area of 5G.

5G networks are considered the gateway to the age of "intelligent everything" that awaits us. The development of 5G and its evolution towards 6G has thus become a landmark in the global competition for technological leadership.

5TONIC will serve to show the capabilities and interoperation of pre-commercial 5G equipment, services and applications by leading global companies in the 5G arena. Apart from the initial members, 5TONIC welcomes new members to join and gain from the benefits of an advanced research and innovation laboratory, oriented to research, debate, field-testing and demonstration of all technologies and equipment to support 5G communications, services and applications.

The main 5TONIC Research & Innovation Laboratory site is located at IMDEA Networks. The Institute is one of the main leaders at European level in the field of 5G and 6G networks. Among 5G European research projects supported by the lab are the ongoing 5G Induce, AI@Edge, and Hexa-X.

5TONIC Members

Telefónica

iMdea institute networks

ERICSSON

intel

COMMSCOPE

uc3m

Capgemini engineering

INTERDIGITAL

5TONIC Collaborators

NOKIA

ASTI
MOBILE ROBOTICS
Transforming the future together

DeepSight AILabs

ROHDE&SCHWARZ

celling
5G solutions

innovalia

U TEK

Telcaria

Fivecomm

New 5TONIC Collaborators

ybvr
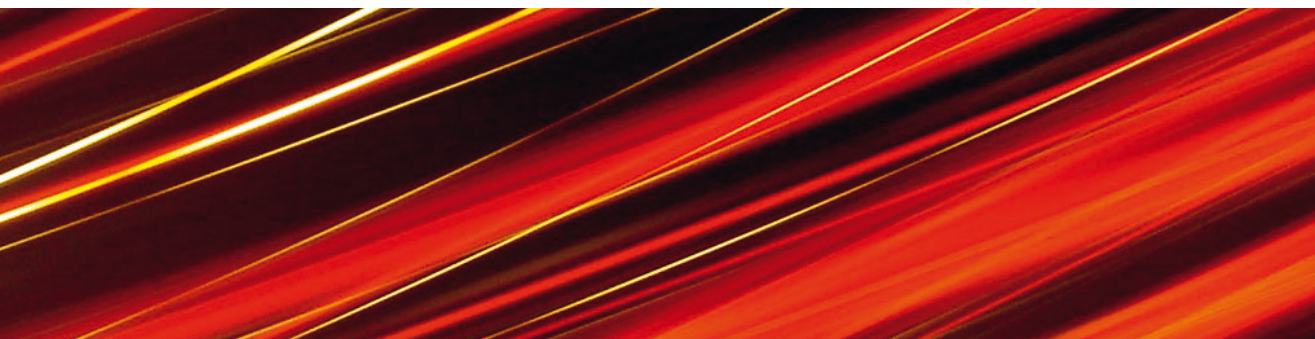
6.2.3 Industry partners

Our technology transfer activities have led to a significantly increased portfolio of companies we collaborate with. During 2022, they were the following:

ABI Lab: Ricerca e innovazione per il settore bancario

ADLINK Technology SARL
Asociatia InfoCons (ICNS)

Battioli Paola Società

Agricola S.S.

COSMOTE Kinites Tilepikoinonies

F-Secure Oyj

Fondazione Mondo Digitale

Ford Otomotiv Sanayi Anonim Sirketi

Fundación Cibervoluntarios (CIB)

Fundación Vithas

Hellenic telecommunications organization S.A.

Interuniversity Microelectronics Centre (IMEC)

IoT Lab

LightBee SL

Mycronic AB

NEC Europe Ltd.

Nokia Bell Labs

Nokia Ireland Limited

Ozyegin Universitesi

pureLiFi Ltd.

Ranplan Wireless Networks Design LTD.

Software Radio Systems Limited

Telefónica I+D

The Circle Società Agricola a Responsabilità Limitata

Toshiba Research Europe Ltd.

Tree Technology S.A.

Trilateral Research Ltd (TRI)

Warrant Hub

WINGS ICT Solutions

We continue to build firm relationships and sound collaborative arrangements with these companies and other key players in the field, including various regional, national and international bodies.

personnel

7

annual report

2022

www.networks.imdea.org

director

(Vacancy)

The Director is the CEO of the Institute. He is appointed by the Board of Trustees amongst scientists with a well-established international reputation in computer networking. The Director fosters and supervises the activities of IMDEA Networks Institute, and establishes the distribution and application of the available funds in accordance with the Institute's strategic goals and within the limits established by the Board of Trustees. The Director reports regularly to the Board. He is aided by the Scientific Council in determining the scientific research strategy and associated policies. The Deputy Director, the Research Director and the General Manager also assist the Director.

deputy director

The Deputy Director provides assistance to the Director in the fostering and supervision of the scientific activities of the Institute and of its administrative management.

Dr. Albert BANCHS
Deputy Director
(acting Director)

Research: Beyond 5G; Mobile Networks; Network Algorithms and Protocols; Smart Networks; Computational-aware networking
Personal Site

Short Bio
Dr. Albert Banchs received his M.Sc. and Ph.D. degrees from the Polytechnic University of Catalonia (UPC-BarcelonaTech) in 1997 and 2002, respectively. He is currently a Full Professor with the University Carlos III of Madrid (UC3M), with double affiliation as Deputy Director of the IMDEA Networks institute. Before joining UC3M, he was at ICSI Berkeley in 1997, at Telefonica I+D in 1998, and at NEC Europe Ltd. from 1998 to 2003. He was an Academic Guest at ETHZ in 2012, a Visiting Professor at EPFL in 2015 and 2013 and a Fulbright scholar at University of Texas at Austin in 2019. Prof. Banchs authors over 150 publications in international conferences and journals, and is the co-inventor of several patents.

research professors

Research Professors are our most published and cited researchers. They are recognized and respected leaders in their field of research. They have already made a difference. Their expertise and research interests have a significant impact on the Institute's scientific output and on the careers of their charges.

Dr. Joerg WIDMER
Research Professor (tenured) & Research Director

Research: Wireless Networking; Millimeter-Wave Communication; Wireless Sensing and Localization; Mobile Network Architectures
Personal Site

Short Bio

Dr. Joerg Widmer is Research Professor and Research Director of IMDEA Networks in Madrid, Spain. Before, he held positions at DOCOMO Euro-Labs in Munich, Germany and EPFL, Switzerland. His research focuses on wireless networks, ranging from extremely high frequency millimeter-wave communication and MAC layer design to mobile network architectures. He authored more than 200 conference and journal papers, 3 IETF RFCs, and 13 patents. He received an ERC consolidator grant, the Friedrich Wilhelm Bessel Award of the Humboldt Foundation, a Ramon y Cajal grant, as well as nine best paper awards. He is Fellow of the IEEE and Distinguished Member of the ACM.

Dr. Marco AJMONE MARSAN
Research Professor

Research: Network performance analysis; Energy-efficient networking
Personal Site

Short Bio

Marco Ajmone Marsan is a part-time research professor at the IMDEA Networks Institute. From 1974 to 2021 he was at the Politecnico di Torino, in the different roles of an academic career, with an interruption from 1987 to 1990, when he was a full professor at the Computer Science Department of the University of Milan. He obtained degrees in EE from the Politecnico di Torino and the University of California, Los Angeles (UCLA).

Dr. Suman BANERJEE
Research Professor

University of origin: University of Wisconsin-Madison. WI. USA

Short Bio

Suman Banerjee received the undergraduate degree from IIT Kanpur in computer science and engineering and was a gold medalist in his graduating class, and the MS and PhD degrees from the University of Maryland. His PhD dissertation was the university's nomination for the ACM Doctoral Dissertation Award. He is a professor in computer sciences with UW-Madison where he is the founding director of the WiNGS laboratory, which broadly focuses on research in wireless and mobile networking systems. While at Wisconsin, he received the CAREER award from the US National Science Foundation and the inaugural Rockstar Award from ACM SIGMOBILE for early career achievements and contributions in his field. He has authored more than 100 technical papers in leading journals and conferences in the field, including the ACM/IEEE Transactions on Networking, the ACM/IEEE Transactions on Mobile Computing, ACM Sigcomm, ACM MobiCom, IEEE Infocom, ACM MobiSys, ACM CoNEXT, ACM IMC, IEEE Dyspan, and more. It also includes various award papers from conferences such as ACM MobiCom, ACM CoNEXT, and IEEE Dyspan. He served as the chair of ACM SIGMOBILE between 2013 and 2017. He is a member of the IEEE.

Dr. Antonio FERNÁNDEZ ANTA
Research Professor

Research: Communications and Networks; Parallel and Distributed Processing; Algorithms; Discrete and Applied Mathematics; Distributed Ledgers; Data Analysis
Personal Site

Short Bio

Antonio Fernández Anta is a Research Professor at IMDEA Networks. Previously he was a Full Professor at the Universidad Rey Juan Carlos (URJC) and was on the Faculty of the Universidad Politécnica de Madrid (UPM), where he received an award for his research productivity. He was a postdoc at MIT from 1995 to 1997, and spent sabbatical years at Bell Labs Murray Hill and MIT Media Lab. He has been awarded the Premio Nacional de Informática "Aritmel" in 2019 and is a Mercator Fellow of the SFB MAKI in Germany since 2018. He has more than 30 years of research experience, and more than 200 scientific publications. He was the Chair of the Steering Committee of DISC and has served in the TPC of numerous conferences and workshops. He received his M.Sc. and Ph.D. from the University of SW Louisiana in 1992 and 1994, respectively. He completed his undergraduate studies at the UPM, having received awards at the university and national level for his academic performance. He is a Senior Member of ACM and IEEE.

