

annual report

2021

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imdea networks institute

developing the  
science of networks

 **institute**  
**imdea**  
networks

# annual report 2021 www.networks.imdea.org

## foreword



**Albert Banchs**

Deputy Director (acting Director)  
of the IMDEA Networks Institute

May 2022



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. The impact of such networks on all aspects of the economy and society is profound, and the year 2021 saw a lot of discussions of new data-driven use cases that will increase that impact even further.

Consequently, mobile networks have to adapt to cater to such new services. Besides supporting a vastly larger number of connected devices and significantly higher performance requirements, a key feature of future mobile networks will be the integration of communication and sensing, where base stations and devices will embed wireless sensing capabilities for localization, environment mapping, activity and gesture recognition, etc. New applications such as health monitoring and remote healthcare, smart manufacturing, autonomous vehicles, augmented and virtual reality, require accurate real-time information about the environment as well as the objects and persons in it.

By ubiquitously sensing the environment via wireless channel measurements, the importance of mobile operators as data sources and data custodians will increase significantly. This brings at the same time immense opportunities to provide better and much more intelligent services than currently possible, as well as vast challenges on how to gather, store, and process the huge volumes of sensing and other highly sensitive data in a secure and privacy preserving manner. At IMDEA Networks, we are researching how to adapt mobile network architectures to meet these challenges and have just been awarded several important projects MAP-6G, RISC-6G, AEON-ZERO, and AEON-CPS within the UNICO-5G program of the Spanish government to drive these efforts.

At the same time, machine learning (ML) is at the core of such new use cases. Most of this data on which it is based, however, is locked in closed silos. What is missing for this data to become usable for the benefit of society via ML, is an open protocol and architecture, together with a scalable, privacy-preserving software/cloud-based implementation to allow consumers/buyers of datasets and producers/aggregators/sellers of datasets to perform such transactions. Such an architecture not only would help data consumers obtain the data they seek, e.g., valuable mobility or IoT data, but would also empower data owners, be it individuals or organizations, to become active players in the data economy. This way companies with siloed data would be able to monetize them and create an extra revenue stream. More importantly, individuals that are currently not receiving any monetary compensation for their data will also have the chance to benefit directly as well as improve their privacy by exercising better control on who gets to use their data and for what. IMDEA Networks is addressing this research challenge by designing and implementing the concept of a personal data internetwork (PDI), which will help solve the most pressing privacy and data protection problems. We will show how to achieve such a radical approach on top of the existing Web and its services in a democratic manner that does not lead to the creation of data monopolies. PDI will use Named Data Networking (NDN) principles at its data layer to handle personal data naming, routing, and in-network storage and replication.

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.

a n n u a l   r e p o r t

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editor

IMDEA Networks Institute

graphic design

base 12 diseño y comunicación

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## 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 2021 the Institute graduated 5 new PhD Students and hired 12 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 2021, Narseo Vallina and his collaborators received the AEPD Emilio Aced data protection award from the Spanish Data Protection Agency for the third year in a row, which is an extraordinary achievement. Borja Genovés Guzmán, a post-doc at IMDEA Networks, was awarded the 2021 Excellence and Entrepreneurship Award by the UC3M Social Council.

For the five years comprising 2017 to 2021, we are ranked #2 in Europe and #16 in the world in the csrankings.org index for our research areas of computer networks, mobile computing, and measurements and performance analysis. Furthermore, the Stanford University 2021 list of top 2% scientists in the world includes 6 of our 13 faculty members.

## 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 2021, in addition to prizes for the high quality of our scientific results. For example, IMDEA Networks researchers received the Best of CCR 2021 award from ACM SIGCOMM and a best paper award at the WNS3 workshop.

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 Transaction on Mobile Computing and IEEE Journal on Selected Areas in Communications, and at the very top conferences in our area, such as IEEE INFOCOM, ACM IMC, ACM MOBICOM, and ACM Mobisys, 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, Joerg Widmer has been appointed TPC co-chair for IEEE INFOCOM 2022, which ranks #1 in conferences according to Google scholar. This confirms the leading roles that our professors play in the research community.

Among projects, our CoronaSurveys project team was particularly successful, being among the 5 finalists of the COVID-19 Symptom Data Challenge and among the 10 finalists of the XPRIZE Pandemic Response Challenge.

### 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.

Our researchers are currently contributing to **16** ongoing research projects that have attracted funding from various sources: **6** European projects, **6** national projects, and **4** financed by the regional government of Madrid, in addition to **3** contracts with industrial partners.

Among industry collaborations, it is worth mentioning the strategic partnerships maintained by IMDEA Networks: Telefonica, which 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, La Razón, RTVE, Invertia (El Español), Newtral, Europa Press, Redes Telecom, Cadena Ser Madrid Sur, Business Insider, Zona Movilidad, Innovaspain, Total Telecom, Science X Network, are some of the circa 90 unique media outlets that carried our news during 2021.

Building on our results of 2021, in the year ahead we look forward to making more 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, 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

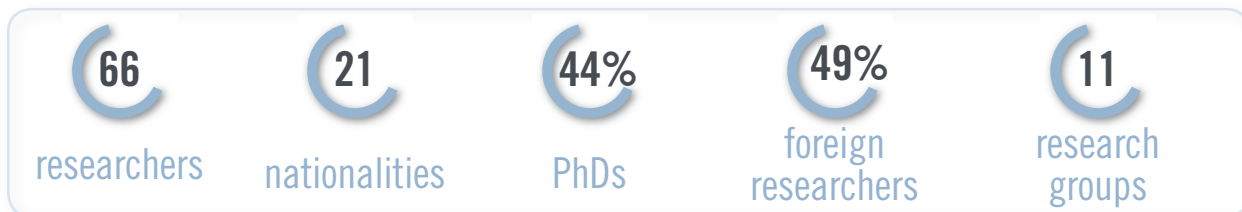
Our mission is to create value by **leading research in protocol, algorithm and systems developments** that enable the **Digital Knowledge Society**. We do this by conducting research and developing innovative and useful scientific and technical advances in the above areas, while actively **promoting 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 [Arturo Azcorra, 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 21 different nationalities**, which carries out new scientific discoveries in Computer Networks, and foster the development of emerging technologies.



### The facilities of IMDEA Networks Institute

The building and laboratories of IMDEA Networks Institute are located at Leganés, Madrid

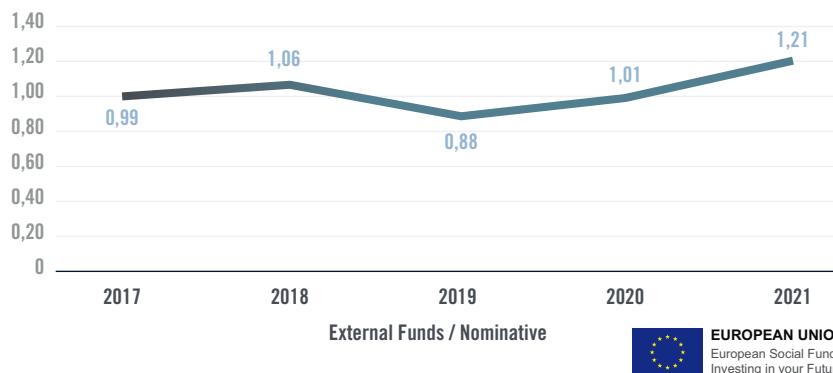
402 m<sup>2</sup> of research labs

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.

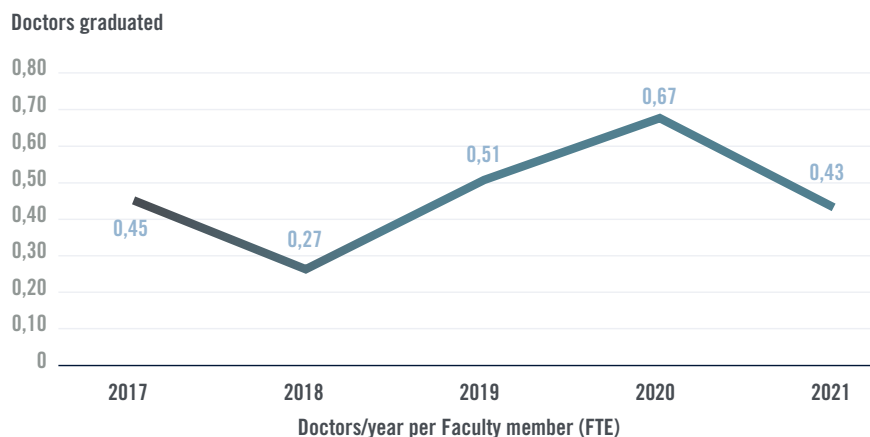




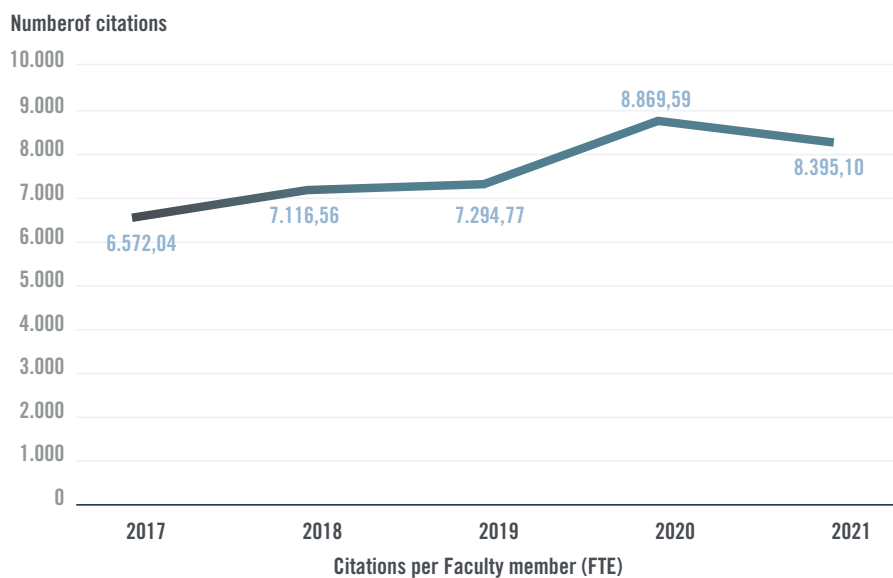
We bring Money to Madrid: Self Funding

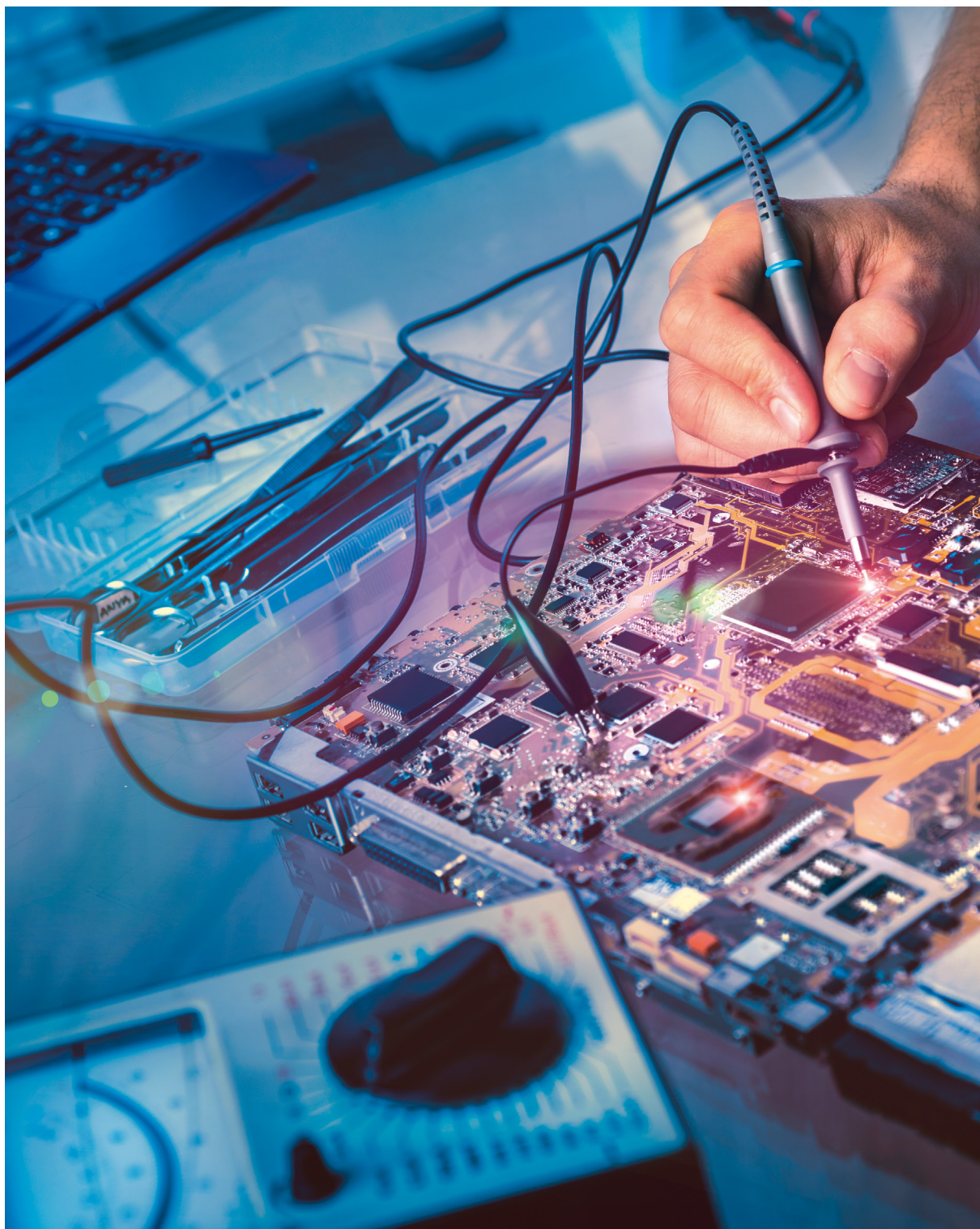


We produce Talent for Madrid: Doctors graduated/year

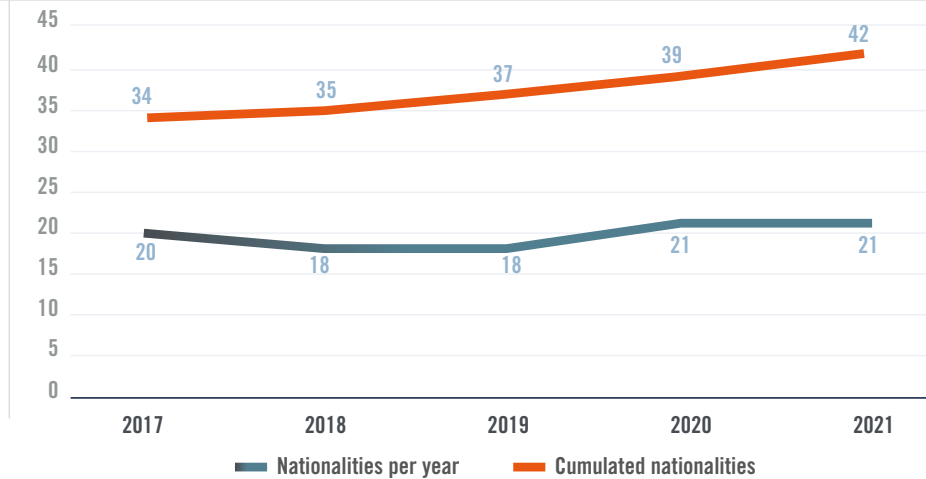


We produce Leadership for Madrid: Citations

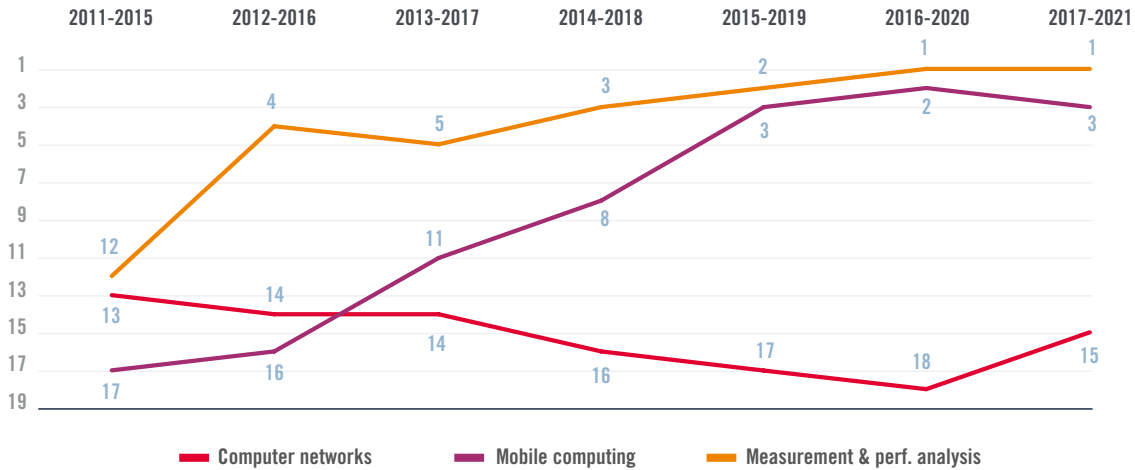




## We produce internationalization of Madrid: Nationalities (Cumulative & Current)



## We produce Leadership for Madrid: CS-Ranking (Europe)



### Computer Networks

- |                                       |                               |
|---------------------------------------|-------------------------------|
| 1 ▶ ETH Zurich                        | 9 ▶ TU Darmstadt              |
| 2 ▶ University College London         | 12 ▶ TU Delft                 |
| 3 ▶ EPFL                              | 12 ▶ Tel Aviv University      |
| 4 ▶ Technion                          | 12 ▶ Universidade de Lisboa   |
| 5 ▶ Hebrew University of Jerusalem    | 15 ▶ IMDEA Networks Institute |
| 6 ▶ KTH Royal Institute of Technology |                               |
| 7 ▶ University of Cambridge           |                               |
| 7 ▶ University of Edinburgh           |                               |
| 9 ▶ Max Planck Society                |                               |
| 9 ▶ Queen Mary University of London   |                               |

