



US-Ireland project 'Fungibility in Mobile Networks for Resilient 6G' - Keynote session

When:

Wed 04 June, 9.10am-12.00pm

Where:

Trinity College Dublin main campus, Mhairtin Ui Chadhain lecture theatre- Room 2041B, Ground floor, Arts Building

Agenda:

Time	Session
09.10-09.20	Welcome
09.20-09.55	Prof. Michalis Matthaiou , Queen's University Belfast Keynote talk ' <i>Cell-Free Massive MIMO + X</i> '
09.55-10.30	Dr. Indrakshi Dey , South East Technological University Keynote talk ' <i>Noise as a Resource: Harnessing Complexity for Insights and Innovations</i> '
10.30-10.45	Coffee break
10.45-11.20	Prof. Luiz DaSilva , Virginia Tech Keynote talk ' <i>The Path to Reliability and Resilience in Next Generation Networks</i> '
11.20-11.55	Prof. Nicola Marchetti , Trinity College Dublin Keynote talk ' <i>On the Link between Network Topology and Resilience</i> '
11.55-12.00	Wrap up



Talks info

Talk 1

Speaker: **Prof. Michalis Matthaiou**, Queen's University Belfast

Title: **Cell-Free Massive MIMO + X**

Abstract: The next generation multiple access (NGMA) techniques are expected to achieve massive and ubiquitous access for a large number of devices and provide high spectral efficiency in ultra-dense networks. To meet these unprecedented mobile traffic demands, a paradigm shift from the conventional cellular networks towards distributed communication systems is required. Cell-free massive multiple-input multiple-output (CF-mMIMO) is considered as a practical and scalable embodiment of the distributed/ network MIMO systems, which inherits not only the key benefits from collocated massive MIMO systems, but also the macro-diversity gain from the distributed systems. In this talk, we provide an overview of current research efforts on the CF-mMIMO systems and their promising future application scenarios. We envision that CF-mMIMO can be the key underpinning platform of all future wireless technologies, namely integrated sensing and communication (ISAC), simultaneous wireless information and power transfer (SWIPT).

Talk 2

Speaker: **Dr. Indrakshi Dey**, South East Technological University

Title: **Noise as a Resource: Harnessing Complexity for Insights and Innovations**

Abstract: Noise has long been discarded as an obstacle to precision and clarity in systems and networks. However, is noise really useless? In an era of increasingly complex and data-driven environments, this chaotic element is gradually revealing as a hidden resource. This presentation introduces how noise can be leveraged across critical domains, like environmental hydrology, biodiversity monitoring and cryptography, and can be transformed from a liability to a resource. When processed with rigor and intention, noise becomes a source of valuable information, a modelable variable and a tool for resilience. We will therefore explore how structured processing and advanced modelling techniques can transform noise from disruptive interference into a strategic asset - making noise useful by design.



Talk 3

Speaker: **Prof. Luiz DaSilva**, Virginia Tech

Title: **The Path to Reliability and Resilience in Next Generation Networks**

Abstract: Ultra reliability has been one of the targets of 5G, but it has yet to be fully realized in today's network deployments. In this talk, we will discuss what it takes to achieve high reliability in wireless networks, both in an urban macro environment and in an industrial setting. We also explore techniques to reduce the resources required to achieve ultra reliability. Finally, we discuss the relationship between reliability and resilience and point to open questions on how to achieve the latter.

Talk 4

Prof. Nicola Marchetti, Trinity College Dublin

Title: **On the Link between Network Topology and Resilience**

Abstract: We will discuss several examples of how reliability can be defined and quantified in the context of future networks, drawing inspiration from theories and tools coming from complex systems science and information theory. We will focus on how the network topology relates to information representation and transfer, robustness, and synchronisation capabilities.