Dr. Marco FIORE
Research Associate

Research: Mobile Networks, Data Science, Network Intelligence
Personal Site

Short Bio

Marco Fiore is a Research Professor at IMDEA Networks Institute, Spain. He received MSc degrees from University of Illinois at Chicago, USA, and Politecnico of Torino, Italy, a PhD degree from Politecnico di Torino, Italy, and a Habilitation à Diriger des Recherches (HDR) from Université de Lyon, France. Marco has been a Maître de Conférences (Associate Professor) at Institut National des Sciences Appliquées (INSA) de Lyon, France, Associate Researcher at Inria, France, Researcher at Consiglio Nazionale delle Ricerche, Italy, and visiting researcher at Rice University, USA, Universitat Politècnica de Catalunya, Spain, and University College London, UK. He is a former Marie Curie fellow and Royal Society visiting research fellow, and he is a Senior Member of IEEE, and a Member of ACM. Marco's research interests are in subjects at the interface of mobile networks and data science.

Dr. Nikolaos LAOUTARIS
Research Professor

Research: Privacy; Transparency/Data Protection; Economics of Networks and Information; Intelligent Transportation; Distributed Systems; Protocols; Network Measurements
Personal Site

Short Bio
Dr. Nikolaos Laoutaris is a research professor at IMDEA Networks Institute in Madrid. Prior to that, he was director of data science at Eurecat and chief scientist of the Data Transparency Lab, which he co-founded in 2014 during his 10-year tenure as a researcher and senior researcher of Telefonica Research in Barcelona. Before Telefonica, he was a postdoc fellow at Harvard University and Marie Curie postdoc fellow at Boston University. He got his PhD in computer science from the University of Athens in 2004.

research associate professors

Research Associate Professors are typically researchers with several years' experience who assume a position of responsibility in leading the day-to-day activities of our research teams.

Dr. Domenico GIUSTINIANO
Research Associate Professor

Research: Low Power LiFi for IoT; Large-scale Spectrum Monitoring and Analytics; 5G and Beyond Localization Systems
Personal Site

Short Bio
Dr. Domenico Giustiniano is Research Associate Professor (tenured) at IMDEA Networks Institute and leader of the Pervasive Wireless System Group. Dr. Giustiniano is leader of the OpenVLC project, an open-source platform for research in visible light communication networks and co-founder of the non-profit Electrosense association, a crowd-sourcing initiative to collect and analyse spectrum data. Before joining IMDEA, he was a Senior Researcher and Lecturer at ETH Zurich. He also worked for a total of four years as Post-Doctoral Researcher in industrial research labs (Disney Research Zurich and Telefonica Research Barcelona). He holds a PhD in Telecommunication Engineering from the University of Rome Tor Vergata (2008), and Executive Education from IE Business School on Management Fundamentals and Skills for Scientists and Researchers (2021).

The original contributions Dr. Giustiniano has made to his field of research are exemplified by publications in international and highly competitive conference venues such as ACM MobiCom (3), ACM Mobisys (2), ACM CoNEXT (9), IEEE INFOCOM (3), ACM/IEEE IPSN (5), ACM HotNets, and journals such as IEEE Journal on Selected Areas in Communications (2), IEEE/ACM Transactions on Networking (3) and IEEE Transactions on Wireless Communications. He has been general co-chair of EWSN 2018 and of IFIP/IEEE SustainIT 2015, and regularly serves as TPC member in top conferences. He is the project coordinator of the H2020 European Training Network ENLIGHT'EM on low-energy Visible Light Communication for IoT (2019-2023). Dr. Domenico Giustiniano is senior member of IEEE and ACM societies.

Dr. Sergey GORINSKY
Research Associate Professor

Research: Computer Networks; Distributed Systems; Network Economics
Personal Site

Short Bio

Dr. Sergey Gorinsky is with IMDEA Networks Institute since 2009 and leads the NetEcon (Network Economics) research group. Between 2010 and 2014, he was a Ramón y Cajal Fellow funded by the Government of Spain. From 2003 to 2009, Dr. Gorinsky served on the tenure-track faculty at Washington University in St. Louis, USA. He received his Ph.D. and M.S. degrees from the University of Texas at Austin, USA in 2003 and 1999 respectively and Engineer degree from MIET (Moscow Institute of Electronic Technology), Zelenograd, Russia in 1994. Dr. Gorinsky distinguished himself through extensive service to the profession, such as TPC chairing of ICNP 2017, general chairing of SIGCOMM 2018 and ICNP 2020, and membership in the TPCs of SIGCOMM 2012, 2016, 2022, NSDI 2024, and other major conferences. He won the Distinguished TPC Member Award of the INFO-COM conference for the record 7 times. Dr. Gorinsky also evaluated research proposals for the European Research Council, European Commission, COST Association, Swiss National Science Foundation, Israel Science Foundation, and other funding agencies.

Dr. Vincenzo MANCUSO
Research Associate Professor

Research: Performance Evaluation; Efficient and sustainable wireless access and edge networks; Network-embedded machine learning; Edge-assisted autonomous driving; Design of opportunistic and sliced mobile networks; Measurements and assessment of mobile networks
Personal Site

Short Bio

Dr. Vincenzo Mancuso is tenured Research Associate Professor at IMDEA Networks Institute, Madrid, Spain. Previously, he was with INRIA (Sophia Antipolis, France), Rice University (Houston, TX, USA) and University of Palermo (Italy), from where he obtained his MSc and PhD. He authored more than 150 peer-reviewed publications focusing on the analysis, design, and experimental evaluation of opportunistic and adaptive protocols and architectures for wireless and edge networks. He is currently working on analysis and optimization of wireless access/edge networks, which includes measurements and assessment of mobile networks and services, and on the use of machine learning techniques for the identification of the causes of network performance problems and for the distributed allocation of communication and computing resources to networked cyber-physical systems.

Dr. Narseo VALLINA-RODRÍGUEZ
Research Associate Professor

Research: Cybersecurity, Network Measurements, Privacy
Personal Site

Short Bio

Narseo Vallina (Ph.D. at Cambridge University) is an Associate Research Professor at IMDEA Networks where he leads the Internet Analytics Group (IAG). He is also one of AppCensus' co-founders. Narseo's research interests fall in the areas of network measurements, security and privacy, and digital rights. Before joining IMDEA, he was a research scientist at ICSI at Berkeley (USA). Narseo's research efforts received best paper awards at prestigious conferences such as IEEE Symposium on S&P, USENIX Security, and ACM IMC, amongst others. For his contributions, he has been selected as ACM Senior Member and a Ramon y Cajal Fellow in 2021. Moreover, Data Protection Agencies and key industry players have recognized the societal, regulatory and technical value of his work. He has received distinctions such as a Google Faculty Fellowship, the AEPD Emilio Aced Award, the CNIL-INRIA Privacy Protection Award, the Caspar Bowden PETS Award, and the IETF/IRTF Applied Networking Research Award.

research assistant professors

Research Assistant Professors at IMDEA Networks Institute are bright researchers at the beginning of their research career, who want to establish a strong research group based on their research vision. They lead their own team of PhD Students and post-doctoral researchers and collaborate with top Research Associate Professors. Research Assistant Professors are not required to teach, so they can focus full-time on research if they so wish.

Dr. Jaya Prakash Varma CHAMPATI
Research Assistant Professor

Research: Edge Intelligence, Quantum Networking
Personal Site

Short Bio

Jaya Prakash Champati is an Assistant Professor at IMDEA Networks Institute, where he leads the Edge Networks group. His general research interest is in the scheduling of communication and computation for emerging applications in edge computing systems, Internet of Things (IoT), and Cyber-Physical Systems (CPS). Prior to joining IMDEA, he was a post-doctoral researcher in the division of Information Science and Engineering, EECS, KTH Royal Institute of Technology, Sweden. He obtained his PhD in Electrical and Computer Engineering from the University of Toronto, Canada in 2017, and his master of technology degree from the Indian Institute of Technology (IIT) Bombay, India in 2010. Prior to joining PhD, he worked at Broadcom Communications, where he contributed to the LTE MAC layer development. He was awarded the prestigious Marie Skłodowska-Curie Actions (MSCA) postdoctoral fellowship, 2021, and he was a recipient of the best paper award at IEEE National Conference on Communications, India, 2011.

Dr. Guillermo SUÁREZ-TANGIL
Research Assistant Professor

Research: Cibersecurity and Cibercrime; Malware Analysis; Mass marking fraud; security and privacy in the social web
Personal Site

Short Bio

Guillermo Suarez-Tangil is Assistant Professor IMDEA Networks and a Ramon y Cajal Fellow. His research focuses on modeling emerging threats in online communities and ing effective mitigation strategies. His background is on systems security and malware analysis and detection. In particular, in the study of smart malware, ranging from the detection of advanced obfuscated malware to automated analysis of targeted malware. Guillermo has been Assistant Professor at King's College London (KCL). Before joining KCL, he has been senior research associate at University College London (UCL) where he has explored the use of program analysis to study malware. He has also been actively involved in other research directions aiming at detecting and preventing of MassMarketing Fraud (MMF) and security and privacy in the social web. Prior to that, he held a post-doctoral position at Royal Holloway, University of London (RHUL) where he was part of the development team of CopperDroid, a tool to dynamically test malware that uses machine learning to model malicious behaviors. He also holds a solid expertise on building novel data learning algorithms for malware analysis. He obtained his PhD on smart malware analysis in Carlos III University of Madrid with distinction and received the Best National Student Academic Award, a competitive award given to the best Thesis in the field of Engineering between 2014-2015 with about 1% acceptance rate (about 100 Cum Laude Thesis were invited to compete for the only award).

post-doc researchers

Post-doctoral Researchers at IMDEA Networks Institute are early-stage, post-doctorate researchers who are looking to establish their research career, working with top research professors and a team of young, pre-doctorate researchers (PhD students).

