3ʳᵈ International Conference on 6G Networking

🛜 6GNet

#6GNet2024

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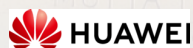
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Program 6GNet 2024

	October 21, 2024		October 22, 2024	October 23, 2024	October 24, 2024
	Room March	*Room November*	*La Grande Scène*	*La Grande Scène*	*La Grande Scène*
8:30	Registration		Registration	Registration	Registration
9:00	TUT #1 *Universal Decoding by Guessing Random Additive Noise Decoding (Part 1)*		Opening Session	FPS #3 *Resource Allocation*	FPS #5 *Mobile and Wireless Communications*
9:30			FPS #1 *Performance*		
10:30	Coffee Break				
11:00	TUT #1 *Universal Decoding by Guessing Random Additive Noise Decoding (Part 2)*		Coffee Break	Coffee Break	Coffee Break
11:30			Keynote #1 *Beyond Connectivity: Pioneering the Future of Next-Generation Networks*	Keynote #2 *Semantics-native Communication and Protocol Learning in the 6G Era*	Keynote #3 *Digital Twins for Communications: How to Create and Use Them*
12:30	Lunch Break		Lunch Break & Demo Session	Lunch Break & Poster Session	Lunch Break
13:30	TUT #2 *Data-Driven Modelling and Optimization of Green Future Mobile Networks: From Machine Learning to Generative AI (Part 1)*	EN-IoT: *Welcome & Keynote*	FPS #2 *Anomaly Detection*	FPS #4 *Design*	FPS #6 *AI-Enhanced Networks*
14:15		EN-IoT: W-TS #1			
15:00	Coffee Break	Coffee Break	Coffee Break & Demo Session	Coffee Break & Poster Session	Coffee Break
15:30	TUT #2 *Data-Driven Modelling and Optimization of Green Future Mobile Networks: From Machine Learning to Generative AI (Part 2)*	EN-IoT: W-TS #2	SPS #1 *Performance Improvements of 5G and 6G Networks*	SPS #2 *5G and 6G Concepts and Use Cases*	Panel *AI-enhanced 6G: Hype or Reality?*
16:45		EN-IoT: *Closing Session*			
17:00					Best Paper Award & Closing Session
18:00			Welcome Reception		
20:00				Conference Dinner	

Welcome Message from the General Chairs

On behalf of the 6GNet Organizing Committee, we are delighted to warmly introduce you to the 3ʳᵈ International Conference on 6G Networking (6GNet 2024), that is taking place on October 21-24, 2024, in Châtillon, France, steps away to the fascinating city of Paris.

6G network research has already started with some initiatives like the 6G Flagship. Besides the (somewhat questionable) speed race, 6G networking is a tremendous opportunity to investigate and foster research in areas like the need for massive digital inclusion and stronger robustness against attacks of any kind, among other challenging topics like global network automation and cross-domain service/slice design, delivery and operation.

6G networking may also be seen as a true convergence point where the distinction between fixed and mobile infrastructures would not make sense anymore.

The research effort in this area of convergence has ignited for quite some time but dramatically progressed with 5G techniques, possibly combined with others like advanced forwarding schemes (multi-path communication designs) or AI/ML-fueled network automation.

This third 6GNet conference therefore aims at assessing the progress of the various research efforts in areas that will forge 6G networks. On top to the 8 technical sessions, 1 Demo session and 1 Poster session resulting from different calls for papers, its program comprises 3 Keynotes, 1 Panel, 2 Tutorials, and 1 Workshop.

The first keynote will be delivered by **Meryem Simsek**, *Head of the Network Architecture Research (NAR) Lab*, Nokia Bell Labs, USA, who will explore the transformative potential of advancements in networking, cloud, and AI that are set to redefine connectivity from current networks to the next generation networks with increased capabilities and a high level of autonomy. The second keynote will be presented by **Mehdi Bennis**, *Full Professor at the Centre for Wireless Communications*, University of Oulu, Finland. He will address the semantics-native communication and learning emergent communication protocols, sitting at the intersection of learning, reasoning and communication in terms of key enablers and mathematical tools. Finally, the third keynote will feature **Jakob Hoydis**, *Principal Research Scientist*, NVIDIA, France, who will develop a vision for 6G deployment, using two enablers namely differentiable ray racing for the creation of digital twin networks and machine learning.