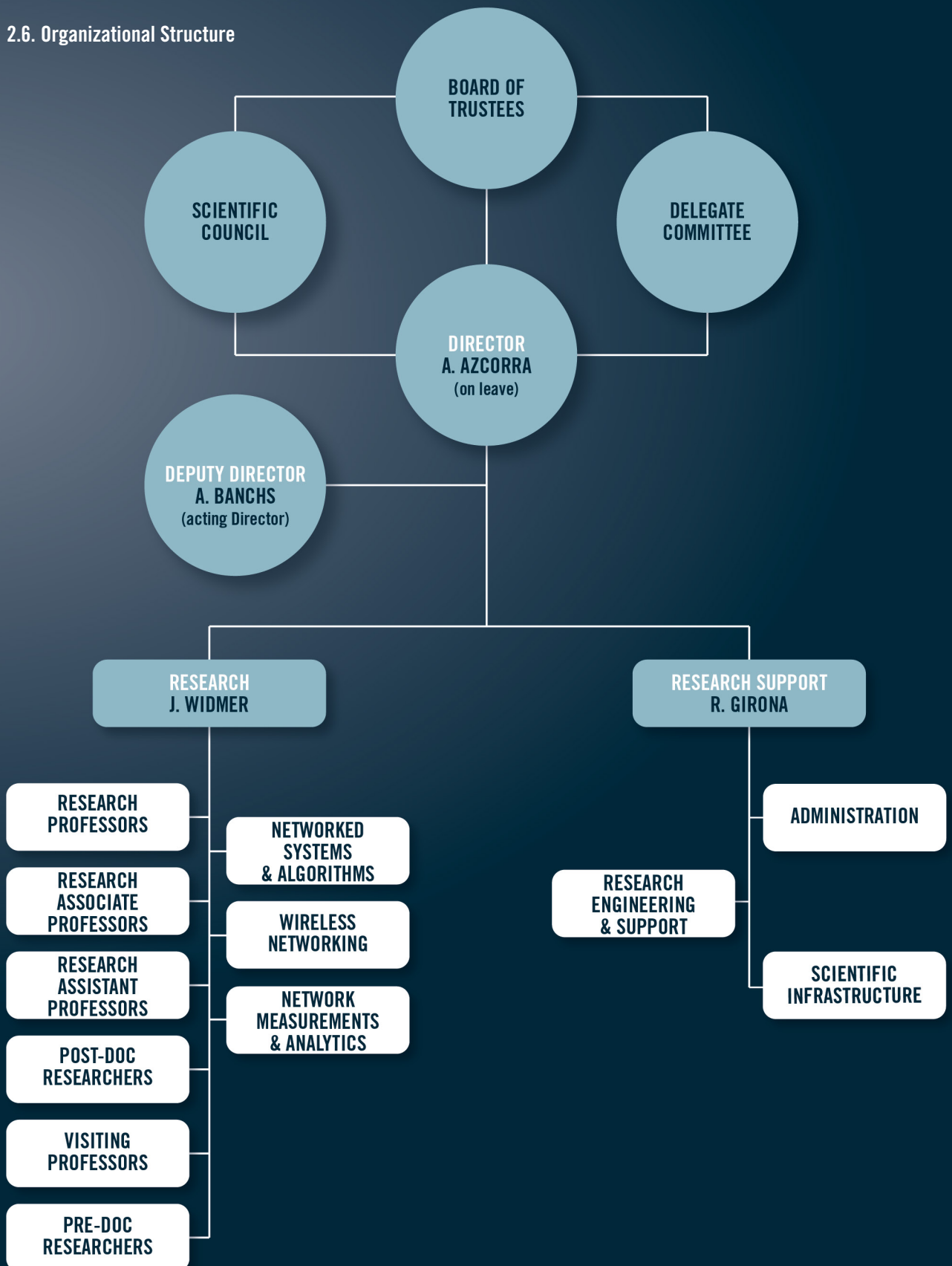
### Mobile Computing

- |                              |
|------------------------------|
| 1 ▶ TU Delft                 |
| 2 ▶ University of Oxford     |
| 3 ▶ IMDEA Networks Institute |
| 4 ▶ University of Cambridge  |
| 4 ▶ University of Edinburgh  |
| 6 ▶ Politecnico di Milano    |
| 7 ▶ TU Darmstadt             |
| 8 ▶ KU Leuven                |
| 8 ▶ Uppsala University       |
| 10 ▶ ETH Zurich              |

### Measurement & Performance Analysis CS-Rank 2017-2021

- |  |
|--|
| 1 ▶ IMDEA Networks Institute             |
| 2 ▶ EPFL                                 |
| 3 ▶ ETH Zurich                           |
| 4 ▶ Max Planck Society                   |
| 4 ▶ TU Delft                             |
| 6 ▶ University College London            |
| 7 ▶ Brandenburg University of Technology |
| 7 ▶ TU Berlin                            |
| 9 ▶ Imperial College London              |
| 9 ▶ Queen Mary University of London      |
| 11 ▶ Freie Universitaet Berlin           |
| 11 ▶ TU Munich                           |

## 2.6. Organizational Structure





### 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**

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Department of Local Administration and  
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Regional Government of Madrid

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**Madrimasd Foundation for Knowledge**

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Full Professor & Managing Director of  
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**University of Massachusetts at Amherst**  
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#### **Prof. Dr. Ioannis Stavrakakis**

Full Professor & Head, Department of Informatics and Telecommunications  
**National and Kapodistrian University of Athens**  
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#### **Dr. Heinrich J. Stüttgen**

Independent consultant

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Vice-Rector for Scientific Policy

#### **Universidad Rey Juan Carlos**

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Faculty of Telecommunications Engineering

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*Designated representative*

#### **Prof. Dr. Luis Javier García Villalba**

Associate Professor of the Department of Software Engineering and Artificial Intelligence  
Faculty of Computer Science & Engineering

## 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. 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

### 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:** Moonshots Ambassador at X, the moonshot factory. Mountain View, 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.

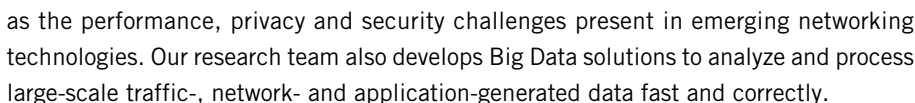


### 3.3. Network Measurements and Analytics

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



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.

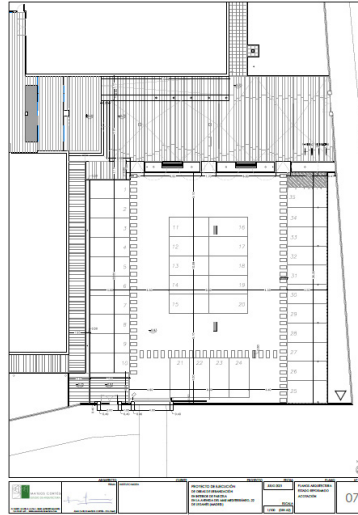
### 3.4 Headquarters and research laboratories infrastructure

### 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 2021 amounted to 2.764 m<sup>2</sup>.



- Central heating boiler replacement:** at the start of 2021 the central heating boiler came to its end of life. The former boiler was replaced with a new condensing boiler of 313 kW and an efficiency of 109%. The boiler is a modular one, so it is possible to add extra modules in case the heating claim increases over time.
- 5TONIC gutters and downpipes refurbishment:** the works for the refurbishment of the 5TONIC roof finished in the third quarter of 2021. The water evacuation capacity of the gutters and downpipes of the 5TONIC roof has been increased to provide a safe place for the DPC of the institute, which is critical for the business continuity.
- New vehicular access to the sports fields area:** during the third quarter of 2021, the works for the construction of a new vehicular access to the sports fields area were performed to provide access to a place where the institute can test vehicle prototypes. One of the two courts of the sports fields has been reinforced, to provide enough stability, so it can be used as an auxiliary parking lot too.
- Generator set:** a new generator set of 133 kVA has been installed to protect the DPC and the rest of 5TONIC from power outages. In 2022, the protection will be extended to the rest of main services of the institute.
- Main entrance, parking and backyard refurbishments:** the works for the refurbishment of the main entrance and parking area started on the last quarter of 2021 and will be completed in the second quarter of 2022. The scope of the works includes: reasphalting the parking, installing new lighting, opening a new pedestrian access on the wall, replacing the pavement, building some planters, rebuilding the ramp to comply with regulation, installing recharge points for electric vehicles, etc. The works for the backyard refurbishment have been postponed and should start on the first quarter of 2022.

### 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.

Two servers, a Dell PowerEdge R7525 server and a Dell PowerEdge R6515 server, and a Synology RX1217RP have been purchased in order to increase the crawling, computation and storage capacities of the traffic analysis and network measurements systems.



To boost the transformation of current networks into software-centric paradigm, enabling flexibility and agility in the whole system lifecycle, an USRP N310 was purchased to perform highly complex experiments to decode the channel status information and develop fast radio access on mm-wave frequencies.

A dedicated testbed of three programmable switches Wedge100BF-32QS has been deployed to run ML/AI models for inference (e.g., traffic classification, anomaly detection) that are implemented in the data/user plane.

Two TRX-BF/01 R2 evaluation boards to analyze millimeter waves have been purchased, and they are being used to develop experimental platforms for in-depth study of signal processing algorithms which can be used in modern and future communications systems.

A Dell S4128F-ON, L3 switch has been acquired to serve as a backup to our main communication switch, the link for all institute communications, both internal and external, and an early network intrusion detection system has been deployed on a Dell PowerEdge R440, providing additional security to the network.



### **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 2021 carried out a number of activities in order to pursue two objectives:

1. Support for the development of new technological solutions for 5G and 6G.
2. Support for the implementation and deployment of new use cases that take advantage of 5G capabilities.

As an example of the projects launched for pursuing the first objective, 5TONIC members Telefónica, Ericsson, Intel and Capgemini collaborated in the integration of Capgemini MEC platform with Ericsson's 5G Core. This integration was demonstrated with a use case carried out with DeepSight Labs.

In terms of new use cases, the activity of the lab was necessarily affected by the pandemic situation, but was able, through a combination of remote and on-site work, to reach some significant achievements. In this sense, it was able to support the implementation of use cases for the ICT project 5G EVE, 5G Vinni, 5G DIVE and 5Growth, in collaboration with companies like ASTI and Innovalia.

In order to fulfill these objectives, 5TONIC has continued the expansion of its infrastructure. In addition to 5G SA and NSA coverage in low-mid frequency bands, the lab now also supports 5G connectivity in millimeter wave frequency bands, which provide a much higher capacity. This new capability was tested in a use case carried out in collaboration with Innovalia.

A significant milestone for the lab was the launch of Hexa-X project, a flagship project in which 5TONIC is deeply involved, paving the way to the next generation of mobile networks (Hexa) by explorative research (X), with the vision to connect human, physical, and digital worlds with a fabric of 6G key enablers. The Hexa-X project ambition includes to develop key technology enablers in the areas of (i) fundamentally new radio access technologies at high frequencies and high-resolution localization and sensing; (ii) connected intelligence through AI-driven air interface and governance for future networks, and (iii) 6G architectural enablers for network disaggregation and dynamic dependability.

In terms of public recognition, Nokia Bell Labs, Telefónica, and IMDEA Networks have been the winners in the category for Best 5G Project at the TM Broadcast Awards for their 5G MEC Ultra Video Server project developed and tested at the 5TONIC.

During 2021, 5TONIC also has incorporated the Spanish start up Fivecomm as a new collaborator.



# research projects, grants and fellowships



4.1. Funding awards [34]

4.2. Ongoing projects [37]

a n n u a l   r e p o r t

2021

[www.networks.imdea.org](http://www.networks.imdea.org)

## 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

#### The NortonLifeLock Research Group Graduate Fellowship



##### Awardee

- Julien Gamba (PhD Student).

##### Funded by

NortonLifeLock

#### Google Fellowship in Privacy and Security



##### Awardee

- Julien Gamba (PhD Student).

##### Funded by

Google

### 4.1.2 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*

### Awardees

- Dr. Vincenzo MANCUSO, Research Associate Professor
- Dr. Joerg WIDMER, Research Professor

### Funded by

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



## 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)



### 4.1.3 Regional

## Youth Employment Initiative (YEI) – Programa de Empleo Juvenil

*Convocatoria de ayudas para la contratación de investigadores predoctorales e investigadores postdoctorales cofinanciadas por Fondo Social Europeo a través del Programa Operativo de Empleo Juvenil y la Iniciativa de Empleo Juvenil (YEI)*

### Awardee

- Dr. Giuseppe SANTAROMITA, Post-Doc Researcher

### Funded by

European Social Fund (Youth Employment Initiative), Department of Education, Youth and Sports, Regional Government of Madrid



## 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





Dirección General de Investigación  
e Innovación Tecnológica  
CONSEJERÍA DE CIENCIA,  
UNIVERSIDADES E INNOVACIÓN

## 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



Dirección General de Investigación  
e Innovación Tecnológica  
CONSEJERÍA DE CIENCIA,  
UNIVERSIDADES E INNOVACIÓN

## 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.

## AEON-ZERO

*(Network Intelligence for zero-touch orchestration and anomaly detection)*



Funded by the  
European Union  
NextGenerationEU



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



Building upon the experience and results of the ongoing DAEMON project, funded by the European Commission, AEON-ZERO will focus on developing Network Intelligence (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](#)

## 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-CPS 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



*This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 101021377.*

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, cybersecurity, and EU's market position.

[More info](#)



*This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.101008468.*

## 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

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.

[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

Departing from the current hype around Artificial Intelligence (AI), DAEMON will set forth a pragmatic approach to Network Intelligence (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.

[More info](#)



*This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.101016411.*



*This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.101017109.*





This project has received funding from the European Union's Horizon 2020 research and innovation programme under Marie Skłodowska-Curie grant agreement No.860239.

## BANYAN

(Big dAta aNalytics for radio Access Networks)

**Funded by:** European Union H2020-ICT-2019 (Information and Communication Technology) Grant

**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.

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 frequencies. 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](#)



*This project has received funding from the European Union's Horizon 2020 research and innovation programme under Marie Skłodowska-Curie grant agreement No.861222.*

## 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](#)



*This project has received funding from the European Union's Horizon 2020 research and innovation programme under Marie Skłodowska-Curie grant agreement No.814215.*

## ECID

*(Edge Computing for Intelligent Driving)*

**Funded by:** Spanish Ministry of Science and Innovation

**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

**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](#)

## 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 April 2023

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 April 2023

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](#)





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de Madrid

## 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.

[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.

[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](#)



*This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.871249.*

## 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](#)



*This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.871370.*

## PinPoint5G+

*(Accurate, Pervasive and Low-Latency Positioning to Innovate 5G Networks and Beyond)*

**Funded by:** Spanish Ministry of Science, Innovation and Universities

**Duration:** January 2019 to December 2021

Positioning data is the cornerstone to enable data analytics and applications in the location-based service (LBS) market. At the same time, positioning data can bring dramatic benefits to the 5th generation of cellular networks and beyond (5G+) for the management and control of networks that are getting increasingly denser and more heterogeneous. Yet today's cellular systems fail to provide accurate, pervasive and low-latency localization. The result is a plethora of fragmented localization systems based on diverse radio technologies and protocols that do not interoperate. This project aims to extend the functionalities of network to (i) provide accurate and ubiquitous locations of physical entities as a network-native service based on the integration of 5G+ technologies, and (ii) exploit position data to optimize the allocation of network resources based on anticipatory networking concepts.

[More info](#)

## COLLABORATE

*(Developing a Strongly Consistent, Fault-Tolerant, Long-Lived Distributed Storage System with Failure Prediction Mechanism)*

**Funded by:** Cyprus Research Promotion Foundation. RPF/POST-DOC/0916/0090 - COL-LABORATE

**Duration:** May 2019 to October 2021

Distributed Storage Systems (DSS) encompass the technology powering modern cloud data storage services such as DropBox and Google Drive that are used by millions of users as networked platforms for collaborative applications and data storage. Algorithms for DSS ensure data availability and survivability by replicating data in geographically dispersed network locations. However, a major problem with data distribution is consistency, especially when the storage is accessed concurrently by multiple processes; a key to enabling collaboration. Numerous strategies have been devised to mitigate these issues, however, a robust and efficient solution remains elusive. This project proposes a novel atomic DSS built on top of asynchronous message-passing, failure-prone, commodity devices and its goal is to enhance the practicality of atomic data storage by combining three services: (i) Fragmentation, (ii) Reconfiguration, and (iii) Failure Prediction.

[More info](#)

## MYP-SOCRATES

*(Large Scale Collaborative Detection and Location of Threats in the Electromagnetic Space)*

**Funded by:** NATO Emerging Security Challenges Division – Science for Peace and Security Programme (SPS). Grant G5461

**Duration:** June 2018 to October 2021

Create the foundations for an accurate, autonomous, fast and secure system that identifies intruders in the electromagnetic space, before the threat can become serious, learning about its physical layer features and its geographic location.

[More info](#)





5G EVE



*This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.815074.*

## 5G-EVE

*(5G European Validation platform for Extensive trials)*

**Funded by:** European Union. H2020-ICT-2018-1

**Duration:** July 2018 to June 2021

We are at the “eve” of a fundamental transition in 5G, and the aspiration of 5G-EVE is to create the foundations for a pervasive roll-out of end-to-end 5G networks in Europe. It is one of three 5G PPP infrastructure projects started on 1st July 2018, whose goal is to implement and test advanced 5G infrastructures in Europe. The 5G-EVE concept is based on further developing and interconnecting existing European sites in Greece, Spain, France, and Italy to form a unique 5G end-to-end facility, which will enable experiments with: (a) heterogeneous access, including NR, licensed/unlicensed spectrum, advanced spectrum management; (b) Mobile Edge Computing, backhaul, core/service technologies; (c) means for site interworking and multi-site/domain/technology slicing/orchestration.

5G-EVE will be initially compliant with 3GPP Rel. 15 and, later on, with Rel. 16.

[More info](#)



## DW-MARKING

*(Data Watermarking: The missing link to on-/off-chain implementation of distributed data marketplaces)*

**Funded by:** European Union through ONTOCHAIN First Open Call, Next Generation Internet (NGI) Initiative

**Duration:** March 2021 to May 2021

Data Marketplaces (DMs), in which data sellers make datasets available for purchase by data buyers are emerging fast in the big data market for monetising personal, or aggregate, often anonymized, datasets. Monolithic DMs operating under a single authority, need to place full trust on a single company/organisation. They may also end up producing additional monopolies/oligopolies on the Internet. Therefore, several attempts are ongoing for developing distributed marketplaces, often on top of Distributed Ledger Technologies (DLTs). Fully on-chain approaches are having scalability problems when faced with large datasets, such as those traded over DMs. To facilitate trustworthy off-chain handling of datasets in distributed DMs, DW-marking will develop a new breed of digital watermarking techniques for protecting ownership, and establishing accountability, in the off-chain handling of datasets.