Dr. Jose AGUILAR
Post-Doc Researcher

Research: Artificial intelligence; parallel and distributed systems; control systems; combinatorial optimization
Personal Site

Short Bio
Jose Aguilar received the B. S. degree in 1987 (Universidad de Los Andes-Venezuela), the M. Sc. degree in 1991 (Universite Paul Sabatier-France), and the Ph.D degree in 1995 (Universite Rene Descartes-France). He was a Postdoctoral Research Fellow in the Department of Computer Sciences at the University of Houston (1999-2000), and of the H2020-MSCA-COFUND-EU programme in the Department of Automática at the Universidad de Alcala (2020-2022). He has been full Professor at the Universidad de Los Andes, Venezuela, and EAFIT University, Medellín, Colombia. He is a Senior Researcher at IMDEA (Madrid Institute for Advanced Studies), in Madrid, Spain. He is member of the Mérida Science Academy and President of CLEI (Centro Latinoamericano de Estudios en Informática). He has published more than 650 papers and 10 books in journals, books and proceedings of international conferences. Dr. Aguilar has been a visiting research/professor in different universities/laboratories, coordinator or inviting research in more than 20 research/industrial projects, and supervised more than 20 Doctoral Thesis.

Dr. Constantine AYIMBA
Post-Doc Researcher

Research: Machine Learning; Cloud/Edge Computing; Explainable Artificial Intelligence; Connected vehicles
Personal Site

Short Bio
Constantine is a Post-Doc Researcher at IMDEA Networks Institute. He received his PhD. in Telematics Engineering in 2022 from University Carlos III in Madrid and an MSc. in Wireless Communication from Lund University in 2015. His research interests are at the intersection of network services and machine learning. He has several years professional experience working in the telecommunication industry in Sub Saharan Africa.

Dr. Antonio BAZCO-NOGUERAS
Post-Doc Researcher

Research: Edge Computing; Machine Learning; Wireless Networking; Information theory
Personal Site

Short Bio
Dr. Antonio Bazco-Nogueras is a postdoctoral researcher at IMDEA Networks Institute and recipient of the "Atracción de Talento" grant. He joined both the Network Data Science group and the Opportunistic Architectures Lab in 2021. His research is currently focused on embedding intelligence in the network and studying explainable and energy-efficient ML/AI solutions tailored for communications, and his research interests include distributed systems, information theory, Artificial Intelligence, and probability theory. He obtained a Ph.D. degree in Telecommunications from Sorbonne Université in 2019. Before joining IMDEA, he was a post-doctoral researcher at EURECOM (France) from 2020, and previously he was a predoctoral researcher at Mitsubishi Electric R&D Centre Europe (France) from 2016 to 2019. He was also a Visiting Scholar with the Center for Pervasive Communications and Computing (CPCC) at University of California–Irvine.

Dr. Elisa CABANA
Post-Doc Researcher

Research: Machine Learning; Statistics; Robust data analysis; Outlier detection; Mobile network data; Watermarking; Data economics
Personal Site

Short Bio
Elisa holds a PhD in Mathematical Engineering by the University Carlos III of Madrid (UC3M). Before that she finished her Lic. degree in Mathematics and the master program at UC3M. She also worked as an Assistant Professor in the Statistics lecture in UC3M during the PhD. Elisa's research gives rise to a new methodology for outlier detection, robust regression, robust classification and quality control, with advantageous performance in case of high dimensional data and high levels of contamination, with application in neuroscience, environmental studies, health and other fields. Her work resulted in several presentations at both national and international congresses and research papers published in Scientific Journals of high quality. Now she is a post-doctoral researcher at the IMDEA Networks Institute in Madrid, in the Data Transparency Lab. Her current research interests include: ML, AI and Privacy-Preserving Anomaly Detection. She is focused now in various areas of applications: the study of mobility information from mobile network data to estimate the evolution and risk of epidemics, the study of how to improve watermarking techniques for protecting ownership rights in datasets, and also the development of trustworthy, fair and robust data economics.

Dr. Livia Elena CHATZIE-LEFTHERIOU
Post-Doc Researcher

Research: Optimization, algorithms; eXplainable Artificial Intelligence (XAI); Online Learning (OL); Network Intelligence (NI)
Personal Site

Short Bio
Dr. Livia Elena Chatzieleftheriou is a postdoctoral researcher at IMDEA Networks Institute. Her background is in applied mathematics. She was awarded my Ph.D. in computer science, working on resource allocation, content recommendations, and Online Learning (OL) mechanisms for mobile edge networks after presenting her work in top-tier conferences and journals in her field.

Her current interests span a variety of tools and techniques from math (e.g. optimization, algorithms and queueing theory), eXplainable Artificial Intelligence (XAI) and OL, and emerging technologies/applications, such as Autonomous Vehicles (AV), O-RAN, and traffic forecasting for 6G networks. Overall, she enjoys mixing-and-matching traditional and arising techniques, and trendy apps, aiming at the design of innovative approaches towards native Network Intelligence (NI) and automation for future networks.

Dr. Claudio FIANDRINO
Post-Doc Researcher

Research: AI/ML for network optimization; 5G Networks; Edge computing
Personal Site

Short Bio
Claudio Fiandrino is a postdoctoral researcher at IMDEA Networks Institute. He obtained his Ph.D. degree at the University of Luxembourg in 2016 and the B.Sc. and M.Sc. both from Politecnico di Torino, Italy in 2010 and 2012 respectively. Claudio has received numerous awards for his research, including a Fulbright scholarship in 2022, a 5-year long Spanish Juan de la Cierva grants and several Best Paper Awards. He is member of IEEE and ACM, serves in the Technical Program Committee (TPC) of several international IEEE and ACM conferences and regularly participates in the organization of events. Claudio is member of the Editorial Board of IEEE Networking Letters and Chair of the IEEE ComSoc EMEA Awards Committee. His primary research interests include explainable and robust AI for mobile networks, next generation mobile networks, and multi-access edge computing.
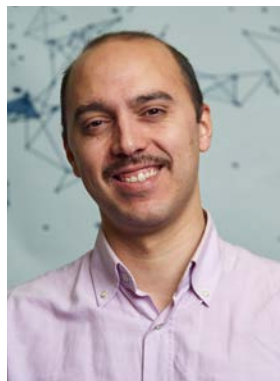
Dr. Álvaro GARCÍA-RECUERO
Post-Doc Researcher

Research: Distributed Systems; Complex Networks; Security and Privacy; Federated Learning
Personal Site

Short Bio
Dr. Alvaro Garcia is a postdoctoral researcher working in Federated Learning and Privacy at IMDEA Networks Institute of Madrid. He holds a Ph.D. in Computer Science by Université de Rennes 1 (UR1), developed at the French National Research Institute of Informatics and Automatics since 2017. His PhD dissertation proposes a privacy-preserving design of a protocol for abuse detection over the Internet, namely decentralised Private Set Intersection (dPSI) by using BLS digital signatures, while Data Minimisation is employed for achieving reduced protocol runtime in future decentralised deployments. In the past, he has worked at different R&D laboratories in Europe doing state of the art work in Big Data (INESC-ID Lisboa), Privacy (INRIA) and even Networks as a visiting postdoctoral scholar in Queen Mary University of London in UK. He is part of the PIMCity project and oversees the development of the data provenance components of IMDEA Networks, which recently led to the publication of a joint article at IEEE Internet Computing named "A PIMS Development Kit for New Personal Data Platforms" (DOI: 10.1109/MIC.2022.3157356).

Dr. Augusto GARCÍA
Post-Doc Researcher

Research: Artificial Intelligence in Medicine
Personal Site

Short Bio
Augusto Garcia-Agúndez studied Industrial Engineering at Universidad Politecnica de Madrid and completed his PhD in electronic engineering at TU Darmstadt. Currently, he is a postdoctoral researcher in Antonio Fernandez Anta's Global Computing group residing at Brown University as part of a Marie Skłodowska-Curie Global Fellowship Action.

Dr. Borja GENOVÉS-GUZMÁN
Post-Doc Researcher

Research: Next Generation Wireless Networks; Visible Light Communication (VLC); LiFi; Mobile Communications
Personal Site

Short Bio
Postdoctoral researcher (granted with Juan de la Cierva - Formación) in the Pervasive Wireless Systems Group of IMDEA since September 2019. In 2019 I received a Ph.D. degree in the University Carlos III of Madrid. During my Ph.D. studies I was a visiting scholar in Southampton University and The University of Edinburgh. I have participated in several European and national projects, and I received the First Prize in Graduation National Awards from the Ministry of Education, Culture and Sports of Spain. My research interests include visible light communication, Internet of Things, low-power wireless communications and mobile communications.