The panel, entitled "***AI-enhanced 6G: Hype or Reality?***", will focus on the role of AI into 6G promises, and will explore whether the promise of AI in 6G is truly achievable or if it remains a wishful thinking. The panel, moderated by **Dragan Samardzija**, *Nokia Bell Labs*, USA, will feature distinguished experts involved in the design of AI-enabled 6G: **Jean-Claude Belfiore** (*Huawei France Research Center*, France), **Eric Hardouin** (*Orange Innovation*, France), **Jakob Hoydis** (*NVIDIA*, France), **Stefano Secci** (*Cnam*, France) and **Alvaro Valcarce Rial** (*Nokia Bell Labs*, France).

On the first day, the two half-day tutorials will address on the one hand, Guessing Random Additive Noise Decoding (GRAND), a noise-centric approach using guesswork to create a universal decoding algorithm, by **Muriel Médard** (*MIT*, USA) and **Ken R. Duffy** (*Northeastern University*, USA). On the second hand, **Antonio De Domenico** and **Nicola Piovesan** (both at *Huawei Technologies*, France) will explore how data-driven modelling can sustain Green Future Mobile Networks.

We are also offering one workshop on an engaging topic, namely EN-IoT, a workshop on ***Energy Neutral and Sustainable IoT Devices and Infrastructure***, that is drawing significant attention. In additional to technical sessions, this Workshop includes a keynote by **Jeroen Famaey** (*University of Antwerp and imec*, Belgium) who will address energy-aware computing and communications.

We would like to thank everyone who contributed to the organization of the conference. The Organizing Committee did an outstanding job in setting technical sessions, tutorials, keynotes and panels and for architecting a very attractive technical program, involving distinguished experts from Academia and Industry. We are indebted to the authors who contributed to the 6GNet 2024 program with their submissions on high-quality research works, as well as the members of the Technical Program Committee who made sure that contributions meet the highest expected quality. Special thanks go to Aziza Lounis and DNAC for setting up the logistics and following all aspects of the overall organization.

We are also grateful to IEEE and IEEE Comsoc, as continuous Technical Sponsors. We also acknowledge our Partners, namely **6G Flagship**, **6G-Path**, **6G-life** and **Paris Systematic** for their endorsement of the conference.

Last but not least, we sincerely acknowledge the support of our Patrons: Orange that is once again hosting 6GNet 2024 in Orange Gardens, its Innovation campus, like for the inaugural 6GNet event in 2022. Huawei and Nokia that have been continuously engaged at various levels in our event, and of course the Research Chair on Sustainable 6G ("6G Durable") set up by Centrale Supelec, CNRS and Paris-Saclay University together with Orange.

We are looking forward to a successful and engaging conference on 6G Networking in Paris!

Muriel Medard
(MIT, USA)
General Co-Chair

Prosper Chemouil
(CNAM, France)
General Co-Chair

Frank Fitzek
(Technical University of Dresden, Germany)
TPC Co-Chair

Anna Brunström
(Karlstad University, Sweden, and University of Malaga, Spain)
TPC Co-Chair

6GNet 2024 Keynotes

Beyond Connectivity: Pioneering the Future of Next-Generation Networks

Abstract: *Next-generation networks are set to transform global connectivity by fusing digital and physical realms – enabling ambient technologies and augmented human experiences. This keynote will explore the transformative potential of advancements in networking, cloud, and AI, that are set to redefine connectivity, from today's networks to the burgeoning potential of novel networking capabilities and cognizant (level-5) autonomy. We will delve into the challenges and opportunities presented by these innovations. Attendees will gain insights into the future landscape of global connectivity, understanding how these advancements will impact industries, economies, and daily life. Join us to envision a world where seamless, ultra-fast, and intelligent networks empower every aspect of human endeavor, driving progress and innovation in the digital age.*

