



New RAN **T**Echniques for **5G** Ultra**A**-dense **M**obile networks -  
TeamUp5G

## Winter School on New radio access techniques enabling advanced video applications in 5G

Co-sponsored by



IRACON



**Madrid, 20-22 November 2019**

### **Organizers:**

Ana Garcia Armada, Universidad Carlos III de Madrid, Spain

Fernando J. Velez, Instituto de Telecomunicações/Universidade da Beira Interior,  
Portugal

Alvaro Villegas, Nokia Bell Labs, Spain

### **Description:**

The fact that video is (and will continue) dominating the mobile traffic is one of the drivers for the deployment of 5G. The new radio access techniques need to be able to provide the quality of service and experience that the new applications are demanding. In this Winter School we will have the possibility to learn from experts from both domains: the radio access and the video applications. Discussions to find out what is missing and where to orient the students' research will be one of the main contributions of the training.

This three days training period will address recent advances in radio access, comprising signal processing, modulation, random access schemes and resource management, that are enabling the advance of mobile communications towards 5G and beyond and will facilitate the new uses cases, such as ultra-high definition video or virtual/augmented reality. The topics span from aspects of advanced multi-carrier or multi-antenna techniques following new paradigms such as cell-free massive MIMO, to system level optimization, including scheduling algorithms and spectrum management, as well as video applications that are able to exploit the availability of wireless 1 Tbit/s data rate on a per link basis.

Business aspects, cost/revenue trade-off, public policies for spectrum sharing and new frequencies, entrepreneurship and IPR protection will also be central parts of the training. The event also includes training on research, as it foresees a poster session that will allow the students to share their recent findings and ideas with their colleagues and tutors, who will give feedback and suggestions. Academic vision will be complemented by industrial experience, the IPR knowledge of the Spanish patent office and the “hands-on” part of the training.

**Program:**

20 November

9:00 Registration and Welcome

9:30 Seminar on patents and IPR – Juan Manuel Vázquez Burgos, OEPM (Spanish Patent and Trademark Office)

11:00 Coffee Break \*

11:30 (Cont.) Seminar on patents and IPR – Juan Manuel Vázquez Burgos, OEPM (Spanish Patent and Trademark Office)

13:00 Lunch\*

15:00 Visit to Nokia Bell Labs: Talk “AR/VR in 5G” by Alvaro Villegas

16:45 Visit to Telefónica: Talk TBD by F. Javier Lorca

21 November

9:00 Overview of TeamUp5G research (Ana García Armada)

9:45 Massive MIMO in 5G, Ana Garcia Armada, Univ. Carlos III de Madrid, Spain

10:30 Coffee Break\*

11:00 Cell Free Massive MIMO, Alister Burr, University of York, UK

12:00 Physical Layer Aspects of Ultra-Reliable Low-Latency Communication, Theodoros Tsiftsis, Jinan University, China

13:00 Lunch\*

14:30 Visit to labs and demos

15:30 Poster session

All the students are invited to present a poster about their research (Poster dimension 90 cmx 120 cm)

20:30 Dinner\*

## 22 November

9:00 IoT architectures using CoAP, Jelena Mistic, Ryerson University, Canada

10:00 Blockchain for Communications, Vojislav Mistic, Ryerson University, Canada

10:45 Coffee Break\*

11:00 About video QoS, Luis Bellido, UPM, Spain

12:00 Are Drones the killer application for taking 5G to new heights?, L Miguel Campos, PDMF, Portugal

13:00 Lunch\*

14:30 Entrepreneurship – case study, Albena and Peter Lindgren, Aarhus University, Denmark

17:30 Closing remarks

(\*) *Provided by the organization*

### **Location:**

- Universidad Carlos III de Madrid. Leganés Campus. Avda. de la Universidad, 30. 28911 Leganés - Madrid – España
- How to get here:
  - <https://www.uc3m.es/about-uc3m/how-to-get-here/leganes-campus>
- Room: Lecture Hall (Auditorio)
- Leganés Campus map:
  - <https://www.uc3m.es/life-on-campus/campuses-plans/leganes>

### **Course fees:**

- TeamUp5G ESRs: free
- IRACON members: free
- Members of the Vehicular Technology Society: free
- University student (full time Master or Ph. D. student): 150 €
- Any other participant: 225 €

### **Registration:**

- Fee free members (TeamUp5G, IRACON and VTS): please complete this [form](#).
  - Please note a Google Account is needed to upload affiliation proof documents.
- No fee-free members: please go to this [link](#).

### **Travel grants:**

Provided by [COST IRACON](#)