Dr. Michele GUCCIARDO
Post-Doc Researcher

Research: Network Programmability, Network Intelligence, Beyond 5G
Personal Site

Short Bio
Michele Gucciardo is a postdoctoral researcher at IMDEA Network Institute, Spain. He received his B.Sc. and M.Sc. degrees in Telecommunications engineering respectively from Politecnico di Milano, Italy, and from the University of Palermo, Italy. He received a Ph.D. in ICT from the University of Palermo, Italy. His research activity has focused on wireless networks, with an interest on IoT access networks. More recently, he has focused on ML in programmable data planes for beyond 5G systems.

Dr. Timothy OTIM
Post-Doc Researcher

Research: Positioning and navigation systems; mobile communications; channel modelling; transportation research; statistical modelling
Personal Site

Short Bio
In 2021, Timothy Otim worked as a Post-Doc Researcher at the German Aerospace Centre (DLR) in Wessling, Germany. Currently, he is working as a Post-Doc Researcher on 5G positioning at IMDEA Networks Institute in Madrid, Spain.

Dr. Marius PARASCHIV
Post-Doc Researcher

Research: Quantum Communications, Network-Based Quantum Machine Learning, Distributed Quantum Computation
Personal Site

Short Bio
Joined the Human Centric Data Economy group of Prof. Nikolaos Laoutaris in April 2019. His primary research interests are in geometric deep learning (application of machine learning algorithms to graph data). Prior to this, he has worked on a series of projects and collaborations with other IMDEA faculty members, including a comprehensive study of domain classification services and their relative inconsistencies as well as producing a computer vision model. A second research interest is related to the notions of "data value" and the value of individual data providers to a particular service, from an economic but also an information-theoretic perspective.

Dr. Juan Marcos RAMIREZ
Post-Doc Researcher

Research: Interpretable Models; Machine Learning; Mobile Networks
Personal Site

Short Bio
Juan Marcos Ramírez Rondón received the B.S. diploma in electrical engineering, the Master's degree in biomedical engineering, and the Doctor's degree in applied sciences at the Universidad de Los Andes (ULA), Mérida, Venezuela, in 2002, 2007, and 2017, respectively. In 2004, he joined as a teaching and research staff of the Electrical Engineering Department at ULA, Venezuela. He worked as a postdoctoral intern at the High Dimensional Signal Processing (HDSP) Group, Universidad Industrial de Santander, Colombia (2017-2019). He also worked as Marie Curie Postdoctoral fellow at the Universidad Rey Juan Carlos (2017-2019). Currently, he is working as a Postdoctoral Researcher at IMDEA Networks Institute.

Dr. Giuseppe SANTAROMITA
Post-Doc Researcher

Research: Wireless Networks; 5G; Localization
Personal Site

Short Bio
Dr. Giuseppe Santaromita joined the Pervasive Wireless Systems Group led by Dr. Domenico Giustiniano at IMDEA Networks in May 2020. He received his Ph.D. in Information and Communication Technologies at the University of Palermo (Italy), with a focus on physical layer flexibility to improve the performance of high-capacity and ultra-dense wireless networks. He is a member of IEEE and ACM. His main research interest at IMDEA involves low latency-high accuracy localization methods for wireless networks, and the implementation of an experimental 5G New Radio framework able to collect useful measurements for positioning.

Dr. Syed WAQAS HAIDER SHAH
Post-Doc Researcher

Research: 5G and beyond cellular networks; device-to-device communication; reconfigurable intelligent surfaces; analytical analysis of mobile networks; quality-of-service provisioning
Personal Site

Short Bio
Syed is a Marie Skłodowska-Curie Actions postdoctoral fellow at IMDEA Networks, Madrid, Spain. He joined the Wireless Networking Group in September 2022. He received a master's degree in electrical engineering from the National University of Science and Technology, Islamabad, Pakistan in 2016, and a Ph.D. degree in electrical engineering from Information Technology University, Lahore, Pakistan in 2021. From 2019 to 2021, he was a split-site Ph.D. Scholar with the Computer Laboratory, Department of Computer Science and Technology, University of Cambridge, UK, where he worked under the supervision of Prof. Jon Crowcroft. He has published in highly reputed venues, such as IEEE *INFOCOM*, *IEEE ICC*, *IEEE Wireless Communication Letters*, *IEEE Transactions on Vehicular Technology*, *IEEE Transactions on Green Communication and Networking*, *Elsevier Computer Networks*, and *Transactions on Emerging Telecommunication Technologies*. He is also a reviewer of many international journals and conferences.

visiting professors/researchers

Visiting Professors share our research interests and spend their sabbatical with us for either one or two terms. They usually have several years' post-doctoral research experience and are interested in extending their horizons with a temporary assignment in a new environment.

Dr. Leonardo BADIA

University of origin: University of Padova, Italia

Short Bio

Leonardo Badia received both the Laurea degree (summa cum laude) in electrical engineering and the Ph.D. in information engineering (with highest mark) from the University of Ferrara, in 2000 and 2004, respectively. In March 2011 he joined the faculty of the University of Padova, where he is presently an Associate Professor. Leonardo Badia also held several research and teaching collaborations at various titles (lecturing and/or participations to research projects) with the Italian Universities of Padova, Pisa, Ferrara, the IMT Advanced Studies Institute in Lucca, and the Consorzio Ferrara Ricerche, Italy. He is author of more than 170 scientific papers published in international peer-reviewed journals or conferences.

Dr. Markus FIDLER

University of origin: Leibniz University Hannover, Germany

Short Bio

Markus Fidler is a professor for communications networks and the director of the Institute of Communications Technology at Leibniz University Hannover, Germany. After graduating in electrical engineering in 1997 from RWTH Aachen University, he was a systems engineer in mobile communications at Hagenuk Telecom and at Alcatel SEL. In 2004 he received his doctoral degree in computer engineering from RWTH Aachen University. As a postdoctoral researcher, he worked at the Institute Mittag-Leffler at KTH Stockholm, at NTNU Trondheim, the University of Toronto, and TU Darmstadt, where he received his habilitation degree in communications networks end of 2008. He was admitted to the Emmy Noether programme of the German Research Foundation in 2005 and he was awarded a Starting Grant of the European Research Council in 2012.

Dr. Matthias HOLLICK

University of origin: Technical University of Darmstadt, Germany

Short Bio

Matthias Hollick is a Full Professor of Computer Science at the Technical University of Darmstadt where he is heading the Secure Mobile Networking Lab (SEEMOO) since 2009. He is co-affiliated with the Department of Electrical Engineering and Information Technology Department. His research has been published at top venues such as ACM CoNEXT, ACM IMWUT, ACM MobiCom, AMC MobiSys, ACM Sigmetrics, ACM WiSec, EWSN, IEEE ComST, IEEE JSAC, IEEE Infocom, IEEE JioT, IEEE S&P, IEEE TMC, IEEE/ACM ToN, NDSS, PETS, USENIX Security, and other renowned venues in the topic area of mobile and wireless systems as well as cybersecurity and privacy.

The research of Prof. Hollick's team has been awarded with more than 15 best paper and demo awards including at ACM CHI, ACM MobiCom, ACM IMWUT, EWSN, ACM WiSec, and IEEE DOCSS in recent years. The results of his research found their way into numerous highly visible open source software projects.

Dr. Christian QUADRI

University of origin: University of Milan, Italy

Short Bio

Christian Quadri is Assistan Professor (RTD-A) at the Computer Science Dept. of the University of Milan. He is member of CONNETS Lab. His current research interests focus on resource allocation in MEC/FOG-computing environments and mobile services to support autonomous and remote driving.

Dr. Andrei COSTIN

University of origin: University of Jyväskylä (Central Finland)

Short Bio

Dr. Andrei Costin is currently a Senior Lecturer/Assistant Professor in Cybersecurity at University of Jyväskylä (Central Finland), with a particular focus on IoT/firmware cybersecurity and Digital Privacy. He received his PhD in 2015 from EURECOM/Telecom Paris-Tech under co-supervision of Prof. Francilon and Prof. Balzarotti. Dr. Costin has been publishing and presenting at more than 45 top international cybersecurity venues, both academic (Usenix Security, ACM ASIACCS, etc.) and industrial (BalckHat, CCC, HackInTheBox, etc.). He is the author of the first practical ADS-B attacks (BlackHat 2012) and has literally established the large-scale automated firmware analysis research areas (Usenix Security 2014) – these two works are considered seminal in their respective areas, being also most cited at the same time. Dr. Costin is also the CEO/co-founder of Binare.io, a deep-tech cybersecurity spin-off from University of Jyväskylä, focused on innovation and tech-transfer related to IoT cybersecurity.

pre-doc researchers

Our PhD Students are young, aspiring researchers who occupy a salaried position in our research team whilst undertaking their Ph.D. at a leading Madrid University for up to five years. Most of these pre-doc researchers enter the Ph.D. program at University Carlos III of Madrid (UC3M). IMDEA Networks Institute has a far-reaching collaboration agreement with UC3M, which includes the provision of a Postgraduate program for our early-stage researchers. In the future, we may have similar arrangements with other Madrid Universities.