Meryem Simsek
(Head of Network Architecture Research Lab / Nokia Bell Labs, USA)

Meryem Simsek is head of the Network Architecture Research (NAR) Lab at Nokia Bell Labs and is leading an interdisciplinary team of experts to drive network architecture innovations across multiple network layers and across all network segments. Previously, Dr. Simsek has held various scientific leadership roles with VMware, Intel Labs, UC Berkeley, International Computer Science Institute (ICSI) Berkeley, and Technical University Dresden. Her research background and interest span a wide range of topics including but not limited to distributed systems, (mobile) network technologies, cloud computing, AI/ML and multi-agent systems, game theory, and control theory. Dr. Simsek is the recipient of the IEEE Communications Society Fred W. Ellersick Prize in 2015, the Rising Star in Computer Networking and Communications by N2Women in 2019, the Edge Computing World Edge Women of the year top 10 finalist in 2022, and the IEEE ComSoc Tactile Internet Technical Committee Service award in 2023.

Semantics-native Communication and Protocol Learning in the 6G Era

Abstract: *This keynote talk will first provide a brief introduction of VisionX sitting at the intersection of learning, reasoning and communication in terms of key enablers and mathematical tools, while contrasting it with current efforts in this exciting research area. Subsequently, recent results in semantics-native communication and learning emergent communication protocols in various use cases will be presented. This talk will highlight the importance of transmitting semantic information as opposed to raw data that is either redundant, stale or useless to a receiver to carry out a task.*

Mehdi Bennis
(Head of of the intelligent connectivity and networks/ systems group / University of Oulu, Finland)

Mehdi Bennis is a full Professor at the Centre for Wireless Communications, University of Oulu, Finland and head of the intelligent connectivity and networks/systems group (ICON). His main research interests are at the intersection of communication and ML in 5G/6G networks. He has published 300+ research papers in international conferences, journals and book chapters. He has been the recipient of several prestigious awards including the 2015 Fred W. Ellersick Prize from the IEEE Communications Society, the 2016 Best Tutorial Prize from the IEEE Communications Society, the 2017 EURASIP Best paper Award for the Journal of Wireless Communications and Networks, the all-University of Oulu award for research, the 2019 IEEE ComSoc Radio Communications Committee Early Achievement Award and the 2020-2023 Clarviate Highly Cited Researcher by the Web of Science. Dr Bennis is a Specialty Chief Editor for Data Science for Communications in the Frontiers in Communications and Networks journal and an IEEE Fellow.

Advancing Cloud and IoT Security through LLMs, Federated and Deep Reinforcement Learning

Abstract: *A possible vision for 6G networks is that they can autonomously specialize to the radio environment in which they are deployed. I will discuss two key tools that are required to make this happen, namely differentiable ray racing for the creation of digital twin networks and machine learning. Differentiable ray tracing allows for gradient based optimization of many scene parameters and enables data-driven calibration of ray tracing models to measurements. Such digital twins can then be used as "gyms" for training of environment-specific communication schemes and applications. As examples, I will show how one can learn radio material parameters from channel measurements and present the architecture and performance of a recently developed 5G-compliant neural receiver which is not only compatible with different bandwidth allocations and number of layers but can run in real-time on a GPU.*

Jakob Hoydis
(Principal Research Scientist at NVIDIA, France)

Jakob Hoydis is a Principal Research Scientist at NVIDIA working on the intersection of machine learning and wireless communications. Prior to this, he was Head of a research department at Nokia Bell Labs, France, and co-founder of the social network SPRAED. He obtained the diploma degree in electrical engineering from RWTH Aachen University, Germany, and the Ph.D. degree from Supéléc, France. From 2019-2021, he was chair of the IEEE COMSOC Emerging Technology Initiative on Machine Learning as well as Editor of the IEEE Transactions on Wireless Communications. Since 2019, he is Area Editor of the IEEE JSAC Series on Machine Learning in Communications and Networks.