[More info](#)

## SMOOTH

(GDPR Compliance Cloud Platform for Micro Enterprises)

Funded by: European Union. H2020 Cibersecurity PPP

Duration: May 2018 to January 2021

According to the last official available 2015 data, almost 93% of all enterprises in Europe in the non-financial business sector have less than 10 employees. However, when it refers to the imminent General Data Protection Regulation (GDPR)'s application, MEnts are the most vulnerable due to their lack of expertise and resources to invest in their adoption. It is urgent to develop solutions that assist MEnts in smoothly adopting the GDPR, safeguarding the interests of the EU citizens on data privacy and security, avoiding the negative socioeconomic consequences entailed to breaches for MEnts, and, by extension, benefitting the European society. SMOOTH addresses this challenge from two complementary focuses, with the aim of becoming the reference tool platform to adopt the GDPR in this context: creating awareness on the importance of being compliant with the GDPR (SMOOTH will deliver a practical GDPR interactive handbook tailored specifically to MEnts) and assisting to effectively adopt and comply with the GDPR.

[More info](#)



*This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.786741.*



# scientific activities



- 5.1. Awards [52]
- 5.2. Publications [53]
- 5.3. Scientific service [67]
- 5.4. Outreach [78]
- 5.5. Local Scientific Partnership [94]

a n n u a l   r e p o r t

2021

[www.networks.imdea.org](http://www.networks.imdea.org)

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. Project Awards

**CoronaSurveys project** (led by Antonio Fernández Anta, Research Professor at IMDEA Networks) is a collaborative endeavor between several universities, research institutions and independent volunteers. Data about the COVID-19 pandemic has been collected since March 2020 via anonymous open surveys (all the data collected is openly available). This data allows the production of estimates on the incidence and evolution of COVID-19 using the Network Scale-up Method. The project has received two awards:

- The CoronaSurveys team was among the 5 finalists of the [COVID-19 Symptom Data Challenge](#). It was awarded 5,000 US dollars.
- The CoronaSurveys team was among the 10 finalists of the [XPRIIZE Pandemic Response Challenge](#). It was awarded 3,000 US dollars in AWS credits for cloud and compute services.

*50 Ways to Leak Your Data: An Exploration of Apps' Circumvention of the Android Permissions System*

#### BEST OF CCR 2021

(ACM SIGCOMM 2021)

**Ralph Holz, Jens Hiller, Johanna Amann, Abbas Razaghpanah, Thomas Jost, Narseo Vallina-Rodriguez, Oliver Holfeld**

*Tracking the deployment of TLS 1.3 on the Web: A story of experimentation and centralization*

#### BEST PAPER AWARD

(The Workshop on ns-3 (WNS3) 2021, 21-25 June 2021)

**Hany Assasa, Nina Grosheva, Tanguy Ropitault, Steve Blandino, Nada Golmie, Joerg Widmer**

*Implementation and Evaluation of a WLAN IEEE 802.11ay Model in Network Simulator ns-3*

#### BEST TEASER AWARD

(The 22nd IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks (WoWMoM 2021), 7-11 June 2021)

**Mohamed Moulay, Rafael García, Vincenzo Mancuso, Pablo Rojo, Antonio Fernández Anta**

*TTrees: Automated Classification of Causes of Network Anomalies with Little Data*

### 5.1.2. Paper Awards

#### 'AEPD EMILIO ACED AWARD 2021 ('DATA PROTECTION AWARDS 2021')

(Spanish Data Protection Agency, 28 January 2022, Madrid)

**Joel Reardon, Álvaro Feal, Primal Wijesekera, Amit Elazari Bar On, Narseo Vallina-Rodriguez, Serge Egelman**

### BEST PAPER AWARD

(The 15th ACM Workshop on Wireless Network Testbeds, Experimental evaluation & Characterization, ACM WiTECH 2021, 1 April 2022, New Orleans, United States)

**Francesco Gringoli, Alejandro Blanco, Joerg Widmer**

*AX-CSI: Enabling CSI Extraction on Commercial 802.11ax Wi-Fi Platforms*

### 5.1.3. Researcher Awards

**ERICSSON AWARD FOR THE BEST DOCTORAL THESIS IN INNOVATION FOR SUSTAINABLE CONNECTIVITY FROM THE COLEGIO OFICIAL DE INGENIEROS DE TELECOMUNICACIÓN (COIT) AND THE ASOCIACIÓN ESPAÑOLA DE INGENIEROS DE TELECOMUNICACIÓN (AEIT) FOR THE DOCTORAL THESIS DIRECTED BY ALBERT BANCHS**

**Cristina Márquez and Albert Banchs (October 2021)**

Cristina Márquez's PhD Thesis "Characterization of mobile network services to assess the impact of network slicing in a nationwide scenario", whose thesis supervisor is Albert Banchs, received this recognition for academic excellence.

**EXCELLENCE AND ENTREPRENEURSHIP AWARDS 2021 - UC3M SOCIAL COUNCIL**

**Borja Genovés Guzmán (June 2021)**

IMDEA Networks' Post-Doc Researcher has been awarded by the UC3M Social Council with the 2021 Excellence and Entrepreneurship Awards in the category of ancient students of UC3M for his outstanding professional development in the years after graduation.

**IEEE SENIOR MEMBER**

**Vincenzo Mancuso (April 2021)**

Senior Member is the highest grade for which IEEE members can apply. IMDEA Networks' Research Associate Professor has

got the professional recognition of his peers for technical and professional excellence.

### 5.1.4. R&D Awards

**DISTINGUISHED TPC MEMBER AWARD AT IEEE INFOCOM 2021**

**Albert Banchs, Sergey Gorinsky, Marco Fiore / February 2021**

IEEE INFOCOM 2021

IMDEA Networks faculty Albert Banchs, Marco Fiore, and Sergey Gorinsky 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 2021. There were 112 publications, out of which 91 were peer reviewed. This is how they are structured:

2 Books | 3 Book Chapters | 40 Journal Articles | 4 Magazine Articles | 40 Conference and Workshop Papers | 2 Conference and Workshop Posters & Demos | 9 Invited Papers, Keynotes, Invited Talks, Tutorials, Lectures, etc.

As well as the previous there were:

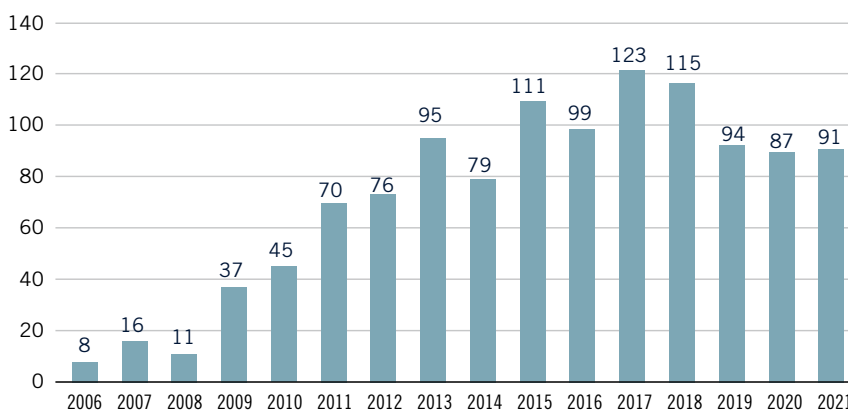
5 PhD Theses

According to **Google Scholar**, IMDEA Networks' researchers have received around **97.593 citations in total** along their research career, which corresponds to an **aggregated H-index of 134**.

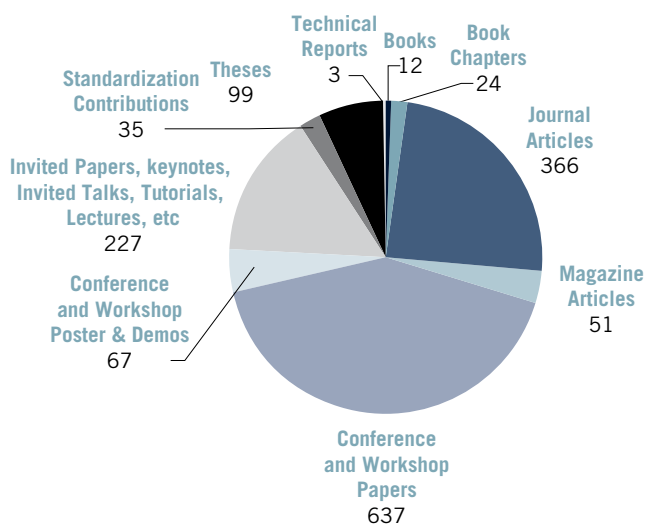
# Scientific Publications

## 2006-2021

### number of publications (peer-reviewed)



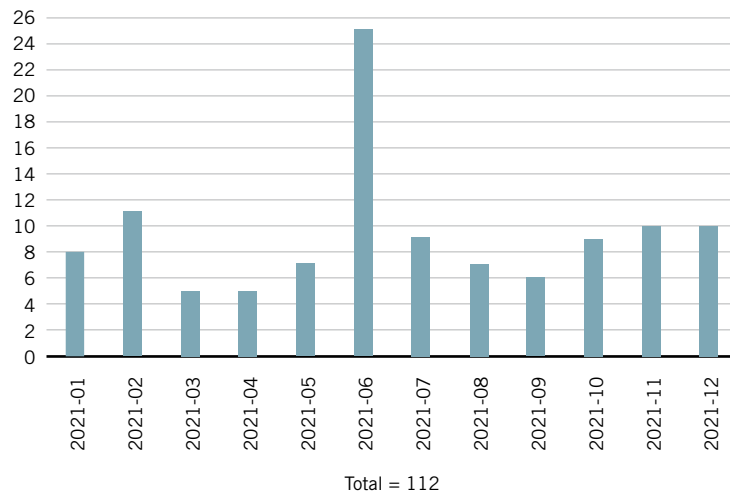
### all publications by type



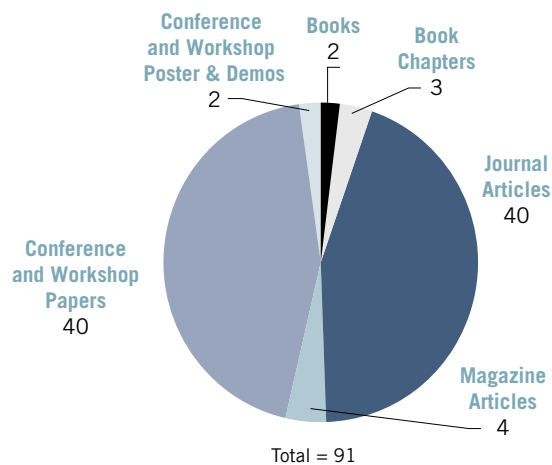
# 2021



## total number of publications per month



## publications by type (peer reviewed)







## Publications 2021

### Books [2]

1. **Antonio FERNÁNDEZ ANTA (August 2021)**  
*Principles of Blockchain Systems*  
pp. 213, Morgan & Claypool Publishers. ISBN: 978-1636391687.
2. **Arturo AZCORRA (August 2021)**  
*Lightning Guide to Databases with MS-Access and SQL*  
pp. 760, Arturo Azcorra. ISBN: 978-84-09-33305-9)

### Book Chapters [3]

1. **Emmanuelle Anceume, Antonio FERNÁNDEZ ANTA, Chryssis Georgiou, Nicolas NICOLAOU, Maria Potop-Butucaru (August 2021)**  
*Formalization of Blockchain Properties*  
Morgan & Claypool Publishers. ISBN: 978-1636391687.
2. **Piergiorgio Vitello, Andrea Capponi, Claudio FIANDRINO, Guido Cantelmo (July 2021)**  
*Mobility-Aware Solutions for Edge Data Center Deployment in Urban Environments*  
CRC Press. ISBN: 9780367814397.
3. **Álvaro FEAL, Julien GAMBA, Juan Tapiador, Primal Wijesekera, Joel Reardon, Serge Egelman, Narseo VALLINA-RODRÍGUEZ (February 2021)**  
*Don't Accept Candy from Strangers: An Analysis of Third-Party Mobile SDKs*  
Volume Data Protection and Artificial Intelligence, Blomsbury Publishing. ISBN: 9781509941759.

### Journal Articles [40]

1. **Elisa CABANA, Rosa Elvira Lillo (December 2021)**  
*Robust adjusted discriminant analysis based on shrinkage with application to geochemical and environmental fields*  
Chemometrics and Intelligent Laboratory Systems. 10.1016/j.chemolab.2021.104488. Volume 221, Elsevier. ISSN: 0169-7439.
2. **Eleftherios Lampiris, Antonio BAZCO-NOGUERAS, Petros Elia (December 2021)**  
*Resolving the Feedback Bottleneck of Multi-Antenna Coded Caching*  
IEEE Transactions on Information Theory. 10.1109/TIT.2021.3139013. IEEE. ISSN: 1557-9654.
3. **Noelia PÉREZ PALMA, Falko Dressler, Vincenzo MANCUSO (December 2021)**  
*Precise: Predictive Content Dissemination Schemes Exploiting Realistic Mobility Patterns*  
Computer Networks. Elsevier.
4. **Iñaki Ukar, Marco GRAMAGLIA, Marco FIORE, Zbigniew Smoreda, Esteban Moro (December 2021)**  
*News or Social Media? Socioeconomic divide of mobile service consumption*  
Journal of the Royal Society Interface. Volume 18, The Royal Society. ISSN: 1742-5689.
5. **José González-Cabañas, Patricia CALLEJO, Pelayo VALLINA, Ángel Cuevas, Rubén Cuevas, Antonio FERNÁNDEZ ANTA (November 2021)**  
*How resilient is the Open Web to the COVID-19 pandemic?*  
Telematics and Informatics. Volume 64, Elsevier.
6. **Maurizio REA, Domenico GIUSTINIANO, Pablo JIMÉNEZ MATEO, Yago LIZARRIBAR, Joerg WIDMER (October 2021)**  
*Beam Searching for mmWave Networks with sub-6 GHz WiFi and Inertial Sensors Inputs: an experimental study*  
Computer Networks. Elsevier.

**7. Vicent Cholvi, Juan Echagüe, Antonio FERNÁNDEZ ANTA, Christopher Thraves (October 2021)**

*System Stability Under Adversarial Injection of Dependent Tasks*

IEEE Access. 10.1109/

ACCESS.2021.3119849. Volume 9, IEEE.

ISSN: 2169-3536.

**8. Dolores GARCIA MARTI, Jesus Omar LACRUZ, Damiano Badini, Danilo DE DONNO, Joerg WIDMER (October 2021)**

*Model-free machine learning of wireless SISO/MIMO communications*

Computer Communications. 10.1016/j.com-com.2021.09.033. Elsevier.

**9. Dolores GARCIA MARTI, Jesus Omar LACRUZ, Pablo JIMÉNEZ MATEO, Joan PALACIOS, Rafael RUIZ, Joerg WIDMER (October 2021)**

*Scalable Phase-Coherent Beam-Training for Dense Millimeter-wave Networks*

IEEE Transactions of Mobile Computing.

**10. Loic Bonnetain, Angelo Furno, Nour-Eddin El Faouzi, Marco FIORE, Razvan Stanica, Zbigniew Smoreda, Cezary Ziemlicki (September 2021)**

*TRANSIT: Fine-grained human mobility trajectory inference at scale with mobile network signaling data*

Transportation Research Part C: Emerging Technologies. 10.1016/j.trc.2021.103257. Volume 130, Elsevier. ISSN: 0968-090X.

**11. Oluwasegun OJO, Antonio FERNÁNDEZ ANTA, Rosa Elvira Lillo, Carlo Sguera (August 2021)**

*Detecting and classifying outliers in big functional data*

Advances in Data Analysis and Classification.

**12. Sai Subramanyam Thoota, Dolores GARCIA MARTI, Özlem Tu fe Demir, Rakesh Mundlamuri, Joan PALACIOS, Cenk M. Yetis, Christo Kurisum-moottil Thomas, Sameera H. Bharadwaja, Emil Björnson, Pontus Giselsson, Marios Kountouris, Chandra R. Murthy, Nuria González-Prelcic, Joerg WIDMER (July 2021)**

*Site-specific millimeter-wave compressive chan-*

*nel estimation algorithms with hybrid MIMO architectures*

ITU Journal on Future and Evolving Technologies. Volume 2.

**13. Anja Feldmann, Oliver Gasser, Franziska Lichtblau, Enric Pujol, Ingmar Poesse, Christoph Dietzel, Daniel Wagner, Matthias Wichtlhuber, Juan Tapiador, Narseo VALLINA-RODRÍGUEZ, Oliver Hohlfeld, Georgios Smaragdakis (July 2021)**

*A Year in Lockdown: How the Waves of COVID-19 Impact Internet Traffic*

Communications of the ACM. Volume 64, ACM. ISSN: 10.1145/3465212.

**14. Josu Doncel, Vincenzo MANCUSO (July 2021)**

*Optimal Performance of Parallel-Server Systems with Job Size Prediction Errors*

Operations research letters. Volume 49, Elsevier. ISSN: 0167-6377.

**15. Elisa CABANA, Rosa Elvira Lillo (June 2021)**

*Robust multivariate control chart based on shrinkage for individual observations*

Journal of Quality Technology. 10.1080/00224065.2021.1930617.

**16. Constantine AYIMBA, Paolo CASARI, Vincenzo MANCUSO (June 2021)**

*SQLR: Short-Term Memory Q-Learning for Elastic Provisioning*

IEEE Transactions on Network and Service Management. Volume 18, IEEE Communications Society. ISSN: 1932-4537.

**17. Maurizio REA, Domenico GIUSTINIANO (June 2021)**

*Location-aware Wireless Resource Allocation in Industrial-like Environment*

IEEE Transaction on Mobile Computing. 10.1109/TMC.2021.3088058. IEEE. ISSN: 1558-0660.

**18. Carlos Baquero, Paolo CASARI, Antonio FERNÁNDEZ ANTA, Amanda GARCÍA-GARCÍA, Davide Frey, Augusto García-Agundez, Chryssis Georgiou, Benjamin Girault, Antonio Ortega, Mathieu Goes-**



sens, Harold Hernández, Nicolas NICOLAOU, Efsthios Stavrakis, Oluwasegun OJO, Julian C Roberts, Ignacio Sánchez (June 2021)

*The CoronaSurveys System for COVID-19 Incidence Data Collection and Processing*  
Frontiers in Computer Science. 10.3389/fcomp.2021.641237. Volume 3, ISSN: 2624-9898.