IMDEA Networks research team of postdocs, pre-doctoral researchers, engineers and internship students

Aristide Tanyi Jong AKEM
Pre-Doc Researcher

BSc: Telecommunications Engineering - University of Yaounde I. Yaounde, Cameroon
MSc: Electrical and Computer Engineering - Carnegie Mellon University Africa. Kigali, Rwanda
Previous Position: Graduate Teaching Assistant, Carnegie Mellon University Africa, Kigali, Rwanda
Research: Machine Learning; Programmable Networks; Network Intelligence

Ghina AL ATAT
Pre-Doc Researcher

BSc: Physics with minors in Mathematics, Computer Science, and Computational Science - American University of Beirut (AUB). Beirut, Lebanon.
MSc: Computational Science – AUB. Beirut, Lebanon.
Previous Position: Research Assistant at Suliman S. Olayan School of Business, AUB, Beirut, Lebanon. Teaching Assistant at Physics Department, AUB, Beirut, Lebanon.
Research: Learning at the Edge; Edge Computing; Edge Intelligence; Design of Algorithms; Decision Making

Sergi ALCALÁ-MARÍN
Pre-Doc Researcher

BSc: Telecommunications Engineering - Universitat Politècnica de Catalunya. Spain
MSc: Advanced Telecommunication Technologies - Universitat Politècnica de Catalunya. Spain
Previous Position: Manager. Universitat de Barcelona. Spain
Research: Beyond 5g, Deep Learning, Wireless communications, Network performance analysis, Network performance measurement; Mobile networks

Santiago ANDRÉS
Pre-Doc Researcher

BSc: Telecommunication Engineering - Universidad Politécnica of Madrid. Madrid, Spain
Previous Position: Principal Consultant. Axon Consulting. Madrid, Spain
Research: Data Economics; Privacy; Transparency & Data Protection; Economics of Networks

Nikolaos APOSTOLAKIS
Pre-Doc Researcher

Integrated Master (BSc + MSc): Eletrical and Computer Engineering - National Technical University of Athens. Athens, Greece
Previous position: Network Software Engineer - Intracom Telecom. Paiania, Greece
Research: Network automation; Cloud orchestration; Deep Reinforcement Learning

Giulia ATTANASIO
Pre-Doc Researcher

BSc: Telecommunication Engineering - Politecnico di Torino. Turin, Italy
MSc: Communications and Computer Networks Engineering - Politecnico di Torino. Turin, Italy
Research: Low-latency communications; machine learning

Vinuri BANDARA
Pre-Doc Researcher

BSc: Information Systems - University of Colombo. Sri Lanka
MSc: Sofware and Systems - Universidad Politécnica de Madrid (UPM). Madrid, Spain
Previous Position: Research Engineer, Score Lab, Sri Lanka
Research: Android Privacy and Security; Network security

Miguel Ángel BERMEJO
Pre-Doc Researcher

BSc: Telecommunications Engineering - Universidad Politécnica de Madrid (UPM). Madrid, Spain
MSc: Data Science - Universitat Oberta de Catalunya (UOC). Barcelona, Spain
Previous Position: Telecommunications Engineer. Lisbon, Portugal
Research: Online advertising; Internet measurements; Data Analytics; Machine Learning

Beyza BÜTÜN
Pre-Doc Researcher

BSc: Computer Engineering - Middle East Technical University. Ankara, Turkey
MSc: Computer Engineering - Middle East Technical University. Ankara, Turkey
Research: Machine Learning, Programmable Networks, Sustainable Network Intelligence, Energy Consumption Measurements and Optimization

Tianyue CHU
Pre-Doc Researcher

BSc: Double Bachelor's Degree. Mathematics and Applied Mathematics & Finance - Shenzhen University. Shenzhen, China
MSc: Statistics - Shenzhen University. Shenzhen, China
Previous position: Research Assistant. Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences. Shenzhen. China
Research: Machine learning; Statistics

Alan COLLET
Pre-Doc Researcher

BSc: Engineering Sciences - Polytechnic Institute of Bordeaux. Bordeaux, France
MSc: Telecommunication Engineering - ENSEIRB-MATMECA. Bordeaux, France
MSc: Computer Sciences - Illinois Institute of Technology. Chicago, United States
Research: Apply AI to networks; network intelligence; intent-based networking

Sai Pavan DERAM
Pre-Doc Researcher

BSc: Electronics and communications engineering - SASTRA University. India
MSc: Communication and signal processing - TU Ilmenau, Germany
Previous position: Research Assistant. Communications Reseach Laboratory, TU Ilmenau, Germany
Research: mmWave communications, Physical layer signal processing, parameter estimation techniques

Sergio DÍAZ ARANDA
Pre-Doc Researcher

BSc: Mathematics – Complutense University. Madrid, Spain
MSc: Mathematics – Complutense University. Madrid, Spain
MSc: Statistical-Computational Treatment of Information – Complutense University. Madrid, Spain
Previous position: Research Assistant at the UC3M-Santander Big Data Institute, Madrid, Spain
Research: social networks; statistics; data science; discrete mathematics

Stavros ELEFTHERAKIS
Pre-Doc Researcher

BSc: Mathematics - University of Crete. Heraklion, Greece
MSc: Applied and Computational Mathematics - University of Crete. Heraklion, Greece
Previous position: Teaching Assistant. Department of Mathematics and Applied Mathematics. University of Crete
Research: Machine learning; Deep Learning; 5G Localization; Partial Differential Equations; Applied Statistics

Andrea FRESA
Pre-Doc Researcher

BSc: Computer Engineering - University Federico II. Naples, Italy
MSc: Computer Engineering - University Federico II. Naples, Italy
Previous Position: Master Thesis Worker. Ericsson Research. Jorvas, Finland
Research: Edge Computing; Edge Intelligence; Design of Algorithms; IoT

Dayrene FRÓMETA
Pre-Doc Researcher

BSc: Electronics and Telecommunication Engineering - Technological University of Havana José Antonio Echeverría (CUJAE). Havana, Cuba
MSc: Communication Systems - Pontifical Catholic University of Rio de Janeiro (PUC-Rio). Rio de Janeiro, Brazil
Previous Position: Lecturer. Department of Telematics, Technological University of Havana José Antonio Echeverría (CUJAE). Havana. Cuba
Research: Next Generation Wireless Networks; Visible Light Communication (VLC); LiFi systems; Millimeter-wave (mm-wave) systems

Vahid GHAFOURI
Pre-Doc Researcher

BSc: Industrial Engineering - Sharif University. Tehran, Iran
MSc: Business Analytics - Sabanci University. Istanbul, Turkey
Research: Polarization and Radicalization on Social Media

Khasa GILLANI
Pre-Doc Researcher

BSc: Information Technology - PMAS Arid Agriculture University Rawalpindi. Rawalpindi, Pakistan
MSc: Software Engineering - Sangmyung University. Seoul, South Korea
Previous position: Research Assistant - Sangmyung University. Seoul, South Korea
Research: 5Growth; Mobile Edge Computing (MEC)

Aniketh GIRISH
Pre-Doc Researcher

BSc: Computer Science - Amrita Vishwa Vidyapeetham. Kerala, India
MSc: Cybersecurity - University Carlos III de Madrid. Madrid, Spain
Previous position: Research Associate - IIJ Innovation Institute, Tokyo, Japan
Research: Privacy and Security; Regulatory Compliance; IoT

Nina GROSHEVA
Pre-Doc Researcher

BSc: Telecommunication and Information Engineering. Ss. Cyril and Methodius University. Skopje. North Macedonia
MSc: Communications Engineering - RWTH Aachen University. Aachen, Germany
Previous Position: Intern. German Aerospace Center. Oberpfaffenhofen, Germany
Research: Network Simulation (ns-3); Millimeter Wave Networking; Performance Analysis

Rita INGABIRE
Pre-Doc Researcher

BSc: Electrical Engineering - Makerere University. Kampala, Uganda
MSc: Information Systems - Makerere University. Kampala, Uganda
Previous Position: Senior Engineer. MTN Uganda
Research: Interpretable machine learning; Edge/Cloud design; Intelligent Network design

Devriş IŞLER
Pre-Doc Researcher

BSc: Computer Science and Engineering - Gaziantep Zirve University. Gaziantep, Turkey
MSc: Computer Science and Engineering - Koç University. stanbul, Turkey
Previous position: Research Assistant. KU Leuven. Leuven, Belgium
Research: Applied cryptography privacy; usable security; data transparency and protection

Yago LIZARRIBAR
Pre-Doc Researcher

BSc: Industrial Technologies Engineering - University of Navarra. San Sebastián, Spain
MSc: Mechanical Engineering - University of Navarra. San Sebastián, Spain
Previous Position: Research Assistant. Massachusetts Institute of Technology. Cambridge. MA. USA
Research: Collaborative Spectrum Sensing; Distributed Systems; Machine Learning

Leonardo LO SCHIAVO
Pre-Doc Researcher

BSc: Computer Science Engineering - Università degli Studi di Catania. Catania, Italy
MSc: Communications and Computer Networks Engineering - Politecnico di Torino. Turin, Italy
Previous position: Project Implementation Engineer at Amadeus IT Group. Nice. France
Research: Machine learning; 5G Networks; Network Slicing; Network Virtualization

Orlando E. MARTÍNEZ-DURIVE
Pre-Doc Researcher

BSc: Computer Science - University of Havana. Havana, Cuba
MSc: Computer Science - University of Havana. Havana, Cuba
Previous position: Researcher at the Faculty of Physics, University of Havana, Cuba
Research: Remote sensing; population estimation; land usage detection; mobile networks metadata

Amir MEHRJOO
Pre-Doc Researcher

BSc: Mechanical Engineering - Shiraz University. Shiraz, Iran
MSc: Business and Finance (Marketing Specialization) - University Carlos III of Madrid. Madrid, Spain
Previous position: Teaching Assistant. University Carlos III of Madrid. Spain
Research: Machine learning; Online Advertising; Data Analytics; Social Networks; Ad Transparency