He is recipient of the 2019 VTG IDE Johann-Philipp-Reis Prize, the 2019 IEEE SEE Glavieux Prize, the 2018 IEEE Marconi Prize Paper Award, the 2015 IEEE Leonard G. Abraham Prize, the IEEE WCNC 2014 Best Paper Award, the 2013 VDE ITG Förderpreis Award, and the 2012 Publication Prize of the Supéléc Foundation. He has received the 2018 Nokia AI Innovation Award, as well as the 2018 and 2019 Nokia France Top Inventor Awards. He is a co-author of the textbook "Massive MIMO Networks: Spectral, Energy, and Hardware Efficiency" (2017). He is a 2023 Distinguished Industry Speaker of the IEEE Signal Processing Society as well as an IEEE Fellow.

He is one of the maintainers and core developers of Sionna, a GPU-accelerated open-source link-level simulator for next-generation communication systems.

6GNet 2024 Panel

AI-enhanced 6G: Hype or Reality?

Abstract: *As we move towards the next generation of mobile networks, the integration of AI into 6G promises to revolutionize the way we connect, communicate, and interact with technology. AI is expected to play a pivotal role in enhancing network capabilities, from intelligent resource management and automated network optimization to the creation of new, AI-driven services that were previously unimaginable. However, with great potential comes great complexity, and the path to AI-enhanced 6G has many technical, ethical, and operational challenges. This panel brings together experts from leading organizations to explore whether the promise of AI in 6G is truly achievable or if it remains largely aspirational. Together, they will discuss the role of AI in shaping 6G, the hurdles that must be overcome, and what it will take to turn the hype into reality.*

Dragan Samardzija
(Nokia Bell Labs, USA)
Moderator

Dragan Samardzija received the B.S. degree in electrical engineering and computer science in 1996 from the University of Novi Sad, Serbia, and the M.S and Ph.D. degree in electrical engineering from Wireless Information Network Laboratory (WINLAB), Rutgers University, USA, in 2000 and 2004, respectively. Since 2000 he has been with Bell Labs, working on the next generation wireless systems. His research interests include analysis, design, and experimental evaluation of radio access solutions. He has been focusing on 5G and 6G software and hardware implementation platforms (ASICs, SoCs, CPUs and GPUs) and Cloud RAN. Digital and mixed-signal compute platforms for Extreme Massive MIMO and AI are of his recent interest, Dragan is currently managing research work at four international Nokia Bell Labs locations. He received the Bell Labs Fellow award in 2017. He taught a number of courses, including at Columbia University, and held numerous technical workshops around the world. He authored over 100 peer-reviewed publications and numerous patents granted and pending.

Eric Hardouin
(Orange Innovation, France)

Eric Hardouin the Orange research on Networks and Infrastructures, which investigates future access and core networks, infrastructures and their information systems, to provide ambient connectivity and distributed computing power that are cost effective, inclusive, sustainable and source of value for the society. Eric received his Ph.D. degree in signal processing and telecommunications from Telecom Bretagne and the University of Rennes 1, France, in 2004. Since 2004, he has been with Orange, where he conducted research on interference mitigation for mobile networks. Between 2008 and 2013 he represented Orange in the physical layer standardization group of 3GPP (RAN WG1) for HSPA, LTE and LTE-Advanced. From 2012 to 2015, Eric coordinated the research on wireless networks in Orange. From 2016 to 2022, Eric led the Orange research on future access and transport networks and technologies, as well as related business models.

Eric had a leading role in the NGMN 5G White Paper, as co-lead of the work on 5G requirements. Eric is the author of the book "LTE et les réseaux 4G" (in French).

Stefano Secci
(CNAM, France)

Stefano Secci is currently a Full professor at Cnam Paris, France, responsible of the teaching and research activities in networking, as Leader of Networks and IoT team. Previously, he has been an Associate Professor with the University Pierre and Marie Curie (Paris VI, Sorbonne University). He has also been a postdoc at George Mason University and a Research Fellow NTNU, Ecole Polytechnique de Montreal, and Politecnico di Milano. Stefano holds a dual Ph.D. degree in computer networks from Politecnico di Milano, Italy and Telecom ParisTech, France. Before his PhD, he was a Network Engineer with Fastweb Italia and CNIT, Italy. He initially got a telecommunication engineering degree from Politecnico di Milano, Italy.