**19. Evgenia CHRISTOFOROU, Antonio FERNÁNDEZ ANTA, Ángel Sánchez (June 2021)**

*An experimental characterization of workers' behavior and accuracy in crowdsourced tasks*  
PLOS ONE. <https://doi.org/10.1371/journal.pone.0252604>. Volume 16, Public Library of Science. ISSN: 1932-6203.

**20. Álvaro FEAL, Pelayo VALLINA, Julien GAMBÀ, Sergio Pastrana, Antonio Nappa, Oliver Hohlfeld, Narseo VALLINA-RODRÍGUEZ, Juan Tapiador (May 2021)**

*Blocklist Babel: On the Transparency and Dynamics of Open Source Blocklisting*  
Transactions on Network and Service Management.

**21. Zhiyan Chen, Claudio FIANDRINO, Burak Kantarci (May 2021)**

*On blockchain integration into mobile crowdsensing via smart embedded devices: A comprehensive survey*  
Journal of Systems Architecture. Volume 115.

**22. Augusto García-Agundez, Oluwasegun OJO, Harold Hernández, Carlos Baquero, Davide Frey, Chryssis Georgiou, Mathieu Goessens, Rosa Elvira Lillo, Raquel Menezes, Nicolas NICOLAOU, Antonio Ortega, Efsthios Stavrakis, Antonio FERNÁNDEZ ANTA (April 2021)**

*Estimating the COVID-19 Prevalence in Spain with Indirect Reporting via Open Surveys*  
Frontiers in Public Health.

**23. Ramón Pérez, Jaime García-Reinoso, Aitor Zabala, Pablo Serrano, Albert BANCHS (April 2021)**

*An experimental publish-subscribe monitoring assessment to Beyond 5G networks*  
EURASIP Journal on Wireless Communications and Networking. Volume 2021, SpringerOpen.

**24. Kaixuan Ji, Ce Chi, Fa Zhang, Antonio FERNÁNDEZ ANTA, Penglei Song, Avinab Marahatta, Youshi Wang, Zhiyong Liu (April 2021)**

*Energy-Aware Scheduling Based on Marginal Cost and Task Classification in Heterogeneous Data Centers*  
Energies. <https://doi.org/10.3390/en14092382>. Volume 14, MDPI.

**25. Jesus Omar LACRUZ, Dolores GARCIA MARTI, Pablo JIMÉNEZ MATEO, Joan PALACIOS, Joerg WIDMER (March 2021)**

*High-Speed Millimeter-Wave Mobile Experimentation on Software-Defined Radios*  
GetMobile: Mobile Computing and Communications. Volume 24.

**26. Jaya Prakash Varma CHAMPATI, Ramana Avula, Tobais Oechtering, James Gross (March 2021)**

*Minimum Achievable Peak Age of Information Under Service Preemptions and Request Delay*  
IEEE Journal on Selected Areas in Communications. 10.1109/JSAC.2021.3065047. IEEE Communications Society. ISSN: 0733-8716.

**27. Marco GRAMAGLIA, Marco FIORE, Angelo Furno, Razvan Stanica (March 2021)**

*GLOVE: towards privacy-preserving publishing of record-level-truthful mobile phone trajectories*  
ACM/IMS Transactions on Data Science.

**28. Haftay Gebreslasie Abreha, Carlos Jesús Bernardos, Antonio de la Oliva, Luca COMINARDI, Arturo AZCORRA (February 2021)**

*Monitoring in fog computing: state-of-the-art and research challenges*  
International Journal of Ad Hoc and Ubiquitous Computing. Volume 36.

**29. Borja Nogales, Miguel Silva, Iván Vidal, Miguel Luís, Francisco Valera, Susana Sargento, Arturo AZCORRA (February 2021)**

*Using Aerial and Vehicular NFV Infrastructures to Agilely Create Vertical Services*  
Sensors. Volume 21, Multidisciplinary Digital Publishing Institute.

**30. Gianluca RIZZO, Noelia PÉREZ PALMA, Marco AJMONE MARSAN, Vincenzo MANCUSO (February 2021)**

*Storage Capacity of Opportunistic Information Dissemination Systems*

IEEE Transactions on Mobile Computing.

**31. Borja Nogales, Luis. F Gonzalez, Iván Vidal, Francisco Valera, Jaime García-Reinoso, Diego R. Lopez, Juan Rodríguez, Neftalí González, Ignacio Berberana, Arturo AZCORRA (February 2021)**

*Integration of 5G Experimentation Infrastructures into a Multi-Site NFV Ecosystem*

Journal of Visualized Experiments: Jove.

**32. Josu Doncel, Luis de la Pisa, Agustín SANTOS, Antonio FERNÁNDEZ ANTA (February 2021)**

*A Fair and Scalable Mechanism for Resource Allocation: The Multilevel QPQ Approach*

IEEE Access. Volume 9.

**33. Piergiorgio Vitello, Andrea Capponi, Claudio FIANDRINO, Guido Cantelmo, Dzmitry Kliazovich (February 2021)**

*Mobility-Driven and Energy-Efficient Deployment of Edge Data Centers in Urban Environments*

IEEE Transactions on Sustainable Computing. 10.1109/TSUSC.2021.3056621. IEEE. ISSN: 2377-3782.

**34. Vitalii DEMIANIUK, Sergey GORINSKY, Sergey Nikolenko, Kirill KOGAN (February 2021)**

*Robust Distributed Monitoring of Traffic Flows*

IEEE/ACM Transactions on Networking. 10.1109/TNET.2020.3034890. Volume 29, Co-sponsored by the IEEE Communications Society, the IEEE Computer Society, and the ACM with its Special Interest Group on Data Communications (SIGCOMM). ISSN: 1063-6692.

**35. Antonio FERNÁNDEZ ANTA, Theophanis Hadjistasi, Nicolas NICOLAOU, Alexandru Popa, Alexander A. Schwarzmann (February 2021)**

*Tractable low-delay atomic memory*

Distributed Computing. DOI: <https://doi.org/10.1007/s00446-020-00379-y>. Volume

34, Springer Science+Business Media. ISSN: 0178-2770.

**36. Felipe Ortega, Rosa Gomez-Villafuertes, María Benito-León, Margaret Martínez de la Torre, Luis A. Olivos-Oré, Marina Arribas-Blazquez, María Victoria Gomez-Gavero, Arturo AZCORRA, Manuel Desco, Antonio R. Artalejo, Luis Puellas, María Teresa Miras-Portugal (January 2021)**

*Salient brain entities labelled in P2rx7-EGFP reporter mouse embryos include the septum, roof plate glial specializations and circumventricular ependymal organs*

Brain Structure and Function. 10.1007/s00429-020-02204-5.

**37. Maria J. Blesa, Antonio FERNÁNDEZ ANTA (January 2021)**

*Maria Serna's Contributions to Adversarial Queuing Theory*

Computer Science Review. Elsevier. ISSN: 1574-0137.

**38. Mohammed Rashed, Guillermo SUAREZ-TANGIL (January 2021)**

*An Analysis of Android Malware Classification Services*

Sensors.

**39. Maximo Morales Cespedes, Borja GENOVÉS GUZMÁN, Víctor P. Gil Jimenez (January 2021)**

*Lights and shadows: A comprehensive survey on cooperative and precoding schemes to overcome LOS blockage and interference in indoor VLC*

Sensors. 10.3390/s21030861. Volume 21, ISSN: 1424-8220.

**40. Manuel Alfonso, Manuel Cebrian, Antonio FERNÁNDEZ ANTA, Lorenzo Coviello, Andrés Abeiliuk, Iyad Rahwan (January 2021)**

*Superintelligence Cannot be Contained: Lessons from Computability Theory*

Journal of Artificial Intelligence Research. Volume 70.



## Magazine Articles [4]

1. Stefania Bartoletti, Henk Wymeersch, Tomasz Mach, Oliver Brunnegard, Domenico GIUSTINIANO, Peter Hammarberg, Musa Furkan Keskin, Jesus Omar LACRUZ, Sara Modarres Razavi, Joakim Ronnblom, Fredrik Tufvesson, Joerg WIDMER, Nicola Blefari Melazzi (November 2021)

*Positioning and Sensing for Vehicular Safety Applications in 5G and Beyond*

IEEE Communications Magazine. IEEE.

2. Domenico GIUSTINIANO, Giuseppe Bianchi, Giuseppe Conti, Giuseppe Bartoletti, Nicola Blefari Melazzi (October 2021)

*5G and Beyond for Contact Tracing*

IEEE Communication Magazine. IEEE.

3. Stefania Bartoletti, Luca Chiaraviglio, Sergio Fortes, Takai Eddine Kennouche, Gürkan Solmaz, Giacomo Bernini, Domenico GIUSTINIANO, Joerg WIDMER, Raquel Barco, Giuseppe Siracusano, Giuseppe Conti, Nicola Blefari Melazzi (July 2021)

*Location-Based Analytics in 5G and Beyond*

IEEE Communications Magazine. 10.1109/MCOM.001.2001096. Volume 59, IEEE. ISSN: 0163-6804.

4. Nikolaos LAOUTARIS, Costas Iordanou (January 2021)

*What do Information Centric Networks, Trusted Execution Environments, and Digital Watermarking have to do with Privacy, the Data Economy, and their future?*

ACM SIGCOMM Computer Communication Review. Volume 51, ACM. ISSN: 0146-4833.

## Conference or Workshop Papers [40]

1. Domenico Scotece, Claudio FIANDRINO, Luca Foschini (December 2021)

*On the Efficiency of Service and Data Handoff Protocols in Edge Computing Systems*

IEEE Global Telecommunications Conference. Madrid.

2. Kai Xu, Rajkarn Singh, Marco FIORE, Mahesh Marina, Hakan Bilen, Muhammad Usama, Howard Benn, Cezary Ziemlicki (December 2021)

*SpectraGAN: spectrum based generation of city*

*scale spatiotemporal mobile network traffic data*  
ACM International Conference on Emerging Networking Experiments and Technologies. Munich, Germany (Virtual Conference).

3. Yijing Zeng, Roberto CALVO PALOMINO, Domenico GIUSTINIANO, Gerome Bovet, Suman BANERJEE (December 2021)

*Adaptive Uplink Data Compression in Spectrum Crowdsensing Systems*

IEEE International Symposium on Dynamic Spectrum Access Networks. Virtual.

4. Edgar ARRIBAS, Vicent Cholvi, Vincenzo MANCUSO (December 2021)

*An Optimal Scheme to Recharge Communication Drones*

IEEE Global Telecommunications Conference. Madrid, Spain.

5. Giulia ATTANASIO, Claudio FIANDRINO, Marco FIORE, Joerg WIDMER (November 2021)

*Characterizing RNTI Allocation and Management in Mobile Networks*

ACM/IEEE International Conference on Modeling, Analysis and Simulation of Wireless and Mobile Systems. Alicante, Spain.

6. Thomas Koch, Weifan Jiang, Tao Luo, Pietros Gigis, Yunfan Zhang, Kevin Vermuelen, Emile Aben, Matt Calder, Ethan Katz-Bassett, Lefteris Manasakis, Georgios Smaragdakis, Narseo VALLINARODRÍGUEZ (November 2021)

*Towards a traffic map of the Internet: Connecting the dots between popular services and users*

ACM Workshop on Hot Topics in Networks. Virtual.

7. Dolores GARCIA MARTI, Damiano Badini, Danilo DE DONNO, Joerg WIDMER (November 2021)

*Scalable machine learning algorithms to design massive MIMO systems*

ACM/IEEE International Conference on Modeling, Analysis and Simulation of Wireless and Mobile Systems. Alicante, Spain.

**8. Constantine AYIMBA, Michele Segata, Paolo CASARI, Vincenzo MANCUSO (November 2021)**

*Closer than Close: MEC-Assisted Platooning with Intelligent Controller Migration*

ACM/IEEE International Conference on Modeling, Analysis and Simulation of Wireless and Mobile Systems. Alicante, Spain.

**9. Muhammad Talha Paracha, Daniel J. Dubois, Narseo VALLINA-RODRÍGUEZ, David Choffnes (November 2021)**

*IoTLS: Understanding TLS Usage in Consumer IoT Devices*

Internet Measurement Conference. Virtual.

**10. Ginés GARCÍA, Andres Garcia-Saavedra, Marco GRAMAGLIA, Xavier Costa-Perez, Pablo Serrano, Albert BANCHS (October 2021)**

*Nuberu: Reliable RAN virtualization in shared platforms*

Proceedings of the 27th Annual International Conference on Mobile Computing and Networking. New Orleans, USA.

**11. Muhammad Sarmad Shahab MIR, Borja GENOVÉS GUZMÁN, Ambuj Varshney, Domenico GIUSTINIANO (October 2021)**

*PassiveLiFi: Rethinking LiFi for Low-Power and Long Range RF Backscatter*

ACM International Conference on Mobile Computing and Networking. New Orleans, United States.

**12. Panicos Karkallis, Jorge Blasco, Guillermo SUAREZ-TANGIL, Sergio Pastrana (October 2021)**

*Detecting video-game injectors exchanged in game cheating communities*

European Symposium On Research In Computer Security.

**13. Albert BANCHS, Marco FIORE, Andres Garcia-Saavedra, Marco GRAMAGLIA (October 2021)**

*Network Intelligence in 6G: challenges and opportunities*

ACM International Workshop on Mobility in the Evolving Internet Architecture (MobiArch),

held in conjunction with MobiCom 2021. New Orleans, United States.

**14. Vicent Cholvi, Antonio FERNÁNDEZ ANTA, Chrissy Georgiou, Nicolas NICOLAOU, Michel Raynal, Antonio RUSSO (September 2021)**

*Byzantine-tolerant Distributed Grow-only Sets: Specification and Applications*

Jornadas de Concurrencia y Sistemas Distribuidos 2020+1. Barcelona, Spain.

**15. Vicent Cholvi, Antonio FERNÁNDEZ ANTA, Chrissy Georgiou, Nicolas NICOLAOU, Michel Raynal, Antonio RUSSO (September 2021)**

*Atomic Appends in Asynchronous Byzantine Distributed Ledgers*

Jornadas de Concurrencia y Sistemas Distribuidos 2020+1. Barcelona, Spain.

**16. Javier Álvarez, Carlos Baquero, Elisa CABANA, Jaya Prakash Varma CHAMPATI, Antonio FERNÁNDEZ ANTA, Davide Frey, Augusto García-Agundez, Chrissy Georgiou, Mathieu Goessens, Harold Hernández, Rosa Elvira Lillo, Raquel Menezes, Raúl Moreno, Nicolas NICOLAOU, Oluwasegun OJO, Antonio Ortega, Jesús Rufino, Efsthios Stavarakis, Govind Jeevan, Christin Glorioso (August 2021)**

*Estimating Active Cases of COVID-19*

KDD Workshop on Data-driven Humanitarian Mapping: Harnessing Human-Machine Intelligence for High-Stake Public Policy and Resilience Planning. Virtual.

**17. William Tolley, Beau Kujath, Mohammad Taha Khan, Narseo VALLINA-RODRÍGUEZ, Jedidiah R. Crandal (August 2021)**

*Blind In/On-Path Attacks and Applications to VPNs*

30th USENIX Security Symposium (USENIX Security 21). Virtual.

**18. Claudio FIANDRINO, Giulia ATTANASIO, Marco FIORE, Joerg WIDMER (July 2021)**

*Traffic-Driven Sounding Reference Signal Resource Allocation in (Beyond) 5G Networks*

IEEE International Conference on Sensing, Communication and Networking (SECON 2021).



**19. Ramón Pérez, Aitor Zabala, Albert BANCHS (June 2021)**

*Alviu: An Intent-Based SD-WAN Orchestrator of Network Slices for Enterprise Networks*

International Conference on Network Softwarization. Tokyo, Japan.

**20. Javier TALAVANTE, Borja GENOVÉS GUZMÁN, Domenico GIUSTINIANO (June 2021)**

*Multi-cell Deployment for Experimental Research in Visible Light Communication-based Internet of Things*

IoL '21: Proceedings of the ACM Workshop on Internet of Lights 2021, co-located with MobiSys 2021. Virtual, WI, USA.

**21. Muhammad Sarmad Shahab MIR, Behnaz Majleseini, Borja GENOVÉS GUZMÁN, Borja Genovés Guzmán, Domenico GIUSTINIANO (June 2021)**

*LED-to-LED based VLC Systems: developments and open problems*

IoL '21: Proceedings of the ACM Workshop on Internet of Lights, co-located with MobiSys 2021. Virtual, WI, USA.

**22. Jesus Omar LACRUZ, Rafael RUIZ, Joerg WIDMER (June 2021)**

*A Real-Time Experimentation Platform for sub-6 GHz and Millimeter-Wave MIMO Systems*

The 19th Annual International Conference on Mobile Systems, Applications, and Services (MobiSys 2021). Virtual, WI, USA.

**23. Ramón Pérez, Priscilla Benedetti, Matteo Pergolesì, Jaime García-Reinoso, Aitor Zabala, Pablo Serrano, Mauro Femminella, Gianluca Reali, Albert BANCHS (June 2021)**

*A Performance Comparison of Virtualization Techniques to Deploy a 5G Monitoring Platform*

2021 Joint European Conference on Networks and Communications & 6G Summit (EuCNC/6G Summit). Porto, Portugal.

**24. Blyth Crawford, Florence Keen, Guillermo SUAREZ-TANGIL (June 2021)**

*Memes, Radicalisation, and the Promotion of Violence on Chan Sites*

International AAAI Conference on Web and Social Media (ICWSM).

**25. Aziza Alzadjali, Maria Mushtaq, Flavio Esposito, Claudio FIANDRINO, Jitender Singh Deogun (June 2021)**

*OctoMap: Supporting Service Function Chaining via Supervised Learning and Online Contextual Bandit*

The 7th IEEE International Conference on Network Softwarization (IEEE NetSoft 2021). Virtual.

**26. Hany ASSASA, Nina GROSHEVA, Tanguy Ropitault, Steve Blandino, Nada Golmie, Joerg WIDMER (June 2021)**

*Implementation and Evaluation of a WLAN IEEE 802.11ay Model in Network Simulator ns-3*

The Workshop on ns-3 (WNS3) 2021. Virtual.