Muhammad Sarmad Shahab MIR
Pre-Doc Researcher

BSc: Electronics Engineering - National University of Sciences and Technology. Islamabad, Pakistan
MSc: Smart Systems Integration - Titulación conjunta de la Universidad Heriot-Watt, UK, USN. Norway, BME. Hungary
Previous position: Working Student. Ovesco GmbH. Germany
Research: Wireless Sensor Networks; Visible light and Backscatter Communication; Smart Systems

Mariella MISCHINGER
Pre-Doc Researcher

BSc: Computer Science - Technical University of Munich. Munich, Germany
MSc: Computer Science - Technical University of Munich. Munich, Germany
Previous position: IT Product Owner / Project Manager at Unternehmer-TUM GmbH, Munich, Germany
Research: Cybersecurity; Malware; Crime; Fraud

Sachit MISHRA
Pre-Doc Researcher

BSc: Electronics and Communication Engineering - Jaypee University of Engineering and Technology. Guna, India
MSc: Computer Engineering - Politecnico di Torino. Turin, Italy
Previous position: Software Developer. Accenture Private Ltd.
Research: Mobile traffic analysis and modeling

Serly MOGHADAS GOLIAN
Pre-Doc Researcher

BSc: Electrical and Electronics Engineering – Urmia University of Technology (Urmia, Iran)
MSc: Communications Systems Engineering – Urmia University (Urmia, Iran)
Research: Explainable AI, Machine Learning, Mobile Networks

Bei OUYANG
Pre-Doc Researcher

BSc: Electrical and Information Engineering - Beijing Institute of Technology. Beijing, China
MSc: Electrical and Computer Engineering - Rice University. Houston, United States
Previous Position: Research Intern, Microsoft Research Asia, Shanghai, China
Research: Integrated Sensing and Communication; mmwave; wireless systems

Jesús PÉREZ-VALERO
Pre-Doc Researcher

BSc: Telematics Engineering - Technical University of Cartagena. Cartagena, Spain
MSc: Telecommunications Engineering - Technical University of Cartagena. Cartagena, Spain
Research: Mathematical Optimization; Statistical Modeling; Performance Analysis and Ultra-Reliable B5G Networks

Leonardo PERONI
Pre-Doc Researcher

BSc: Informatic and automatic engineering - Università "La Sapienza" di Roma. Rome, Italy
MSc: Mechatronic Engineering - Politecnico di Torino. Turin, Italy
Previous position: Technology Consultant. Hesplora. Florence. Italy.
Research: Machine learning; Computer Networks; Control theory

Alessio SCALINGI
Pre-Doc Researcher

BSc: Computer Engineering - University of Naples Federico II. Naples, Italy
MSc: Computer Engineering - University of Naples Federico II. Naples, Italy
Previous position: Data Engineer. Alliance Healthcare
Research: Pervasive Wireless Systems; Anomaly Detenction

Salil SHARMA
Pre-Doc Researcher

BSc: Electronics & Communications Engineering - Rajasthan Technical University. Kota, India
MSc: Communication Systems Design - Indian Institute of Information Technology, Design & Manufacturing, Kancheepuram. Chennai, India
MSc: Mobile Computing Systems - Eurecom. Sophia Antipolis, France
Research: Integrated Sensing and Communication; Signal Processing Algorithms; mm-wave

Francesco SPINELLI
Pre-Doc Researcher

BSc: Cinema and Media Engineering - Politecnico di Torino. Torino, Italy
MSc: Communications and Computer Network Engineering - Politecnico di Torino. Torino, Italy
Previous Position: R&D Engineer. Telecom ParisTech. Paris, France
Research: Multi-Access Edge Computing; AI; NFV

Javier TALAVANTE
Pre-Doc Researcher

BSc: Audiovisual Systems Engineering - University Carlos III of Madrid. Madrid, Spain
MSc: Telecommunication Engineering - University Carlos III of Madrid. Madrid, Spain
Previous Position: Research assistant. Infrared Lab UC3M. Madrid, Spain
Research: Visible Light Communication (VLC), LiFi systems, VLC backscatter, Battery-free IoT devices

Pelayo VALLINA-RODRIGUEZ
Pre-Doc Researcher

BSc: Computer Science - University Carlos III of Madrid. Madrid. Spain
MSc: Telematics Engineering - University Carlos III of Madrid. Madrid. Spain
Previous Position: Fellow Student. NETCOM Research Group. University Carlos III of Madrid. Madrid. Spain
Research: Social Computing Systems; Online Advertising; User Privacy

André ZANELLA
Pre-Doc Researcher

BSc: Electrical Engineering - Universidade Federal do Paraná (UFPR). Curitiba, Brazil
MSc: Electrical Engineering - Universidade Federal do Paraná (UFPR). Curitiba, Brazil
Research: Remote Sensing; Mobile Network Metadata; Networks Data Science
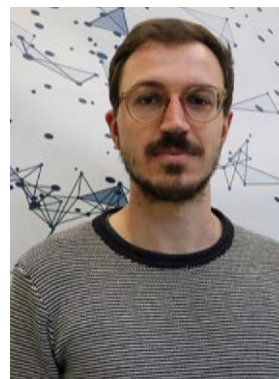
external PhD students

Our External PhD Students are young, aspiring researchers who are supervised or co-supervised by a member of the IMDEA Networks' research team. Most of the External PhD Students to IMDEA Networks are undertaking the Ph.D. program at University Carlos III of Madrid (UC3M).

Vittorio PRODOMO
External PhD Student

BSc: Computer Engineering - University of Naples Federico II. Naples, Italy
MSc: Computer Engineering - Networks and Internet - University of Naples Federico II. Naples, Italy
Research: Machine Learning for Mobile Networks

Antonio RUSSO
External PhD Student

BSc: Computer Science Engineering. Università degli Studi di Napoli Federico II. Naples. Italy
MSc: Computer Science Engineering. Università degli Studi di Napoli Federico II. Naples. Italy
Previous Position: Teaching Assistant. Cybersecurity Academy (Università di Napoli Federico II). Naples. Italy
Research: blockchain; applied cryptography; network security; distributed systems

Lucía UGUINA
External PhD Student

BSc: Telecommunication Technologies Engineering - University Carlos III of Madrid. Madrid, Spain
MSc: Computer Science and Mathematics - Universitat Rovira i Vigili / Universitat Oberta de Catalunya. Tarragona, Spain
Previous Position: Junior Assistant. Management Solutions. Madrid. Spain
Research: Learning Analytics; Data Mining; Real-Time Data

research engineering and support

The Research Engineering & Support unit at IMDEA Networks is dedicated to supporting the continued growth in our research capacity and maximizing the impact of our research output by providing specific technical and professional expertise and assistance to ongoing research endeavors in a variety of ways. Research Engineering & Support personnel work either at the level of the entire Institute, or closely with researchers and their groups. There are roles with an engineering background that take care of the design, installation and maintenance of the IT infrastructure. Other roles may, for instance, provide administrative or operational support to project or lab management.

Typical jobs include systems administration, research (software and/or hardware) engineering, project or research administrator and laboratory technician. These positions are similar to their industry equivalents. They enable our employees to work on cutting-edge research problems and technology in a stimulating and innovative environment.

Admin and research support team

administrative unit

Ramón GIRONA
General Manager

Qualifications: BSc: Computer Science. Universidad de las Palmas de Gran Canaria (ULPGC). Canary Islands. Spain; Industrial Engineering. Universidad Politécnica de Canarias (UPC). Canary Islands. Spain; MBA: Instituto Universitario de Empresa. Madrid. Spain

Marta DORADO
Deputy Operations & Communications Manager

Qualifications: BSc: Dual Bachelor's degree in Journalism and Audiovisual Communication - University Carlos III of Madrid (UC3M). Madrid, Spain. MSc: Journalism and Digital Communication ABC - Complutense University of Madrid (UCM). Madrid, Spain

Brian DUNNE
Senior Human Resources Manager

Qualifications: BBS in Business Studies and French - Trinity College Dublin. Ireland

Ana GONZÁLEZ
Senior Projects & Funding Manager

Qualifications: BA (Hons) "Modern European Studies". University of West London. UK; Postgraduate Diploma in "European Studies". University of West London. UK

Justo MARUGAN
Senior Financial Manager

Qualifications: BSc: Telecommunication Engineering - Universidad de Alcala de Henares (UAH). Madrid, Spain. MSc: Telecom engineering - University of Cantabria (Spain) / Bradford University (UK). MBA: Buckinghamshire New University (UK).