Speaker bios

Michalis Matthaiou is the Chair Professor of Communications Engineering and Signal Processing and Deputy Director of the Centre for Wireless Innovation (CWI) at Queen's University Belfast, U.K. Under his co-leadership, CWI has become the largest physical layer wireless base in the UK (>80people). He is also an Eminent Scholar at the Kyung Hee University, Republic of Korea. He has held research/faculty positions at Munich University of Technology (TUM), Germany and Chalmers University of Technology, Sweden. His research interests span signal processing for wireless communications, beyond massive MIMO, reflecting intelligent surfaces, mm-wave/THz systems and AI-empowered communications. He has published more than 350 papers on these topics, including some 150 IEEE journal papers. Dr. Matthaiou and his coauthors received the IEEE Communications Society (ComSoc) Leonard G. Abraham Prize in 2017. He currently holds the ERC Consolidator Grant BEATRICE (2021-2026) focused on the interface between information and electromagnetic theories. To date, he has received the prestigious 2023 Argo Network Innovation Award, the 2019 EURASIP Early Career Award and the 2018/2019 Royal



Academy of Engineering/The Leverhulme Trust Senior Research Fellowship. His team was also the Grand Winner of the 2019 Mobile World Congress Challenge. He is currently the Editor-in-Chief of Elsevier Physical Communication, a Senior Editor for IEEE Wireless Communications Letters and IEEE Signal Processing Magazine, an Area Editor for IEEE Transactions on Communications, and an Editor-in-Large for IEEE Open Journal of the Communications Society . He is an IEEE and AAIA Fellow.

Indrakshi Dey received the M.Sc. degree in wireless communications from the University of Southampton, Southampton, UK, in 2010, and the PhD degree in electrical engineering from the University of Calgary, Calgary, Canada, in 2015. Currently, Dr. Dey heads the Programmable Autonomous Systems (PAS) division at the Walton Institute, South East Technological University (SETU) in Waterford, Ireland. Her research spans developing propagation models, analysing performance bounds and data models and designing algorithms, signal processing, novel optimization techniques and predictive analytics for AI-aided systems, cyber-physical systems, digital twins, IoT and IoE to mobile, terrestrial, space and quantum networks. Dr. Dey is the Principal Investigator on multiple national, European, international, and commercial projects, an IEEE Senior member, and Board Member for IEEE UK/Ireland Future Networks Group.

Luiz A. DaSilva is the inaugural executive director of the Commonwealth Cyber Initiative (CCI), an organization bringing together 46 institutions of higher education in Virginia, USA, with a common mission of research, innovation, and workforce development in cybersecurity. He is also the Bradley Professor of Cybersecurity in the Department of Electrical and Computer Engineering at Virginia Tech. Prior to that, he was the telecommunications chairholder at Trinity College in Dublin, Ireland, and director of CONNECT – the Science Foundation Ireland Centre for Future Communications and Networks. DaSilva is a Fellow of the Institute of Electrical and Electronic Engineers (IEEE) for his contributions to cognitive networking and to resource management in wireless networks. He pioneered the application of game theory to analyze and design wireless networks, authoring the first book on the topic. He has also been an IEEE Communications Society Distinguished Lecturer, a Fellow of Trinity College Dublin, and a Virginia Tech College of Engineering Faculty Fellow.

Nicola Marchetti is Professor in Wireless Communications at Trinity College Dublin, Ireland. He is a Fellow of Trinity College, and has been an IEEE Communications Society Distinguished Lecturer. He received the PhD in Wireless Communications from Aalborg University, Denmark in 2007, the MSc in Electronic Engineering from University of Ferrara, Italy in 2003, and the MSc in Mathematics from Aalborg University in 2010. He has authored more than 200 journals and



conference papers, 2 books and 9 book chapters, holds 4 patents, and received 4 best paper awards. His research interests span Complex Networks, Mathematics for Communications & Computing, Network Resource Allocation, and Signal Processing for Communications. He serves as Technical Editor for IEEE Wireless Communications, and has served as an Associate Editor for IEEE Network, the IEEE Internet of Things Journal and the EURASIP Journal on Wireless Communications and Networking. He has an extensive experience giving research lectures across the globe, having delivered to date 5 keynotes, 9 IEEE ComSoc distinguished lectures, 20 invited talks, 8 tutorials at international conferences, and 8 international PhD courses.