**27. Antonio FERNÁNDEZ ANTA, Chryssis Georgiou, Theophanis Hadjistasi, Nicolas NICOLAOU, Efsthios Stavarakis, Andria Trigeorgi (June 2021)**

*Fragmented Objects: Boosting Concurrency of Shared Large Objects*

28th International Colloquium on Structural Information and Communication Complexity (SIROCCO 2021). Wrocław, Poland.

**28. Alejandro BLANCO, Joan PALACIOS, Marco Cominelli, Francesco Gringoli, Joerg WIDMER (June 2021)**

*Accurate Ubiquitous Localization with Off-the-Shelf IEEE802.11ac Devices*

The 19th Annual International Conference on Mobile Systems, Applications, and Services (MobiSys 2021). Virtual, WI, USA.

**29. Mohamed Moulay, Rafael García, Vincenzo MANCUSO, Pablo Rojo, Antonio FERNÁNDEZ ANTA (June 2021)**

*TTrees: Automated Classification of Causes of Network Anomalies with Little Data*

The 22nd IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks (WoWMoM 2021). Online.

**30. Vincenzo MANCUSO, Paolo Castagno, Matteo Sereno, Marco AJMONE MARSAN (June 2021)**

*Serving HTC and Critical MTC in a RAN Slice*

The 22nd IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks (WoWMoM 2021). Online.

**31. Mohamed Moulay, Fernando DíEZ, Vincenzo MANCUSO (June 2021)**

*On the Experimental Assessment of QUIC and Congestion Control Schemes in Cellular Networks*

The 19th Mediterranean Communication and Computer Networking Conference (IEEE Med-ComNet 2021). Online.

**32. Vitalii DEMIANIUK, Sergey GORINSKY, Kirill KOGAN (June 2021)**

*TeleNoise: A Network-Noise Module for In-Band Real-Time Telemetry*

The 20th IFIP Networking 2021 Conference (IFIP NETWORKING 2021). Aalto University, Espoo, Finland.

**33. Christian Quadri, Vincenzo MANCUSO, Valerio Cislaghi, Marco AJMONE MARSAN, Gian Paolo Rossi (June 2021)**

*From PLATO to Platoons*

The 19th Mediterranean Communication and Computer Networking Conference (IEEE Med-ComNet 2021). Online.

**34. Rajkarn Singh, Cengiz Hasan, Marco FIORE, Xenofon Foukas, Mahesh Marina, Yue Wang (May 2021)**

*Energy-Efficient Orchestration of Metro-Scale 5G Radio Access Networks*

The 40th IEEE International Conference on Computer Communications (IEEE INFOCOM 2021). Online.

**35. Vicent Cholvi, Chryssis Georgiou, Antonio FERNÁNDEZ ANTA, Nicolas NICOLAOU, Michel Raynal, Antonio RUSSO (May 2021)**

*Byzantine-tolerant Distributed Grow-only Sets: Specification and Applications*

4th International Symposium on Foundations and Applications of Blockchain (FAB 2021).

**36. Shivang Aggarwal, Moinak Ghoshal, Piyali Banerjee, Dimitrios Koutsonikolas, Joerg WIDMER (May 2021)**

*802.11ad in Smartphones: Energy Efficiency, vSpatial Reuse, and Impact on Applications*

IEEE International Conference on Computer Communications (IEEE INFOCOM 2021). Virtual.

**37. Eduardo Blázquez, Sergio Pastrana, Álvaro FEAL, Julien GAMBA, Platon Kotizias, Narseo VALINA-RODRÍGUEZ, Juan Tapiador (May 2021)**

*Trouble Over-The-Air: An Analysis of FOTA Apps in the Android Ecosystem*

42nd IEEE Symposium on Security and Privacy (S&P).

**38. Sohrab Madani, Suraj Jog, Jesus Omar LACRUZ, Joerg WIDMER, Haitham Hassanieh (April 2021)**

*Practical Null Steering in Millimeter Wave Networks*

18th USENIX Symposium on Networked Systems Design and Implementation (NSDI'21). Online.

**39. Chaoyun Zhang, Marco FIORE, Iain Murray, Paul PATRAS (February 2021)**

*CloudLSTM: A Recurrent Neural Model for Spatiotemporal Point-cloud Stream Forecasting*

The 35th AAAI Conference on Artificial Intelligence (AAAI 2021). Online (previously Vancouver, Canada).

**40. Francesco Reviglione, Marco Malinverno, Stefano Feraco, Giuseppe Avino, Claudio Casetti, Carla Fabiana Chiasserini, Nicola Amati, Joerg WIDMER (January 2021)**

*Experimental assessment of IEEE 802.11-based V2I communications*

ACM International Symposium on Performance Evaluation of Wireless Ad Hoc, Sensor, and Ubiquitous Networks (PE-WASUN), held in conjunction with MSWiM 2021. Alicante, Spain.



## Conference and Workshop Posters & Demos [2]

### 1. Santiago ANDRÉS, Costas Iordanou, Nikolaos LAOUTARIS (November 2021)

*What Is the Price of Data? A Measurement Study of Commercial Data Marketplaces (Poster)*  
Internet Measurement Conference. Virtual.

### 2. Vitalii DEMIANIUK, Kirill KOGAN, Antonio FERNÁNDEZ ANTA (June 2021)

*Abstracting Networks with Measurable Guarantees (Poster)*  
The 20th IFIP Networking 2021 Conference (IFIP NETWORKING 2021). Espoo, Finland.

## Invited Papers, Keynotes, Invited Talks, Tutorials, Lectures, etc. [9]

### 1. Sergey GORINSKY (November 2021)

*RL-Cache: Learning-Based Cache Admission for Content Delivery (Invited Talk)*  
TEWI-Kolloquium. University of Klagenfurt, Austria.

### 2. Antonio RUSSO, Antonio FERNÁNDEZ ANTA, María Isabel González Vasco, Romano Simon Pietro (August 2021)

*Chirotonía: Scalable and Secure e-Voting Framework based on Blockchains and Linkable Ring Signatures (Invited Talk)*  
Communication of ACM Europe Workshop.

### 3. Sergey GORINSKY (July 2021)

*On Telemetry and Classifiers (Invited Talk)*  
Kirill Kogan Memorial Workshop. Ariel University, Israel (online presentation).

### 4. Pavel CHUPRIKOV, Vitalii DEMIANIUK, Sergey GORINSKY (July 2021)

*PREDICAT: Efficient Packet Classification via Prefix Disjointness (Invited Paper)*  
ICCCN 2021. virtual.

### 5. Jaya Prakash Varma CHAMPATI (June 2021)

*Energy-Optimal Sampling of Edge-Based Feedback Systems (Invited Paper)*

IEEE Workshop on SAGE: Green Solutions for Smart Environment. Montreal, Canada.

### 6. Vincenzo MANCUSO, Paolo Castagno, Matteo Sereno (June 2021)

*Efficiency of Virtualization over MEC plus Cloud (Invited Paper)*  
2nd International Workshop on Energy Efficient Learning at the Edge (WEEE) - ACM e-Energy 2021. Torino, Italy.

### 7. Antonio FERNÁNDEZ ANTA (April 2021)

*Introducción a las cadenas de bloques y sus fundamentos -Introduction to Blockchains and their Foundations (Invited Talk)*  
Seminar at Universidad de Castilla - La Mancha. Talavera de la Reina, Spain.

### 8. Antonio FERNÁNDEZ ANTA (March 2021)

*CoronaSurveys: Using Surveys with Indirect Reporting to Estimate the Incidence and Evolution of Epidemics (Invited Talk)*  
WSIS Stocktaking Series: The Coronavirus Response – ICT Case Repository. Online.

### 9. Antonio FERNÁNDEZ ANTA (January 2021)

*CoronaSurveys: Using Surveys with Indirect Reporting to Estimate the Incidence and Evolution of Epidemics (Invited Talk)*  
IMDEA Networks seminar series. Leganes, Spain.

## PhD Theses [5]

### 1. Pablo JIMÉNEZ MATEO (December 2021)

*Network management and control for mmWave communications*  
PhD thesis: Department of Telematics Engineering – Universidad Carlos III de Madrid, Spain  
Supervisor: Joerg Widmer, IMDEA Networks Institute, Madrid, España



## 2. Luis F. CHIROQUE (November 2021)

*Breadth Analysis of Online Social Networks*

PhD thesis: Department of Mathematical Engineering – Universidad Carlos III de Madrid, Spain

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

## 3. Nuria MOLNER (September 2021)

*Routing optimization algorithms in integrated fronthaul/backhaul networks supporting multi-tenancy*

PhD thesis: Department of Telematics Engineering – Universidad Carlos III de Madrid, Spain

Supervisor: Antonio de la Oliva, Universidad Carlos III de Madrid, Madrid, España

## 4. Elizaveta DUBROVINSKAYA (June 2021)

*Algorithms for propagation-aware underwater ranging and localization*

PhD thesis: Department of Telematics Engineering – Universidad Carlos III de Madrid, Spain

Supervisors: Paolo Casari, University of Trento, Italy - Albert Banchs, IMDEA Networks Institute, Madrid, España

## 5. Vitalii DEMIANIUK (February 2021)

*New methods, algorithms, and theoretical guarantees for algorithms in network element design*

PhD thesis: Department of Telematics Engineering – Universidad Carlos III de Madrid, Spain

Supervisors: Kirill Kogan, IMDEA Networks Institute, Madrid, España - Sergey Nikolenko, Saint Petersburg State University, Russia



### 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)
- Editorial Board member: Performance Evaluation Journal (Elsevier)
- Editorial Board member: The ACM Transactions on Modeling and Performance Evaluation of Computing Systems Journal (ACM ToMPECS)

##### TPC memberships

- IEEE International Conference on Computer Communications (IEEE INFOCOM 2021), 10-13 May 2021, Virtual Conference
- IEEE Asia Pacific Conference on Wireless and Mobile (APWIMOB), 8-9 April 2021, Bandung, Indonesia
- IEEE Global Communications Conference (Globecom), 7-11 December 2021, Madrid, Spain and Virtual
- IEEE Symposium on Future Telecommunication Technologies (SOFTT), 6-7 December 2021, Bandung, Indonesia
- IEEE International Conference on Industry 4.0, Artificial Intelligence, and Communications Technology (IAICT), 27-28 July 2021, Bandung, Indonesia
- Green Communications Systems and Networks Symposium at IEEE ICC 2021 (ICC 2021 GCSN), 14-18 June 2021, Montreal, Canada
- Wireless Communications Symposium at IEE ICC 2021 (IEE ICC 2021 WC), 14-18 June 2021, Montreal, Canada
- The 29th International Conference on Computers in Education (ICCE 2021), 22-26 November 2021
- IEEE Wireless Communications and Networking Conference (WCNC 2021), 29 March-1 April 2021, Nanjing, China
- IEEE International Conference on Internet of Things and Intelligence System (IOTAIS 2021), 23-24 November 2021, Virtual Conference
- ITC 33 – Networked Systems and Services, 31 August-3 September 2021, Avignon, France
- International Telecommunication Networks and applications conference (ITNAC 2021), 24-26 November 2021, Virtual Conference

## Arturo AZCORRA

### Professional posts and activities

- Expert Group del proyecto COREnect. September 2020 – April 2021
- Chairman of the Vision Group of 5GIA. December 2018 - present
- Chair of the “Vision and Societal Challenges” workgroup of the 5G Infrastructure Association. November 2018 – present
- Member of the Board of Directors of the National Scientific Society for Telematics (ATEL). January 2016 – April 2021 (now, Scientific Society of Telematic Engineering (SCITEL)
- Vice-President of the 5TONIC Laboratory. October 2015 – April 2021
- Deputy Director of the Master in Connected Industry 4.0, Universidad Carlos III de Madrid, 2018 to 2021
- Member of the Executive Committee of the Doctorate School of Univ. Carlos III of Madrid. 9 December 2015 – April 2021
- Deputy Director of the Master in Network Function Virtualization and Software Defined Networks for 5G, Universidad Carlos III de Madrid
- Member of the Board of Directors of the PhD School of University Carlos III of Madrid. 5 December 2013 – April 2021

### Journal editorial boards

- Editor of a special issue of the journal Sensors (March 2021)
- Editorial Board of 6G World, since december 2020

### Organization committees

- Program Committee of “Networking Channel”. March 2021 – present

## Albert BANCHS

### Professional posts and activities

- Expert in 5G networks and services of “Los 100 de COTEC”

### TPC memberships

- IEEE International Conference on Computer Communications (IEEE INFOCOM 2021), 10-13 May 2021, Virtual Conference
- IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks (WoWMoM), 7-10 June 2021, Virtual Conference

## Suman BANERJEE

### Organization committees

- General Chair: ACM International Conference on Mobile Systems, Applications and Services (ACM Mobisys 2021), 24 June – 2 July 2021, Virtual Conference

- Steering Committee member: ACM Mobicom 2021, 28 March-1 April 2022, New Orleans, United States.

#### **TPC memberships**

- ACM International Conference on Mobile Computing and Networking (Mobicom 2021), 28 March-1 April 2022, New Orleans, United States.

### **Antonio BAZCO-NOGUERAS**

#### **Organization committees**

- Financial Chair: 25th International ITG Workshop on Smart Antennas (WSA 2021), 10-11 November 2021, EURECOM, French Riviera

### **Jaya Prakash Varma CHAMPATI**

#### **TPC memberships**

- EAI International Conference on Heterogeneous Networking for Quality, Reliability, Security and Robustness (EAI QSHINE 2021), 29-30 November 2021, Melbourne, Australia and Virtual
- IEEE ICC Workshop on SAGE: Green Solutions for Smart Environment, 14-23 June 2021, Montreal, Canada
- Age of Information Workshop (AoI'21) in conjunction with IEEE INFOCOM 2021, 10 May 2021, Virtual Workshop
- IEEE International Conference on Computer Communications (IEEE INFOCOM 2022), 2-5 May 2022, Virtual Conference

### **Antonio FERNÁNDEZ ANTA**

#### **Professional posts and activities**

- Mercator Fellow at Collaborative Research Centre MAKI, TU Darmstadt, Germany. November 2018 - present

#### **Journal editorial boards**

- Editor of The Computer Journal, Oxford Journals

#### **Organization committees**

- Publicity co-chair: 19th Mediterranean Communication and Computer Networking Conference (MedComNet 2021), 15-17 June 2021, Virtual Conference
- Creator and steering committee member of The Workshop on Energy Efficiency at the Edge. The second edition, WEEE 2021, was held virtually colocated with ACM e-Energy 2021



### TPC memberships

- International Symposium on DIStributed Computing (DISC 2021), 4-8 October 2021, Freiburg, Germany, and Virtual
- 2nd KDD Workshop on Data-driven Humanitarian Mapping, SIROCCO 2021, 17-18 August 2021, Virtual Conference

## Claudio FIANDRINO

### Journal editorial boards

- IEEE Networking Letters

### Organization committees

- TPC Co-Chair: IEEE International Workshop on Computer Aided Modeling and Design of Communication Links and Networks (CAMAD) 2021, 25-27 October 2021, Virtual Conference

### TPC Memberships

- IEEE Consumer Communications & Networking Conference (CCNC), 8–11 January 2022, Virtual Conference
- IEEE International Conference on Communications (ICC), 14-23 June 2021, Virtual Conference
- IEEE Global Communications Conference (Globecom), 7–11 December 2021, Madrid, Spain and Virtual
- IEEE BlackSeaCom, 24–28 May 2021, Virtual Conference

## Marco FIORE

### Professional posts & activities

- Co-founder and CTO at Net AI Tech Ltd
- Expert evaluator for the call “Appel Automne 2020”, Labex DigiCosme of the Ministry of Higher Education and Research (MESR) of France
- Member of one PhD thesis evaluation committee et Sorbonne Université

### Journal editorial boards

- Technical Editor, IEEE Network Magazine
- Recommender, Peer Community In Complex Network
- Associate Editor, Frontiers in Sustainable Cities, specialty section on “Urban Transportation Systems and Mobility”
- Associate Editor, IEEE Access
- Editorial Board member, MDPI Future Internet
- Technical Committee member, Elsevier Computer Communications

### Organization committees

- 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, 14-15 September 2021, Virtual Conference
- Publications Co-chair: ACM International Conference on Mobile Computing and Networking (Mobicom 2021), 28 March-1 April 2022, New Orleans, United States.
- Co-Chair: Wireless Models and Simulations Track Wireless Days 2021 (WD 2021), 30 June-2 July 2021, Virtual Conference

#### **TPC memberships**

- IEEE International Conference on Computer Communications (IEEE INFOCOM 2021), 10-13 May 2021, Virtual Conference
- International Conference on Sensing, Communication and Networking (IEEE SECON 2021), 6-9 July 2021, Virtual Conference
- IEEE International Conference on Communications (IEEE ICC 2021), 14-23 June 2021, Montreal, Canada and Virtual
- IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks (WoWMoM), 7-10 June 2021, Virtual Conference
- Passive and Active Measurement Conference (PAM 2021), 29-31 March 2021, Virtual Conference
- IEEE Vehicular Networking Conference (VNC 2021), 10-12 November 2021, Virtual Conference
- Complex Networks 2021, 30 November-2 December 2021, Madrid, Spain, and Virtual
- Wireless On-demand Network systems and Services Conference (IEEE WONS 2021), 9-11 March 2021, Virtual Conference
- IEEE Consumer Communications & Networking Conference (IEEE CCNC 2021), 9-12 January 2021, Virtual Conference
- IEEE International Symposium on Personal, Indoor and Mobile Radio Communications (IEEE PIMRC 2021), 13-16 September 2021, Virtual Conference
- ACM Workshop on Wireless Network Testbeds, Experimental evaluation & Characterization (ACM WiNTECH 2021), 1 April 2022, New Orleans, United States
- 3rd International Workshop on Urban Computing (IEEE UrbCom 2021), 14-16 July 2021, Virtual Conference
- ACM SIGCOMM 2021 Workshop on Flexible Networks (FlexNets'21), 23 August 2021
- IEEE 5G World Forum (IEEE WF-5G 2021), 31 December 2021, Virtual Conference
- International Workshop on Intelligent Cloud Computing and Networking (ICCN 2021), held in conjunction with IEEE INFOCOM 2021, 10 May 2021, Virtual Workshop

#### **Borja GENOVÉS**

##### **Organization committees**

- Publicity chair: 'Internet of Lights' workshop (ACM MobiSys 2021), 25 June 2021, Virtual Event



## Domenico GIUSTINIANO

### Professional posts & activities

- Panelist of the FCT - Call for Exploratory Research Projects under the Carnegie Mellon Portugal Program