Pilar SÁEZ
HR Administration Manager

Qualifications: Labour Relations. Complutense University of Madrid. Madrid. Spain; Postgraduate Diploma in "Executive Compensation and Benefits". Centro de Estudios Garrigues. Madrid. Spain

research engineering & support

Ignacio BERBERANA
Senior Research Engineer

MSc: Mining Engineer. School of Mining Engineering - Polytechnic University of Madrid. Madrid, Spain
Research: 5G; Radio Communications; RAN Virtualization

Elvira CONTI
Project Manager

BSc: International Relationships - Rey Juan Carlos University. Madrid, Spain

Paula DE DIOS
Project Administrator

BSc: Journalism. Complutense University of Madrid (UCM). Madrid, Spain
MSc: European Political and Social Integration. Vrije Universiteit Brussel. Belgium
MSc: Feminism and Gender Complutense University of Madrid (UCM). Madrid, Spain

Neftalí GONZÁLEZ
Systems Administrator

BSc: IT Systems Engineer. Universidad Rey Juan Carlos. Móstoles. Spain

Susana HERNÁNDEZ
Project Administrator

MSc: Biology (Specialization: Biotechnology) - EQF Level 7 Certificate (Master). Complutense University of Madrid. Madrid. Spain
MSc: Food Science and Technology - EQF Level 7 Certificate. Complutense University of Madrid. Madrid. Spain

Manuel HERRERA
Software Developer

BSc: Higher Degree in Cross-Platform Application Development - IES Zaidín Vergeles. Granada, Spain

Francisco Javier HERVÁS
Project Administrator

BSc: Business Administration - Universidad Autónoma de Madrid. Madrid, Spain
MSc: Management of Human Resources - Universidad Autónoma de Madrid. Madrid, Spain

Dr. Jesús Omar LACRUZ
Research Engineer

BSc: Electrical Engineering - University of the Andes. Mérida, Venezuela
MSc: Electronic System Engineering - Polytechnic University of Valencia. Valencia, Spain
PhD: Electronic Engineering. Polytechnic University of Valencia. Valencia. Spain

Research: mm-Wave; FPGA design; Signal Processing; Digital Communications

Ignacio LÓPEZ DE REGO
Research Engineer

BSc: Physics – Complutense University of Madrid. Madrid, Spain
MSc: Emerging electronics and fotonics technology - Complutense University of Madrid. Madrid, Spain
MSc: Electronic Systems Engineering - Universidad Politécnica de Madrid. Madrid, Spain

Research: Visible Light Communication (VLC), LiFi systems, VLC backscatter, Battery-free IoT devices

Jesús RUFINO
Research Engineer

BSc: Mechanical engineering - Málaga university (UMA). Málaga, Spain
MSc: Mathematical engineering - University Carlos III of Madrid. Madrid, Spain
Research: AI; ML; Statistics applied to survey data

Rafael RUIZ
Systems Administrator

BSc: Industrial Electronics and Automation Engineering - Universidad Politécnica de Cartagena. Murcia, Spain
MSc: Industrial Electronics - Universidad Politécnica de Madrid. Madrid, Spain

Rubén RUPÉREZ
Program Manager

BSc: Industrial Technology Engineering - University Carlos III of Madrid. Madrid, Spain
MSc: Industrial Engineering - University Carlos III of Madrid. Madrid, Spain

Gustavo SEGARRA
Laboratory Technician

BSc: Higher Degree in Administration of networked computer systems - IES Luis Vives. Leganés, Spain

internship students

IMDEA Networks offers a Research Internship program. Eligible candidates are students who are currently undertaking a B.Sc., M.Sc. or equivalent in Computer Science, Electrical Engineering, Computer Engineering, Telecommunications, Telematics or a related field, and who wish to enhance their research potential developing the Science of Networks. Interns work closely with members of our research team, which allows them to acquire on-the-job training and gain valuable experience in computer networking science and technology.

The minimum expected internship duration is usually 3 months, but longer stays are accommodated depending on individual circumstances. Successful interns also receive a special consideration for future positions on our PhD Student team.

We also have a program in place for Visiting PhD Students from partner universities or research organizations to undertake an internship at IMDEA Networks under the direction of one of our faculty members. This program enables them to develop new skills and gain expertise in an enriching new environment.

Stefanos Sotirios BAKIRTZIS
University of origin: University of Cambridge (UK)

Diego Javier BENITO
University of origin: Universidad de Alcalá (Madrid, Spain)

Alexander Paul BRODBELT
University of origin: The University of Edinburgh (UK)

Carlos CHATO
University of origin: Universidad Carlos III de Madrid (Madrid, Spain)

Roberto GARCÍA CORTEJANO
University of origin: Universidad Rey Juan Carlos (Madrid, Spain)

Mihail HRISTOV
University of origin: Universidad Carlos III de Madrid (Madrid, Spain)

David JUAREZ
University of origin: Universidad Carlos III de Madrid (Madrid, Spain)

Mohamed KACEM
University of origin: ENSTA Paris - Institut Polytechnique de Paris (France)

Giovanni Luca MARTENA
University of origin: pureLiFi (UK)

Benoit MATET
University of origin: Université Gustave Eiffel (Paris, France)

Abhishek MISHRA
University of origin: Ecole Polytechnique & Inria Saclay (France)

Lucía MORENO
University of origin: Universidad Carlos III de Madrid (Madrid, Spain)

Federico MUNGARI
University of origin: Politecnico di Torino (Italy)

Steven Jesús PAZ BARRERA
University of origin: Universidad Carlos III de Madrid (Madrid, Spain)

Eloy PÉREZ
University of origin: Universidad Rey Juan Carlos (Madrid, Spain)

Andrea PINTO
University of origin: Saint Louis University (USA)

José Ricardo RAMOS
University of origin: Massachusetts Institute of Technology (Cambridge, Massachusetts, USA)

Alfonso RODRÍGUEZ
University of origin: Universidad Carlos III de Madrid (Madrid, Spain)

Anish SHASTRI
University of origin: University of Trento (Italy)

Michal TERESZKOWSKI-KAMINSKI
University of origin: London King's College (UK)

alumni network

The Institute's Alumni Network is built upon graduate PhD Students who have obtained their Ph.D. and have left the team to further their research career in other organizations. Networking is about making contacts and building relationships. The alumni frame provides its members a supportive community of graduates who have shared experiences, values and goals that will last a lifetime. It also provides a venue through which former PhD Students can maintain a long-term collaborative relationship with the Institute. Alumni are IMDEA Networks Institute's ambassadors worldwide, creating awareness and opening up new communication channels with the global scientific community.

The members of the alumni network appear listed here following the most recent graduation date up to the end of 2022.

Dr. Oluwasegun OJO
Current Position: Post-Doc Researcher. Universidad Carlos III de Madrid. Madrid, Spain
Ph.D. Date: 30 November 2022

Dr. Álvaro FEAL
Current Position: Postdoctoral researcher. Northeastern University, Boston, MA, USA
Ph.D. Date: 29 November 2022

Dr. Dolores GARCIA MARTI
Current Position: Senior Fellow at CERN. Geneva, Switzerland
Ph.D. Date: 28 September 2022

Dr. Julien GAMBA
Current Position: Data scientist. Cisco Systems. Madrid, Spain
Ph.D. Date: 15 September 2022

Dr. Mohamed Lamine MOULAY
Current Position: Senior Software Engineer. Electronics Identification. Madrid. Spain
Ph.D. Date: 20 July 2022

Dr. Víctor SÁNCHEZ AGÜERO
Current Position: UAS Engineer at GMV. Madrid. Spain
Ph.D. Date: 5 July 2022

Dr. Alejandro BLANCO
Current Position: Post-Doc Researcher. University of Edinburgh. UK
Ph.D. Date: 19 May 2022

Dr. Constantine AYIMBA
Current Position: Post-Doc Researcher. IMDEA Networks Institute. Madrid, Spain
Ph.D. Date: 19 May 2022

Dr. Noelia PERÉZ PALMA
Current Position: Postdoctoral Research Assistant. Universidad de Murcia. Spain
Ph.D. Date: 3 February 2022

Dr. Pablo JIMÉNEZ MATEO
Current Position: Senior Full Stack Engineer. BigML, Inc. USA
Ph.D. Date: 17 December 2021

Dr. Luis F. CHIROQUE
Current Position: Data Scientist. TAPTAP Digital. Madrid, Spain
Ph.D. Date: 15 November 2021

Dr. Nuria MOLNER
Current Position: R&D engineer. iTEAM Research Institute of Universitat Politècnica de València. Valencia, Spain
Ph.D. Date: 30 September 2021

Dr. Elizaveta DUBROVINS-KAYA
Current Position: Board Member. Teleone OÜ. Tallinn. Estonia.
Ph.D. Date: 9 June 2021

Dr. Vitalii DEMIANIUK
Current Position: Post-Doc Researcher. Ariel University. Israel
Ph.D. Date: 24 February 2021

Dr. Joan PALACIOS
Current Position: Antenna Research Engineer. Pivotal Commware. Kirkland, Washington, USA
Ph.D. Date: 23 October 2020

Dr. Patricia CALLEJO
Current Position: Visiting Professor. University Carlos III of Madrid. Madrid. Spain
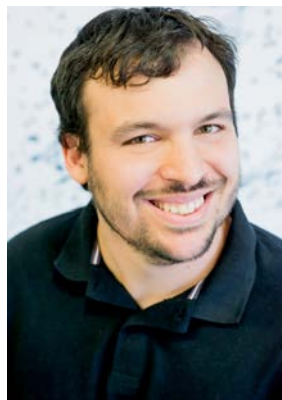**Ph.D. Date:** 8 September 2020

Dr. Edgar ARRIBAS
Current Position: Profesor Doctor. Department of Mathematics and Data Science - CEU San Pablo University. Madrid. Spain
Ph.D. Date: 29 July 2020

Dr. Maurizio REA
Current Position: Senior Researcher. i2CAT Foundation. Barcelona, Spain
Ph.D. Date: 12 June 2020

Dr. Ander GALISTEO
Current Position: Senior Firmware Engineer. Dojo Five: The Embedded Experts. St. Paul, Minnesota. USA
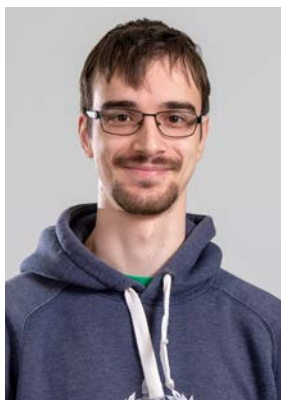**Ph.D. Date:** 3 June 2020