### Journal editorial boards

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

### TPC memberships

- ACM Workshop on Wireless Network Testbeds, Experimental evaluation & Characterization (ACM WiNTECH 2021), 1 April 2022, New Orleans, United States
- ACM International Conference on Mobile Systems, Applications and Services (ACM Mobisys 2021), 24 June – 2 July 2021, Virtual Conference
- ACM International Conference on Emerging Networking Experiments and Technologies (ACM CoNEXT 2021), 7-10 December 2021, Virtual Conference
- IEEE International Conference on Computer Communications (IEEE INFOCOM 2022), 2-5 May 2022, Virtual Conference

## Michele GUCCIARDO

### TPC memberships

- Workshop on Mobility in the Evolving Internet Architecture (MobiArch 2021), 1 April 2022, New Orleans, United States

## Sergey GORINSKY

### Journal editorial boards

- Editorial Board Member: ACM SIGCOMM Computer Communication Review

### Organization committees

- Steering Committee Member: COMSNETS Association

### TPC Memberships

- IEEE International Conference on Network Protocols (ICNP 2021), 1-5 November 2021, Virtual Conference, (Area Chair)
- ACM International Conference on Emerging Networking Experiments and Technologies (ACM CoNEXT 2021), 7-10 December 2021, Virtual Conference
- IEEE International Conference on Computer Communications (IEEE INFOCOM 2022), 2-5 May 2022, Virtual Conference
- ACM Conference on Applications, Technologies, Architectures, and Protocols for Computer Communication (SIGCOMM 2022), 22-26 August, Amsterdam, The Netherlands

- International Conference on Network Softwarization (NetSoft 2022), 27 June – 1 July, Milan, Italy

## Nikolaos LAOUTARIS

### TPC memberships

- ACM International Conference on Emerging Networking Experiments and Technologies (ACM CONEXT'22), 6-9 December 2022, Rome, Italy
- IEEE International Conference on Network Protocols (ICNP 2022), 30 October – 2 November, Lexington, Kentucky, USA

## Vincenzo MANCUSO

### Journal editorial boards

- Editor for IEEE Transactions on Green Communications and Networking (TGCN) for the “Energy Efficiency in Wireless Communications and Networking” area
- Guest editor for Elsevier Computer Communications, Special Issue title: Best articles from MedComNet 2021

### Organization committees

- General Chair for MedComNet 2021

### TPC memberships

- IEEE International Conference on Computer Communications (IEEE INFOCOM 2021), 10-13 May 2021, Virtual Conference
- International Workshop on Energy-Efficient Learning at the Edge (WEEE 2021), 28 June 2021, Virtual Event
- International Conference on Embedded Wireless Systems and Networks (EWSN 2021), 17-19 February 2021, Delft, The Netherlands
- International Conference on Modeling, Analysis and Simulation of Wireless and Mobile Systems (MSWiM 2021), 22-26 November, Alicante, Spain
- IEEE International Black Sea Conference on Communications and Networking (Black-SeaCom 2021), 24-28 May 2021, Virtual Conference
- IEEE International Conference on Computer Communications (IEEE INFOCOM 2022), 2-5 May 2022, Virtual Conference
- IFIP Networking 2022, 13-16 June 2022, Catania, Italy

## Srdjan MATIC

### TPC memberships

- Passive and Active Measurement (PAM) 2022, 28-30 March 2022, Virtual Conference

## Guillermo SUÁREZ-TANGIL

### Professional posts & activities

- Co-Chair of IMDEA Networks' Ethical Board, 2021
- PhD Thesis Reviewer for the University of Cagliari, 2021

### Organization committees

- Steering Committee at the Spanish National Conference in Cybersecurity (VI Jornadas Nacionales de Investigación en Ciberseguridad), 2021
- Editor of the Special Issue in Scientific Programming, 2021
- Organization of the Tracking the Trackers Tutorial at Web Science Conference, 2021

### TPC memberships

- 6th IEEE European Symposium on Security and Privacy (Euro S&P 2021), 7-11 September 2021, Vienna, Austria
- The 16th International Conference on Availability, Reliability and Security (ARES 2021), 17-20 August 2021, Vienna, Austria
- 14th ACM Workshop on Artificial Intelligence and Security (AISec 2021), 15 November 2021, Virtual Workshop
- 14th European Workshop on Systems Security (EuroSec 2021), 26 April 2021, Edinburgh, Scotland, UK
- 3rd Location Privacy Workshop (LPW 2021), 17-20 August, Virtual Workshop
- 3rd Workshop on Attackers and Cyber-Crime Operations (WACCO 2021), 7 September 2021, Virtual Conference
- Malicious Software and Hardware in Internet of Things (Mal-IoT 2021), 11 May 2021, Virtual Event
- External Reviewer at the 24th ACM Conference On Computer-Supported Cooperative Work And Social Computing (CSCW 2021), 23-27 October 2021, Virtual Conference

## Narseo VALLINA-RODRÍGUEZ

### Professional posts & activities

- Jury member: CNIL-INRIA Privacy Award
- Chair of IMDEA Networks' Ethical Board

### Community services

- Organization of a local pod (Madrid) - ACM Internet Measurements Conference (IMC)

### TPC memberships

- ACM Internet Measurement Conference (IMC), 2-4 November 2021, Virtual Conference
- ACM SIGSAC Conference on Computer and Communications Security (CCS), 15-19 November 2021, Virtual Conference
- Network Traffic Measurement and Analysis Conference (TMA Conference 2021), 14-15 September 2021, Virtual Conference
- Privacy Enhancing Technologies Symposium (PETS), 12-16 July 2021, Virtual Conference

## Joerg WIDMER

### Professional posts & activities

- Chair of working group IFIP TC 6 WG 6.2 - Network and Internetwork Architectures
- Steering committee member IFIP Networking, since 2019

### Journal editorial boards

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

### TPC memberships

- IEEE International Conference on Computer Communications (IEEE INFOCOM 2021), 10-13 May 2021, Virtual Conference
- ACM International Conference on Mobile Computing and Networking (Mobicom 2021), 28 March-1 April 2022, New Orleans, United States.
- USENIX Symposium on Networked Systems Design and Implementation (NSDI), 12-14 April 2021, Virtual Conference
- IFIP Networking, 21-24 June 2021, Virtual Conference
- Wireless On-Demand Network Systems and Services (WONS), 9-11 March 2021, Virtual Conference
- ACM Workshop on Wireless Network Testbeds, Experimental evaluation & Characterization (ACM WiNTECH 2021), 1 April 2022, New Orleans, United States



# dissemination events

dissemination  
events









## 5.4. Outreach

### 5.4.1 Major events

These events were reduced due to the situation caused by Covid-19... we are ready to organise new initiatives in 2022!

## Visit of the Master in Journalism 'ABC'-UCM to 5TONIC

*30 November 2021*

A group of eight students from the ABC-UCM Master's Degree in Journalism and Digital Communication visited the IMDEA Networks headquarters to learn about the work being carried out at the 5TONIC laboratory, founded by the Madrid institution and Telefónica. Carlos Jesús Bernardos, vice-president of 5TONIC, and Ignacio Berberana, technical manager of the laboratory and Research Engineer at IMDEA Networks, made a presentation of the ongoing projects and then showed them the lab.

[More info](#)





semana de la  
ciencia y la innovación  
2021

fundación para el  
conocimiento  
madrid

institute  
imdea  
networks

## Science and Innovation Week of Madrid: An Internet of Things System for Timely Wildfire Monitoring

11 November 2021

In this educational talk, Prof. Katia Obraczka (Visiting Professor at IMDEA Networks) described PANTHER (Persistent Autonomous Monitoring for Timely Detection of Wildfires), an energy-efficient IoT (Internet of Things) system designed to be deployed in remote areas to monitor environmental conditions conducive to wildfire initiation and growth, as well as support wildfire mitigation and preparedness efforts.

[More info](#)



## IMC Pod

2-4 November 2021

Organized by Álvaro Feal, Aniketh Girish, Srdjan Matic and Julien Gamba

Local pod organized by the Internet Analytics Group to allow people from IMDEA Networks and UC3M to enjoy the Internet Measurement Conference (IMC) together from the IMDEA Networks Auditorium.



## European Researchers' Night in Madrid 2021: What are you doing to improve the planet?

24 September 2021

Once again, IMDEA Networks participated in the European Researchers' Night in Madrid, a major science outreach event held on September 24 at the Residencia de Estudiantes in Madrid. In its 12th edition, researchers from the seven IMDEA Institutes talked about how they use science to improve the present and the future of the planet.

IMDEA Networks researchers Domenico Giustiniano (Research Associate Professor), Borja Genovés (Post-Doc Researcher), Muhammad Sarmad Mir (PhD Student), Javier Talavante (PhD Student), and Dayrene Frómata (PhD Student) showed a demo where battery-free IoT devices perform by leveraging two emerging technologies, visible light communication, and radio-frequency backscatter.

The European Researchers' Night in Madrid 2021, coordinated by the Fundación para el Conocimiento madri+d, is an action within the framework of the European program Horizon 2020, which is held in more than 300 European cities at the same time.

[More info](#)



NEWS



VIDEO



## 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, Technische Universität Darmstadt, University of California, Berkeley, and Trinity College Dublin. The topics ranged from scientific presentations to technology-transfer oriented talks. All events were held in Madrid. Out of the 29 total number of events in which the Institute participated during 2021, 15 of our events were conducted by invited speakers. We list the latter here:

### **Video-streaming research: an end-to-end pipeline perspective**

Leonardo Peroni, PhD Student at IMDEA Networks Institute, Madrid, Spain

*22 December 2021*

### **Nuberu: A Reliable DU Design Suitable for Virtualization Platforms**

Andres Garcia-Saavedra, Principal Researcher at NEC Laboratories Europe

*16 December 2021*

### **Outlier Detection for Functional Data**

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

*15 December 2021*

### **LwTE: Light-weight Transcoding at the Edge**

Dr. Farzad Tashtarian, Postdoctoral Researcher, Department of Information Technology, Alpen-Adria-Universität, Klagenfurt, Austria

*9 December 2021*

### **Time, Technology, and Globalization. A study of the role of technology in processes of modernization and globalization using the Press, Big Data, and Computational Research Methodologies (GLOTECH)**

Elena Fernández, Post-Doc Researcher at the Department of Computational Linguistics, University of Zurich

*2 December 2021*

### **Single Access Point Localization System**

Stavros Eleftherakis, PhD Student at IMDEA Networks Institute, Madrid, Spain

*1 December 2021*

### **A performance analysis of cell-free mmWave networks**

Nina Grosheva, PhD Student at IMDEA Networks Institute, Madrid, Spain

*24 November 2021*

### **Accurate Ubiquitous Localization with Off-the-Shelf IEEE802.11ac Devices**

Alejandro Blanco, PhD Student at IMDEA Networks Institute, Madrid, Spain

*17 November 2021*

### **Is Your Mobile OS Watching You?**

Doug Leith, Chair of Computer Systems, School of Computer Science & Statistics, Trinity College Dublin, Ireland

*16 November 2021*

### **Deployment of networking services in microservice-based UAV platforms: L2S-M**

Luis F. González, PhD Student at University Carlos III of Madrid, Madrid, Spain

*10 November 2021*

### **An Introduction to In-Band Network Intelligence**

Aristide Tanyi-Jong Akem, PhD Student at IMDEA Networks Institute, Madrid, Spain

*3 November 2021*

### **Characterizing RNTI Allocation and Management in Mobile Networks**

Giulia Attanasio, PhD Student at IMDEA Networks Institute, Madrid, Spain

*27 October 2021*

### **Multi-interface network framework for UAV management and data communications**

Víctor Sánchez Agüero, PhD Student at IMDEA Networks Institute, Madrid, Spain

*20 October 2021*

### **How Blockchain can extend the remote-control range of a Robot while Machine learning is keeping it profitable**

Kiril Antevski, PhD Student at University Carlos III of Madrid, Madrid, Spain

*13 October 2021*

### **Machine learning for the physical layer design**

Dolores García, PhD Student at IMDEA Networks Institute, Madrid, Spain

*6 October 2021*

### **MEC-Assisted Platooning with Intelligent Controller Migration**

Constantine Ayimba, PhD Student at IMDEA Networks Institute, Madrid, Spain

*22 September 2021*

### **Blockchain is dead, long live blockchain! Exploiting Accountability to Strengthen Blockchain Fault Tolerance**

Alejandro Ranchal-Pedrosa, PhD Student at University of Sydney, Australia

*9 September 2021*

### **An Empirical Study of Data Prices in Commercial Marketplaces**

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

*16 June 2021*

### **Let's Work Together: Building a Robust, Consistent, and Efficient Distributed Shared Storage System for Large Data Objects that Promotes Collaboration**

Nicolas Nicolaou, co-founder and a senior scientist and algorithms engineer at Algolysis Ltd, Cyprus

*9 June 2021*



### **Introduction to FHE, TFHE and Machine Learning Applications**

Ilaria Chillotti, Director of Research, Zama, France

*20 May 2021*

### **Mis-shapes, Mistakes, Misfits: An Analysis of Domain Classification Services**

Pelayo Vallina, PhD Student at IMDEA Networks Institute, Madrid, Spain

*5 May 2021*

### **Angel or Devil? A Privacy Study of Mobile Parental Control Apps**

Álvaro Feal, PhD Student at IMDEA Networks Institute, Madrid, Spain

*28 April 2021*

### **Overview of Adversarial Machine Learning (AML) with Applications to Network Anomaly Detection (NAD)**

George Kesidis and David J. Miller (Pennsylvania State University, USA)

*3 March 2021*

### **Tackling the Energy Asymmetry between Sensing, Computation, and Communication in Wireless Embedded Systems**

Ambuj Varshney, Postdoc Researcher, University of California, Berkeley, USA

*1 March 2021*

### **SGD on Distributed Systems**

Ali Ramezani-Kebrya, Postdoctoral Fellow, University of Toronto and Vector Institute, Canada

*25 February 2021*

### **On Three Research Problems**

Nikola Zlatanov, Assistant Professor at Monash University, Australia

*23 February 2021*

### **Roundabouts as Switches: Synchro [& Turbo] Roundabouts with Rotating Priority Sectors (STYROPS) for High-Capacity, Safe, and Sustainable Roundabouts**

Guillermo Ibañez (University of Alcalá, Spain) and Tobias Meuser (Technical University of Darmstadt, Germany)

*17 February 2021*

### **The hardware and software design for a Cyber-IoT-Physical system**

Yaxiong Xie, Postdoc Researcher, Princeton University, USA

*16 February 2021*

### **CoronaSurveys: Using Surveys with Indirect Reporting to Estimate the Incidence and Evolution of Epidemics**

Antonio Fernández Anta, Research Professor at IMDEA Networks Institute, Madrid, Spain

*13 January 2021*

### 5.4.3. Media impacts

# Media impact 2021



Web news



Press releases



Social networks posts



Social networks followers 2021



1.640



265



375

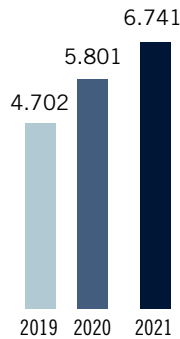


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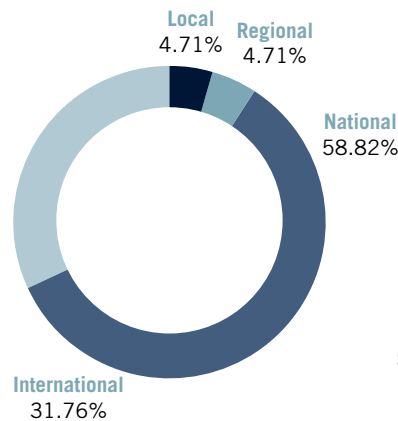


580

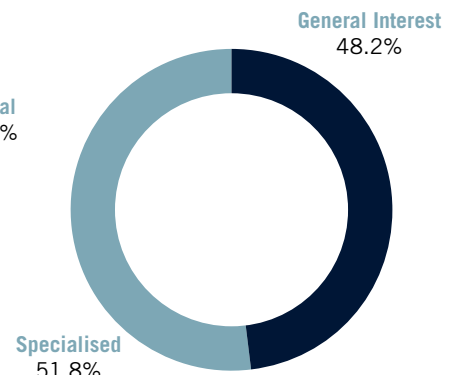
community growth



national, international, local



media content





## Some media impacts



### Albert Banchs talks about the present and future of 5G in 'La Aventura del Saber'

[More info](#)



**Albert Banchs (IMDEA Networks):**  
**“Queremos aportar valor económico  
y social con la transferencia  
tecnológica”**

[More info](#)



# EL PAÍS

## Los expertos apuntan a un error humano como probable causa del apagón de WhatsApp, Facebook e Instagram

[More info](#)


EL PAÍS

### Tecnología

TU TECNOLOGÍA · CIBERSEGURIDAD · PRIVACIDAD · INTELIGENCIA ARTIFICIAL · INTERNET · GRANDES TECNOLÓGICAS · ÚLTIMAS NOTICIAS

REDES SOCIALES &gt;

### Los expertos apuntan a un error humano como probable causa del apagón de WhatsApp, Facebook e Instagram

Todos los carteles de las carreteras de la red donde ponía "nuestros servidores están por aquí" desaparecieron



# ABC

## Ciencia 'made in Madrid', élite mundial

[More info](#)

### ABC MADRID

Opinión · España · Economía · Internacional · Sociedad · Deportes · Cultura · Historia · Ciencia · Gente · Play

EXCLUSIVO PREMIUM

ABC ESPAÑA MADRID Distritos Municipios Videos Plan B

### Ciencia 'made in Madrid', élite mundial

La Universidad de Stanford destaca a 31 investigadores de institutos de la región en el 'top' internacional



Uno de los laboratorios de los Institutos Madrileños de Estudios Avanzados (IMDEA) - ABC



# EL PAÍS

## Por qué la recomendación de deshacerse de los móviles Xiaomi revela una amenaza más grave de lo que parece

[More info](#)

### Tecnología

TU TECNOLOGÍA · CIBERSEGURIDAD · PRIVACIDAD · INTELIGENCIA ARTIFICIAL · INTERNET · GRANDES TECNOLÓGICAS · ÚLTIMAS NOTICIAS

TELÉFONOS MÓVILES >

## Por qué la recomendación de deshacerse de los móviles Xiaomi revela una amenaza más grave de lo que parece

Lituania aconsejó a sus ciudadanos evitar algunos dispositivos chinos, los más vendidos en Europa. Alemania ha empezado luego a investigarlos. Pero el desafío es para todo el ecosistema Android



## Hablamos de los niños e Internet en Twitch: cómo gestionar la educación digital de los más pequeños

[More info](#)



# BUSINESS INSIDER

**Varias apps de control parental son opacas en materia de privacidad y ofrecen datos de niños y padres con fines publicitarios, según una investigación internacional**

[More info](#)

BUSINESS INSIDER

Economía Tecnología Estrategia Política Más temas

## Varias apps de control parental son opacas en materia de privacidad y ofrecen datos de niños y padres con fines publicitarios, según una investigación internacional

Alberto R. Aguilar 7 feb. 2021 8:01h.



valentinrussanov Getty Images

- Una investigación del IMDEA Networks, el IMDEA Software y la EPFL suiza concluyen que varias apps de control parental son opacas en materia de privacidad y protección de datos.

El curso de e  
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MBA



## Los datos de geolocalización que recoge tu móvil: entre el riesgo y la promesa

[More info](#)

Neutral Los datos de geolocalización que recoge tu móvil: entre el riesgo y la promesa

Detrás de la red El reflejo de los ataques a la ... Fact-Fiction 'Onoda: 10.000 noches en la ju... Plata o Plomo

### Los datos de geolocalización que recoge tu móvil: entre el riesgo y la promesa

Un medio católico sacó a la luz la orientación sexual de un obispo a través de datos de ubicación de una app: qué tipo de dato es la geolocalización, para qué sirve y qué puede revelar



### Wireless communication devices without batteries? Research and sustainability, united through light

[More info](#)



Week's top Latest news

Home / Electronics & Semiconductors  
Home / Energy & Green Tech



OCTOBER 28, 2021

### Wireless communication devices without batteries? Research and sustainability, united through light

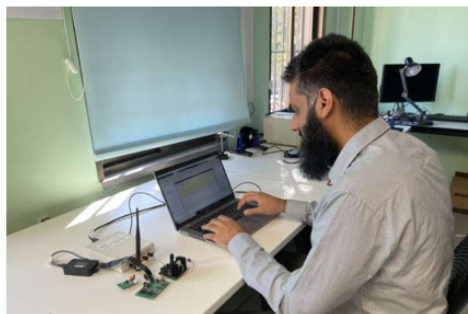
by IMDEA Networks Institute

f 1

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in Share

✉ Email



## Detectando trampas en videojuegos online

[More info](#)

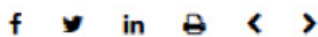


### Redacción

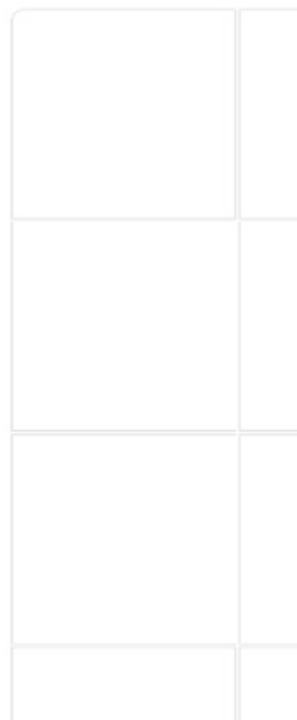
Lunes, 27 de Diciembre de 2021

Computación

# Detectando trampas en videojuegos online



Las trampas (cheats) en los videojuegos online se producen de manera habitual. Sin embargo, en los últimos tiempos las técnicas para crearlas han sido perfeccionadas hasta el punto de que actúan de forma similar a un malware, lo que dificulta el trabajo de las empresas que crean mecanismos antitrampas (anticheat). Un grupo internacional de investigadores, entre quienes se encuentra Guillermo Suárez-Tangil, profesor de IMDEA Networks, ha llevado a cabo un estudio que ayuda precisamente a los desarrolladores de juegos y a la industria antitrampas a identificar los vectores de ataque más rápidamente.







## DAEMON Eyes Greater Network Intelligence in 6G Systems

[More info](#)

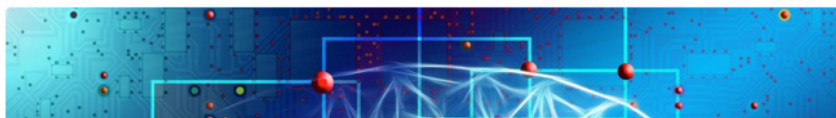


Exclusives Latest Research 6GWorld Resources 6GSyr

## DAEMON Eyes Greater Network Intelligence in 6G Systems

March 3, 2021

Written by Ryan Szporer



## ACTIVO LEGANÉS

### La tecnología de Leganés que usa el internet de las cosas para evitar incendios forestales

[More info](#)



SUCESOS CULTURA DEPORTES POLITICA SOCIEDAD REPORTAJES ENTREVISTAS

EL TIEMPO 20.6 °C Leganés

ULTIMA HORA La ministra de Educación y FP asistió en Leganés al "Technovation Girls"

ÚNETE ACCESO

### La tecnología de Leganés que usa el internet de las cosas para evitar incendios forestales

Por Redacción 12 noviembre, 2021







## Entrevista con Antonio Fernández Anta, Full Professor del IMDEA Networks de la Comunidad de Madrid, en Leganés

[More info](#)

EN DIRECTOA LA CARTAPARRILLABOLETÍN INFORMATIVO ▶



### Entrevista con Antonio Fernández Anta, Full Professor del IMDEA Networks de la Comunidad de Madrid, en Leganés

Publicado el 11-11-2021 13:26:18 CET

   DESCARGAR

El Instituto celebra estos días la semana de la ciencia e innovación 2021

## 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



6.1. Patents [96]

6.2. Technology transfer & impact [96]

a n n u a l   r e p o r t

2021

[www.networks.imdea.org](http://www.networks.imdea.org)

## 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.

### ES Patent Application (September 2021)

**Title:** *Method for determining geometric information on mmWave network devices*

**Inventors:** Guillermo BIELSA LÓPEZ, Joan PALACIOS BELTRAN, Paolo CASARI, Joerg WIDMER, Adrian LOCH NAVARRO

**Rights:** IMDEA Networks Institute

**Overview:** A method for determining geometric information of mmWave network devices comprising collecting measures, by at least one of the devices, of signal strength and SNR of a transmission received from another device of the mmWave network; estimating angle information of the received signals to generate a set of informed particles comprising initial values of state of each informed particle and input in a modified particle filter; the modified particle filter evolving the sets of informed particles and past particles to obtain a set of evolved particles which, in turn, is evolved to obtain a set of posterior particles delivered by the modified particle filter. Finally, the modified particle filter delivers as output final values of geometric information of the at least one device extracted from the delivered set of posterior particles.

**Application number:** ES2725773B2. (Granted: 2021-09-03)

## 6.2. Technology transfer & impact

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



### Consumer Reports – Digital Lab Fellowship

**Funded by:** Consumer Reports

**Duration:** February 2021 to March 2022

The objective of this project is to shed light on the Android supply chain and explore the attribution, privacy and security aspects of this ecosystem. Specifically, IMDEA Networks aims to improve already existing analysis tools to study the privacy risks of custom permissions exposed by pre-installed components and for identifying the supply chain of developers able to pre-install software on Android devices, even if dynamically through the use of Firmware-over-the-air (FOTA) components. The tools and data will be made publicly available to the research community.

This research contract was received as a Fellowship awarded to the researcher Julien Gamba.



### NetPredict 4 - Interpretation of the evolution of network traffic

**Funded by:** NOKIA SPAIN S.A.

**Duration:** September 2021 to February 2022

The NetPredict4 project proposes the extension of the work started in the previous projects in mainly two directions. On the one hand it will perform exhaustive evaluation of the techniques developed in multiple datasets to have a comprehensive study of performance using both numerical and categorical data features. On the other hand, the time dimension will be introduced, in order to compare the characteristics of experiments done under the same conditions at different points in time and to detect performance anomalies in almost-real time in operational environments.

The final goal of Netpredict4 is to take the automated tool for detection and explanation of anomalies that is being developed in this series of projects closer to an early alarm system. The models developed will be exhaustively evaluated, and the results will be collected in an academic paper to be submitted to a high-level international conference.



## 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 Jan 2022

Support for the design and implementation of a predictive model for the capacity planning of a telecommunications architecture.

## ARMASUISSE TechLoc



Funded by: Armasuisse – Science and Technology

Duration: March 2021 to December 2021

TechLoc will have as first objective the investigation of a signal technology classification based on the combination of Embedding, LSTM and fully connected layers using PSD data, which provides better performance than State of the Art works, and as second objective the investigation, in a practical setting, of TDOA localization algorithms for localizing anomalous technologies.

## Deep Learning for Efficient LoS MIMO Backhaul



Funded by: HUAWEI TECHNOLOGIES Italia S.r.l.

Duration: July 2020 to June 2021

The tremendous capacity increases in radio access envisioned for 5G and beyond mobile networks has increased the requirements for efficient ultra-high-speed wireless backhaul. Unfortunately, the increase of spectral efficiency of SISO systems has saturated long ago and current MIMO systems are characterized by too complex processing and too expensive deployment, limiting their commercial success.

The aim of this project is to leverage on Deep Learning (DL) techniques to improve performance and reduce implementation complexity of LoS MIMO backhaul communication systems. Specifically, the goal is to define a learning approach that can cope with the diverse hardware imperfections and channel environments found in LoS MIMO links with antenna spacing much lower than the optimal distance.

## NetPredict3 - Automated interpretation of network traffic traces

Funded by: Nokia Spain

Duration: October 2020 to April 2021

The project is proposed as a continuation of the NetPredict projects: Identification of predictive variables of anomalies in network traffic, completed in 2019 and NetPredict 2: Detection of anomalies in network traffic and identification of possible causes, completed in July 2020.

The final goal of Netpredict 3 is the implementation of a set of advanced machine learning models that allow the automatic interpretation of the causes of the variations in the performance of various network protocols and applications, and their evolution over time. The models developed will be exhaustively evaluated, and the results will be collected in an academic paper to be submitted to a high-level international conference.

### 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 technological 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 networks. Among 5G European research projects supported by the lab are the ongoing 5G Dive and Hexa-X, as well as 5G Growth.



## 5TONIC Members



## 5TONIC Collaborators



## New 5TONIC Collaborators



## 6.2.3 Industry partners

Our technology transfer activities have led to a significantly increased portfolio of companies we collaborate with. During 2021, they were the following:



ABI Lab: Ricerca e innovazione per il settore bancario



ADLINK Technology SARL



Algolysis Ltd



Armasuisse – Science and Technology



Asociația InfoCons (ICNS)



Battioli Paola Società Agricola S.S.



Big Analytics S.A.



Cliqz



Capgemini Engineering



Commscope



COSMOTE Kinites Tilepikoinonies



Ericsson



Ermes Cyber Security SRL



ESBA - European Small Business Alliance Of Small and Medium Independent



Fastweb SPA (FW)



Fondazione Mondo Digitale



Ford Otomotiv Sanayi Anonim Sirketi



F-Secure Oyj



FSTechnology S.p.A



Fundación Cibervoluntarios (CIB)



Fundingbox Accelerator Sp z o.o



Hellenic telecommunications organization S.A.



Incelligent Idiotiki Kefalaïou-chikietaireia



Intel



Interdigital Europe, Ltd



Internet Advertising Bureau Europe (IAB Europe)



Interuniversity Microelectronics Centre (IMEC)



IoT Lab





LightBee SL



Lstech Espana SL

MYCRONIC

Mycronic AB

NEC

NEC Europe Ltd.

NEC

NEC Laboratories Europe

NEXTWORKS  
HEADING THE FUTURE

Nextworks

NOKIA Bell Labs

Nokia Bell Labs

NOKIA

Nokia Spain S.A



Orange



Orange Romania SA



Ozyegin Universitesi



pureLiFi Ltd.



Ranplan Wireless Networks  
Design LTD.



Signify N.V



Software Radio Systems  
Limited



Telecom Italia S.p.a.



Telefónica I+D

The Circle Società  
Agricola a  
Responsabilità  
Limitata

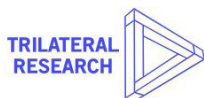
The Circle Società Agricola a  
Responsabilità Limitata

TOSHIBA

Toshiba Research Europe Ltd.

TRII  
TECHNOLOGY

Tree Technology S.A.



Trilateral Research Ltd (TRI)



Velmenni R&D PVT. Ltd



Viavi Solutions France SAS



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.



**Genius is one percent inspiration,  
ninety-nine percent perspiration**

*Thomas Edison*

# personnel



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a n n u a l   r e p o r t

2021

[www.networks.imdea.org](http://www.networks.imdea.org)

# director

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. Arturo AZCORRA**  
Director (on leave)

**Research:** 5G Networks and Services; Network Virtualization and Softwarization; Drone Communications; On-line Social Networks Data Analytics; Mammal Brain Cartography and Topology  
[Personal Site](#)

## Short Bio

Dr. Arturo Azcorra graduated in 1980 from Loy-Norrix High School, Michigan. He received his Telecommunication Engineering degree from Universidad Politécnica de Madrid in 1986, and the Doctor degree in 1989 from the same University. He currently is a full professor at Universidad Carlos III de Madrid, and he's also Director of the International Research Institute IMDEA Networks, a very relevant research institution in Europe. On the professional area, Arturo Azcorra is an IEEE Communications Society Senior Member, an Internet Society member, an ACM-SIGCOMM member, a founding member of the Association for Telematics, and also president of the said Association.



**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 (acting  
Deputy 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 network-  
ing

[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

Dr. 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 250 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. 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 Eureka 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. Marco FIORE

Research Associate Professor

**Research:** Network Intelligence, Mobile Networks, Data Science

[Personal Site](#)

## Short Bio

Marco Fiore is Research Associate Professor at IMDEA Networks Institute and CTO at Net AI Tech Ltd. He received MSc degrees from University of Illinois at Chicago, IL, USA (2003), and Politecnico di Torino, Italy (2004), a PhD degree from Politecnico di Torino (2008), Italy, and a Habilitation a Diriger des Recherches (HDR) from Université de Lyon, France (2014). He held tenured positions as Maître de Conférences (Associate Professor) at Institut National des Sciences

Appliquées (INSA) de Lyon, France (2009-2013), and Researcher at Consiglio Nazionale delle Ricerche (CNR), Italy (2013-2019). He has been a visiting researcher at Rice University, TX, USA (2006-2007), Universitat Politècnica de Catalunya (UPC), Spain (2008), and University College London (UCL), UK (2016-2018). He is a senior member of IEEE, and a member of ACM.



## 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 a tenured Research Associate Professor at IMDEA Networks Institute, Madrid, Spain, where he leads the NetEcon (Network Economics) research group. Dr. Gorinsky 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 Moscow Institute of Electronic Technology, Zelenograd, Russia in 1994. From 2003 to 2009, he served on the tenure-track faculty at Washington University in St. Louis, USA. 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, membership in the TPCs of SIGCOMM 2012, 2016, 2022 and other major conferences, as well as proposal evaluation for the European Research Council (ERC Starting Grants), European Commission (Horizon 2020, FP7), COST Association, and numerous other funding agencies.



### Dr. Vincenzo MANCUSO

Research Associate Professor

**Research:** Design of Opportunistic and Sliced Mobile Networks; Edge-assisted autonomous driving; Measurements and Assessment of Mobile Networks; Wireless Access and Edge Networks; Performance Evaluation; Machine Learning

[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 130 peer-reviewed publications focusing on Internet QoS and on the analysis, design, and experimental evaluation of opportunistic and adaptive protocols and architectures for wireless networks. He is currently working on analysis

and optimization of opportunistic and sliced wireless access/edge networks, which includes measurements and assessment of mobile networks and services, and on the use of (explainable) machine learning techniques for the identification of the causes of network performance problems and for the allocation of communication and computing resources to services like online gaming and assisted driving.



### Dr. Narseo VALLINA-RODRÍGUEZ

Research Associate Professor

**Research:** Network Measurements; Mobile Technologies; IoT; Security and 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; Computation Offloading Algorithms; Age of Information; Network Delay Analysis

[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 is awarded the prestigious Marie Skłodowska-Curie Actions (MSCA) postdoctoral fellowship, 2021, and he is 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 Ciber-crime; Malware Analysis; Mass marketing 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).

## IMDEA Networks Faculty researchers



# 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. 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.



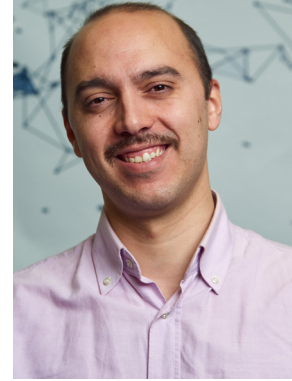
**Dr. Claudio FIANDRINO**

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. in 2010 and 2012 respectively both from Politecnico di Torino, Italy. Claudio has been awarded for his research with two Spanish Juan de la Cierva grants and the Best Paper Awards in IEEE Cloudnet 2016, in ACM WINTech 2018 and IEEE GLOBECOM 2019. He is member of IEEE and ACM, served as part of the organizing committee in several events and member of the Editorial Board of IEEE Networking Letters. His primary research interests include machine learning applied to mobile networks, 5g networking and 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. Borja GENOVÉS-GUZMÁN**

Post-Doc Researcher

**Research:** Next Generation Wireless Networks; Visible Light Communication (VLC); LiFi systems; 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. My research interests focus on new techniques to improve the efficiency of visible light communication systems. I manage the MSCA-ITN ENLIGHT'EM project. In 2019, I obtained my Ph.D. in Multimedia and Communications of the University Carlos III of Madrid. I was a Visiting Scholar with The University of Southampton and The University of Edinburgh. I have participated in several national and European projects, and I received the First Prize in Graduation National Awards from the Ministry of Education, Culture and Sports of Spain.



**Dr. Michele GUCCIARDO**

Post-Doc Researcher

**Research:** Software Defined Networking; Programmable data planes; Machine Learning; B5G

[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. Srdjan MATIC**

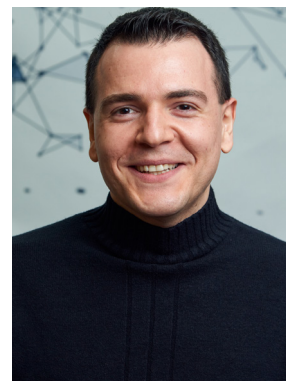
Post-Doc Researcher

**Research:** Privacy; Network Measurements; IoT

[Personal Site](#)

#### Short Bio

Srdjan received his Ph.D. in 2017 from the Università degli Studi di Milano (UniMi). During the Ph.D. he developed new techniques for recovering sensitive information from hidden servers in anonymity networks. From 2018 to 2020, he was a postdoctoral researcher at the University College London (UCL) and the Technische Universität Berlin (TUB), studying Internet privacy and abuses in the IoT ecosystem. In April 2021 he joined the IMDEA Network Institute as a postdoctoral researcher.