Dr. Dario BEGA
Current Position: Network System Automation Researcher. Nokia Bell Labs Core Research. Munich. Germany
Ph.D. Date: 17 April 2020

Dr. Yonas Mitike KASSA
Current Position: Research Scientist. Eurecat. Spain
Ph.D. Date: 14 February 2020

Dr. Pavel CHUPRIKOV
Current Position: Post-Doc Researcher. Universita della Svizzera Italiana. Lugano. Switzerland
Ph.D. Date: 14 November 2019

Dr. Carlos DONATO
Current Position: Project Manager. Zhilabs. A Samsung Company. Madrid. Spain
Ph.D. Date: 7 November 2019

Dr. Guillermo BIELSA
Current Position: RAN Innovation Engineer: New Radio Solutions - Global CTIO. Telefonica. Madrid. Spain
Ph.D. Date: 26 July 2019

Dr. Hany ASSASA
Current Position: System Engineer. Pharrowtech. Leuven. Belgium
Ph.D. Date: 23 July 2019

Dr. Roberto CALVO-PALOMINO
Current Position: Associate Professor. Department of Signal Theory and Communications, Telematics and Computing. Universidad Rey Juan Carlos. Madrid. Spain
Ph.D. Date: 10 July 2019

Dr. Foivos MICHELINAKIS
Current Position: Postdoctoral Fellow. Simula Metropolitan Center for Digital Engineering (SimulaMet). Oslo. Norway
Ph.D. Date: 19 September 2018

Dr. Aymen FAKHREDDINE
Current Position: Principal Investigator, University of Klagenfurt, Austria & Senior researcher, TII, UAE
Ph.D. Date: 14 June 2018

Dr. Roderick FANOU
Current Position: Systems Engineer. Cloudflare, Inc. Austin, Texas, USA
Ph.D. Date: 14 December 2017

Dr. Christian VITALE
Current Position: Research Associate. KIOS Research and Innovation Centre of Excellence (KIOS CoE). Nicosia. Cyprus
Ph.D. Date: 9 June 2017

Dr. José A. RUIPÉREZ-VALIENTE
Current Position: Associate Professor. Department of Information and Communications Engineering. Universidad de Murcia. Murcia. Spain
Ph.D. Date: 31 May 2017

Dr. Evgenia CHRISTOFOROU
Current Position: Research Associate (Transparency in Algorithms Group) at the CYENS-Centre of Excellence, Nicosia, Cyprus
Ph.D. Date: 25 May 2017

Dr. Nicola BUI
Current Position: Senior Research Engineer. Bastille. Boston. Massachusetts. USA
Ph.D. Date: 12 May 2017

Dr. Angelos CHATZIPAPAS
Current Position: Engineering Lead. Lloyds Banking Group. London. United Kingdom
Ph.D. Date: 25 November 2016

Dr. Elli ZAVOU
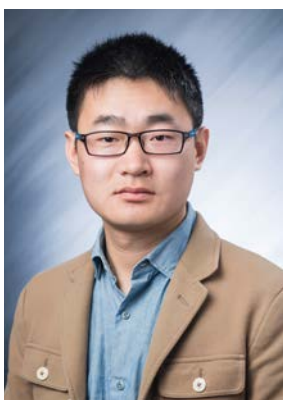**Current Position:** Service Delivery Manager and Data Governance Expert. StratioBD. Madrid. Spain
Ph.D. Date: 30 September 2016

Dr. Syed Anwar UL HASAN
Current Position: Postdoctoral Researcher. ETH Zurich. Switzerland
Ph.D. Date: 20 June 2016

Dr. Qing WANG
Current Position: Assistant Professor. Delft University of Technology - TU Delft. Delft. The Netherlands
Ph.D. Date: 19 May 2016

Dr. Juan Camilo CARDONA
Current Position: Senior Software Engineer. NTT GIN
Ph.D. Date: 6 May 2016

Dr. Pablo SALVADOR
Current Position: Agile Delivery Leader. Paradigma Digital. Madrid. Spain
Ph.D. Date: 8 April 2016

Dr. Gek Hong SIM
Current Position: Post-doc Researcher. TU Darmstadt. Germany
Ph.D. Date: 30 March 2016

Dr. M. Isabel SANCHEZ
Current Position: Postdoctoral Fellow. Simula Research Laboratory. Oslo. Norway
Ph.D. Date: 8 March 2016

Dr. Arash ASADI
Current Position: Research Group leader & Athene Young Investigator. Wireless Communication and Sensing Lab (WISE). Technische Universität Darmstadt. Germany
Ph.D. Date: 8 March 2016

Dr. Vincenzo SCIANCALEPORE
Current Position: Research Scientist. NEC Laboratories Europe. Heidelberg. Germany
Ph.D. Date: 27 November 2015

Dr. Thomas NITSCHE
Current Position: Wissenschaftlicher Mitarbeiter/Research Fellow. Fraunhofer Institute for Embedded Systems and Communication Technologies ESK. Munich. Germany
Ph.D. Date: 25 September 2015

Dr. Ignacio CASTRO
Current Position: Lecturer. Queen Mary University of London. UK
Ph.D. Date: 20 July 2015

Dr. Fabio GIUST
Current Position: Senior System Architect. Athonet. Vicenza. Italy
Ph.D. Date: 5 March 2015

Dr. Jordi ARJONA AROCA
Current Position: Research line coordinator. Instituto Tecnológico de Informática (ITI). Valencia. Spain
Ph.D. Date: 13 February 2015

Dr. Andra LUTU
Current Position: Researcher. Telefonica Research and Development. Barcelona. Spain
Ph.D. Date: 11 November 2014

Dr. Agustín SANTOS
Current Position: Public Officer. Spanish Public Administration. Madrid. Spain
Ph.D. Date: 3 June 2013

Dr. Michal KRYCZKA
Current Position: Manager. Accenture. Warsaw. Poland
Ph.D. Date: 7 February 2013

Dr. Marco GRAMAGLIA
Current Position: Post-Doc Researcher. Universidad Carlos III de Madrid. Madrid. Spain
Ph.D. Date: 26 September 2012

Dr. Alex BIKFALVI
Current Position: Software Engineer. Adevinta. Barcelona. Spain
Ph.D. Date: 18 July 2012

Dr. Paul PATRAS
Current Position: Reader and Chancellor's Fellow. School of Informatics. University of Edinburgh. United Kingdom
Ph.D. Date: 18 March 2011

networked systems&algorithms

Research Professors
· Dr. Sergey Gorinksy
· Dr. Jaya Prakash Varma Champati

Pre-Doc & Post-Doc Researchers
· Ghina Al Atat
· Andrea Fresa
· Khasa Gillani
· Amir Mehrjoo
· Leonardo Peroni
· Lucía Uguina

wireless networking

Research Professors
· Dr. Joerg Widmer
· Dr. Suman Banerjee
· Dr. Marco Fiore
· Dr. Domenico Giustiniano
· Dr. Marco Ajmone-Marsan

Pre-Doc & Post-Doc Researchers
· Dr. Antonio Bazco-Nogueras
· Dr. Claudio Fiandrino
· Dr. Borja Genovés Guzmán
· Dr. Jesús Omar Lacruz
· Dr. Michele Gucciardo
· Dr. Timothy Otim
· Dr. Giuseppe Santaromita
· Dr. Syed Waqas Haider Shah
· Sergi Alcalá-Marín
· Aristide Tanyi Jong Akem
· Giulia Attanasio
· Beyza Bütün
· Alan Collet
· Sai Pavan Deram
· Stavros Eleftherakis
· Dayrene Frómeta
· Dolores García
· Nina Grosheva
· Yago Lizarribar
· Leonardo Lo Schiavo
· Orlando E. Martínez-Durive
· Muhammad Sarmad Shahab Mir
· Sachit Mishra
· Serly Moghadas Golian
· Rafael Ruiz
· Alessio Scalingi
· Salil Sharma
· Javier Talavante
· André Zanella

network measurements&analytics

Research Professors
· Dr. Albert Banchs
· Dr. Antonio Fernández Anta
· Dr. Nikolaos Laoutaris
· Dr. Vincenzo Mancuso
· Dr. Guillermo Suárez-Tangil
· Dr. Narseo Vallina-Rodríguez

Pre-Doc & Post-Doc Researchers
· Dr. Jose Aguilar
· Dr. Constantine Ayimba
· Dr. Elisa Cabana
· Dr. Livia Elena Chatzieleftheriou
· Dr. Álvaro García-Recuero
· Dr. Augusto García
· Dr. Marius Paraschiv
· Dr. Juan Marcos Ramirez
· Santiago Andrés
· Nikolaos Apostolakis
· Constantine Ayimba
· Vinuri Bandara
· Miguel Ángel Bermejo
· Tianyue Chu
· Alan Collet
· Sergio Díaz Aranda
· Álvaro Feal
· Julien Gamba
· Vahid Ghafouri
· Rafael García
· Aniketh Girish
· Rita Ingabire
· Devriş Işler
· Mariella Mischinger
· Oluwasegun Ojo
· Jesús Pérez-Valero
· Francesco Spinelli
· Vittorio Prodomo
· Antonio Russo
· Pelayo Vallina-Rodríguez

Our current team

www.networks.imdea.org

annual report
2022

institute
iMdea
networks