**Dr. Marius PARASCHIV**

Post-Doc Researcher

**Research:** Data Valuation; Statistical Learning; Optimization Algorithms

[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 RAMÍREZ**  
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. Maurizio REA**  
Post-Doc Researcher

**Research:** mmWave networks; Beam Search Algorithms; Signal Processing

[Personal Site](#)

#### Short Bio

Maurizio Rea is Post-Doc Researcher at IMDEA Networks Institute, Madrid, Spain. He holds a PhD in Telematics Engineering from the University Carlos III of Madrid (June 2020). He received his M.Sc. in 2015 in Telecommunications Engineering from the University of Palermo, Italy. He also received a M.Sc. from the University Carlos III of Madrid in 2016. Before joining IMDEA, he worked as Researcher at ETH Zurich where he focused his research on indoor localization systems. His interests include data analysis, wireless communication, mmWave networks, beamforming algorithms, channel state information, angle of arrival algorithms and context-aware mechanisms.



**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.

# visiting professors

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. Katia OBRACZKA

**University of origin:** UC Santa Cruz, California, USA

### Short Bio

Katia Obraczka is a Professor of Computer Science and Engineering at UC Santa Cruz. Prof. Obraczka's research interests span the areas of computer networks, distributed systems, and Internet information systems. She is currently serving as Associate Editor for the IEEE Transactions on Mobile Comput-

ing as well as ACM Letters in Computer Science. She is a Fellow of the IEEE and has recently received the Chair of Excellence University Carlos III of Madrid and Banco Santander 2020-2021 and the INRIA International Chair 2021-2025 awards.

# 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





**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 de 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):** Electrical 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

**Constantine AYIMBA**  
Pre-Doc Researcher

**BSc:** Electrical and Electronic Engineering - University of Nairobi. Nairobi, Kenya

**MSc:** Wireless Communications - Lund University. Lund, Sweden

**Previous Position:** Service Engineer. Ericsson. Nairobi, Kenya

**Research:** Network Function Virtualization; Cloud Services; Machine Learning

**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

**Alejandro BLANCO**  
Pre-Doc Researcher

**BSc:** Telecommunication Technologies Engineering - University Carlos III of Madrid. Madrid, Spain

**MSc:** Double Master's Degree. Telecommunications Engineering & Multimedia and Communications. University Carlos III of Madrid. Madrid, Spain

**Previous Position:** Junior Consultant. Everis. Madrid, Spain

**Research:** Mobile Network; LTE; Software Defined Radio (SDR); Measurements; Data Traffic

**Laura CARUSO**  
Pre-Doc Researcher

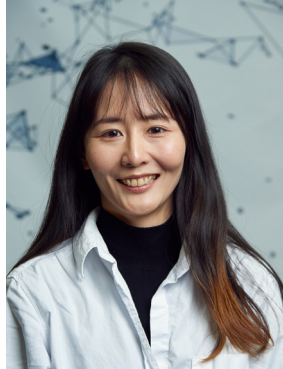
**BSc:** Information Engineering - Università degli studi di Padova. Padua, Italy

**MSc:** Telecommunications Engineering - Università degli studi di Padova. Padua, Italy

**Research:** NFV; 5G; MEC; edge networks







**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 Research Laboratory, TU Ilmenau, Germany  
**Research:** mmWave communications, Physical layer signal processing, parameter estimation techniques



**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

**Álvaro FEAL**  
Pre-Doc Researcher

**BSc:** Computer Engineering - Universidade da Coruña. A Coruña, Spain  
**MSc:** Software and Systems - Polytechnic University of Madrid. Madrid, Spain  
**Previous position:** Research intern. IMDEA Software Institute. Madrid, Spain  
**Research:** Privacy and Security; Regulatory Compliance; Mobile Computing

**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

**Julien GAMBA**  
Pre-Doc Researcher

**BSc:** Computer science - University of Strasbourg. Strasbourg, France  
**MSc:** Computer Networks and Embedded Systems - University of Strasbourg. Strasbourg, France  
**Previous Position:** Internship Student; ICube Laboratory. Strasbourg, France  
**Research:** Network Measurements; Privacy and Security; Interdomain Routing





**Dolores GARCÍA MARTÍ**

Pre-Doc Researcher

**BSc:** Mathematics - University of Valencia. Burjasot, Spain

**MSc:** Quantum Fields and Fundamental Forces - Imperial College London. London, UK

**Research:** Machine Learning; mm-wave



**Vahid GHAFURI**

Pre-Doc Researcher

**BSc:** Industrial Engineering - Sharif University. Tehran, Iran

**MSc:** Business Analytics - Sabanci University. Istanbul, Turkey

**Research:** Polarization and Radi-  
calization on Social Media



**Khasa GILLANI**

Pre-Doc Researcher

**BSc:** Information Technology -  
PMAS Arid Agriculture University  
Rawalpindi. Rawalpindi, Pakistan

**MSc:** Software Engineering - Sang-  
myung University. Seoul, South  
Korea

**Previous position:** Research Assis-  
tant - 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 Associ-  
ate - 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 Engineer-  
ing - RWTH Aachen University.  
Aachen, Germany

**Previous Position:** Intern. German  
Aerospace Center. Oberpfaffen-  
hofen, Germany

**Research:** Network Simulation (ns-  
3); Millimeter Wave Networking;  
Performance Analysis

**Devriş IŞLER**

Pre-Doc Researcher

**BSc:** Computer Science and Engi-  
neering - Gaziantep Zirve Univer-  
sity. Gaziantep, Turkey

**MSc:** Computer Science and Engi-  
neering - Koç University. stanbul,  
Turkey

**Previous position:** Research Assis-  
tant. KU Leuven. Leuven, Belgium

**Research:** Applied cryptography pri-  
vacy; usable security; data trans-  
parency and protection

**Yago LIZARRIBAR**

Pre-Doc Researcher

**BSc:** Industrial Technologies Engi-  
neering - University of Navarra. San  
Sebastián, Spain

**MSc:** Mechanical Engineer-  
ing - University of Navarra. San  
Sebastián, Spain

**Previous Position:** Research Assis-  
tant. Massachusetts Institute of  
Technology. Cambridge. MA. USA

**Research:** Collaborative Spectrum  
Sensing; Distributed Systems;  
Machine Learning

**Leonardo LO SCHIAVO**

Pre-Doc Researcher

**BSc:** Computer Science Engineer-  
ing - Università degli Studi di Cata-  
nia. Catania, Italy

**MSc:** Communications and Com-  
puter Networks Engineering -  
Politecnico di Torino. Turin, Italy

**Previous position:** Project Imple-  
mentation Engineer at Amadeus  
IT Group. Nice. France

**Research:** Machine learning; 5G  
Networks; Network Slicing; Net-  
work 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 Unternehmertum 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:** Machine Learning; Millimeter-Wave Communications; Deep Learning; 5G

## Oluwasegun OJO

Pre-Doc Researcher

**BSc:** B.Tech in Statistics - Federal University of Technology. Akure, Nigeria

**MSc:** Mathematical Sciences - African Institute for Mathematical Sciences. Limbe, Cameroon

**Previous Position:** Freelance Data Scientist. Upwork

**Research:** Data Science; Data Visualization; Machine Learning; Statistics; Social Networks

## 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



**Antonio RUSSO**

Pre-Doc Researcher

**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



**Víctor SÁNCHEZ AGÜERO**

Pre-Doc Researcher

**BSc:** Audiovisual Systems Engineering - University Carlos III of Madrid. Madrid, Spain

**Previous Position:** Internship Student - University Carlos III of Madrid. Madrid, Spain

**Research:** Internet Measurements; IP Routing; BGP; Data Visualization; Network Architectures; UAV/ Drones



**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 Detention

**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-RODRÍGUEZ**

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:** Mobile 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).



**Amr AbdelKhalek ABDELNABI**  
External PhD Student

**BSc:** Electronics and Communication Engineering - Cairo University. Cairo, Egypt

**MSc:** Wireless Communication - Nile University. Cairo, Egypt

**Previous Position:** Research Associate. Texas A&M University (TAMUQ). Doha, Qatar

**Research:** Opportunistic Communication; Stochastic Geometry Application to Wireless networks; Cellular Networks; Wireless PHY and MAC Layers; D2D Communication; Cooperative Communication; Wireless Channel Modeling; Interference Modeling



**Mohamed Lamine MOULAY**  
External PhD Student

**BSc:** Communication and Electronics Engineering - Applied Science University. Amman, Jordan

**MSc:** Multimedia and Communications - University Carlos III of Madrid. Madrid, Spain

**Previous Position:** Internship Student. IMDEA Networks Institute. Madrid, Spain

**Research:** Wireless Communications; AMC; Docker: Python; Linux



**Antonio PASTOR VALLES**  
External PhD Student

**MSc:** Telematics Engineering. University Carlos III of Madrid. Madrid, Spain

**Research:** Complex Networks; Machine Learning; Connectomics; Brain-Machine Interfaces



**Noelia PÉREZ PALMA**  
External PhD Student

**BSc:** Computer Sciences - University of Murcia (UMU). Murcia, Spain

**MSc:** Telematics Engineering - University Carlos III of Madrid. Madrid, Spain

**Previous Position:** Project manager for network creation and optimization projects at Allocation and Supply, Landline Business, Telefónica Spain. Madrid, Spain

**Research:** Opportunistic Networks; Wireless Networks; D2D Communication

## Lucía UGUINA

Pre-Doc Researcher

**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

## Vittorio PRODOMO

Pre-Doc Researcher

**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





# research 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 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 MARUGÁN**  
Senior Financial Manager

**Qualifications:** BSc: Telecommunication Engineering - Universidad de Alcalá 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



**Ignacio BERBERANA**

Senior Research Engineer

**BSc:** Mining Engineer. School of Mining Engineering - Polytechnic University of Madrid. Madrid, Spain

**Research:** 5G; Radio Communications; RAN Virtualization



**Fernando DÍEZ**

Research Engineer

**BSc:** Telematics Engineering - Universidad Politécnica de Madrid. Madrid, Spain



**Rafael GARCÍA**

Research Engineer

**BSc:** Computer Science - University of Córdoba. Córdoba, Spain

**MSc:** Computational Sciences - University of Amsterdam. The Netherlands

**Research:** Machine learning; Data science; Dig data; Artificial intelligence.



**Manuel Ángel JIMÉNEZ**

Research Engineer

**BSc:** Telecommunications Engineering - Universidad de Sevilla. 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 photonics 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

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





# research engineering & support



**Elvira CONTI**

Project Manager

**BSc:** International Relationships - Rey Juan Carlos University. 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

**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

**Francisco Javier TORREJÓN**

Systems Administrator

**BSc:** Telecommunications Engineering - University Carlos III of Madrid. Madrid, Spain

**MSc:** Telecommunications Engineering - University Carlos III of Madrid. Madrid, 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.

## **Javier ÁLVAREZ**

**University of origin:** Universidad Rey Juan Carlos (Madrid, Spain)

## **Diego CALONGE**

**University of origin:** Universidad Carlos III de Madrid (Madrid, Spain)

## **Carlos CARO**

**University of origin:** Universidad Politécnica de Madrid – COIE (Madrid, Spain)

## **Théo Bruno COUTURIEUX**

**University of origin:** ENSEEIHT (EcoLe Nationale Supérieure d'Electronique, d'Electrotechnique, d'Informatique, d'Hydraulique, et des Telecommunications) (Toulouse, France)

## **Irene DE GRUIJTER**

**University of origin:** Universidad Carlos III de Madrid (Madrid, Spain)

## **David JUÁREZ**

**University of origin:** Universidad Carlos III de Madrid (Madrid, Spain)

## **Enrique LOZANO**

**University of origin:** Universidad Carlos III de Madrid (Madrid, Spain)

## **Alfonso RODRÍGUEZ**

**University of origin:** Universidad Carlos III de Madrid (Madrid, Spain)

## **Daniel SANTA OLALLA PEÑA**

**University of origin:** Universidad Carlos III de Madrid (Madrid, Spain)

## **Rishi TRIPATHI**

**University of origin:** University of Politecnico de Torino (Turin, Italy)



# 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 2021.



**Dr. Pablo JIMÉNEZ MATEO**

**Current Position:** Machine Learning 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:** Post-Doc Researcher. The University of Texas at Austin. Austin. Texas. USA

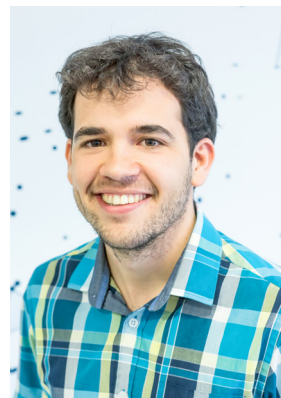
**Ph.D. Date:** 23 October 2020



**Dr. Patricia CALLEJO**

**Current Position:** Postdoctoral fellow. UC3M-Santander Big Data Institute (IBiDat). Madrid. Spain

**Ph.D. Date:** 8 September 2020



**Dr. Edgar ARRIBAS**

**Current Position:** Profesor Doctor. Applied Mathematics and Statistics- 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:** Core Network Research Specialist. Nokia Bell Labs. 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. Università 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:** Specialized Client Engineering- Connectivity and Networks. Telefónica España. Madrid. Spain

**Ph.D. Date:** 26 July 2019



**Dr. Hany ASSASA**

**Current Position:** System Engineer. Pharowtech. 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:** Senior Researcher. Technology Innovation Institute. Abu Dhabi, United Arab Emirates

**Ph.D. Date:** 14 June 2018



**Dr. Roderick FANOU**

**Current Position:** Systems Engineer. Cloudflare, Inc. Austin, Texas, USA

**Ph.D. Date:** 14 December 2017

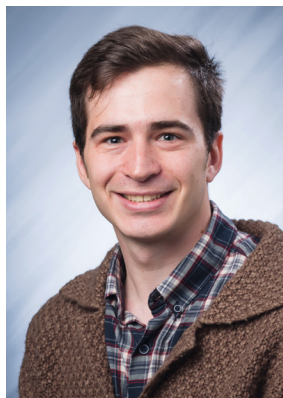




### Dr. Christian VITALE

**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:** Juan de la Cierva Researcher. 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:** Lead Software Engineer. Lloyds Banking Group. London. United Kingdom

**Ph.D. Date:** 25 November 2016



### Dr. Elli ZAVOU

**Current Position:** Software Developer. StratioBD. Madrid. Spain

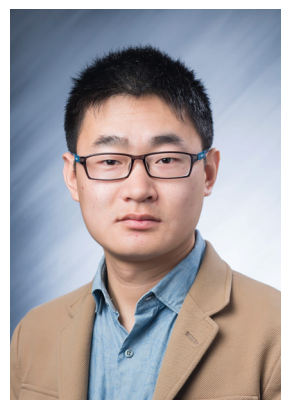
**Ph.D. Date:** 30 September 2016



### Dr. Syed Anwar UL HASAN

**Current Position:** Postdoctoral Researcher. ETH Zurich. Switzerland

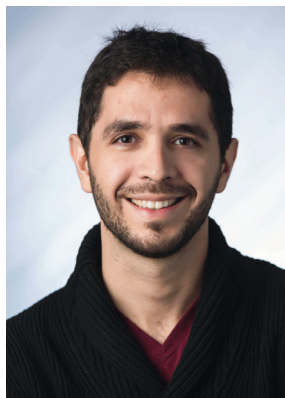
**Ph.D. Date:** 20 June 2016



### Dr. Qing WANG

**Current Position:** Assistant Professor. Delft University of Technology - TU Delft. Delft. The Netherlands

**Ph.D. Date:** 19 May 2016



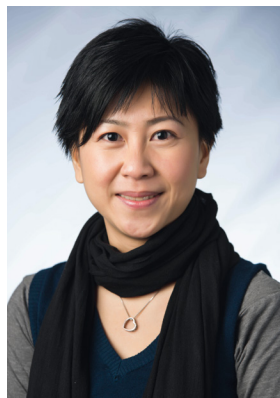
**Dr. Juan Camilo CARDONA**

**Current Position:** Software Engineer. Cisco Systems. Barcelona. Spain  
**Ph.D. Date:** 6 May 2016



**Dr. Pablo SALVADOR**

**Current Position:** Scrum Master. 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 SÁNCHEZ**

**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. Secure Mobile Networking Lab (SEEMOO). 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 NITSCHÉ**

**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. Adeventa. 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

# research team structure




**networked**  
systems&algorithms

**Research Professors**

- Dr. Arturo Azcorra
- Dr. Sergey Gorinsky
- Dr. Jaya Prakash Varma Champati

**Pre-Doc & Post-Doc Researchers**

- Andrea Fresa
- Laura Caruso
- Khasa Gillani
- Amir Mehrjoo
- Leonardo Peroni
- Víctor Sánchez-Agüero
- 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. Maurizio Rea
- Dr. Giuseppe Santaromita
- Sergi Alcalá-Marín
- Giulia Attanasio
- Alejandro Blanco
- Alan Collet
- Sai Pavan Deram
- Stavros Eleftherakis
- Dayrene Frómata
- 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
- 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. Elisa Cabana
- Dr. Álvaro García-Recuero
- Dr. Srdjan Matic
- Dr. Marius Paraschiv
- Dr. Juan Marcos Ramírez
- Amr Abdelnabi
- Santiago Andrés
- Nikolaos Apostolakis
- Constantine Ayimba
- Miguel Ángel Bermejo
- Tianyue Chu
- Alan Collet
- Álvaro Feal
- Julien Gamba
- Vahid Ghafouri
- Rafael García
- Aniketh Girish
- Devriş İşler
- Mariella Mischinger
- Mohamed Lamine Moulay
- Oluwasegun Ojo
- Noelia Pérez Palma
- Jesús Pérez-Valero
- Francesco Spinelli
- Vittorio Prodomo
- Antonio Russo
- Pelayo Vallina-Rodríguez

*Our current team*







Comunidad  
de Madrid



EUROPEAN UNION  
STRUCTURAL FUNDS



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