Stefano has been the Chair of the Internet Technical Committee, joint between the IEEE Communication Society and the Internet Society.
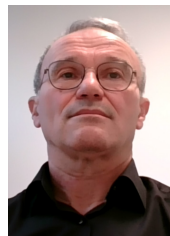
Jean-Claude Belfiore
(Huawei France Research Center, France)

Jean-Claude Belfiore is the director of the Advanced Wireless Technology Lab at Huawei France Research Center. Jean-Claude received the Engineering degree from Supelec, the PhD from Telecom Paris and the Habilitation from University Pierre et Marie Curie. He was first enrolled in Alcatel and then at Telecom Paris where he became a full Professor, before joining the Huawei France Research Center in 2015.

As a professor, he has carried out research in the fields of wireless communications, coding for wireless networks, space-time coding and coding for physical layer security. In Huawei, he participated to the standardization of polar codes for 5G and is now working on 6G, especially on Native AI and semantics.

Jean-Claude Belfiore has made pioneering contributions on signal design for wireless communication systems, space-time coding, cooperative and multi-user communications. He is the co-inventor of the celebrated Golden Code and got the 2007 Blondel medal. He is author or co-author of more than 200 technical papers and communications and he has served as advisor for more than 30 Ph D. thesis.

Jakob Hoydis
(Principal Research Scientist at NVIDIA, France)

Jakob Hoydis is a Principal Research Scientist at NVIDIA working on the intersection of machine learning and wireless communications. Prior to this, he was Head of a research department at Nokia Bell Labs, France, and co-founder of the social network SPRAED. He obtained the diploma degree in electrical engineering from RWTH Aachen University, Germany, and the Ph.D. degree from Supéléc, France. From 2019-2021, he was chair of the IEEE COMSOC Emerging Technology Initiative on Machine Learning as well as Editor of the IEEE Transactions on Wireless Communications. Since 2019, he is Area Editor of the IEEE JSAC Series on Machine Learning in Communications and Networks.

He is recipient of the 2019 VTG IDE Johann-Philipp-Reis Prize, the 2019 IEEE SEE Glavieux Prize, the 2018 IEEE Marconi Prize Paper Award, the 2015 IEEE Leonard G. Abraham Prize, the IEEE WCNC 2014 Best Paper Award, the 2013 VDE ITG Förderpreis Award, and the 2012 Publication Prize of the Supéléc Foundation. He has received the 2018 Nokia AI Innovation Award, as well as the 2018 and 2019 Nokia France Top Inventor Awards. He is a co-author of the textbook "Massive MIMO Networks: Spectral, Energy, and Hardware Efficiency" (2017). He is a 2023 Distinguished Industry Speaker of the IEEE Signal Processing Society as well as an IEEE Fellow.

He is one of the maintainers and core developers of Sionna, a GPU-accelerated open-source link-level simulator for next-generation communication systems.

Alvaro Valcarce Rial
(Nokia Bell Labs, France)

Alvaro Valcarce is Head on Wireless AI Research at Nokia Bell Labs, France, where he focuses on the application of reinforcement learning to L2 and L3 problems for the development of beyond 5G technologies. He was previously a system engineer with Node-H GmbH, where he developed Self Organising Networks (SON) algorithms for LTE small-cells. He received his PhD in 2010 from the University of Bedfordshire and his background is on cellular networks, optimization algorithms, computational electromagnetics, and satcom.

6GNet 2024 Tutorials

Tutorial #1 Universal Decoding by Guessing Random Additive Noise Decoding

Abstract: *Forward error correction decoding has typically been code-specific. A recent alternative is Guessing Random Additive Noise Decoding (GRAND), a noise-centric approach using guesswork to create a universal decoding algorithm. It removes noise effects from the received signal and uses the codebook as a hash check. Decoding continues until verification succeeds or an erasure is declared. GRAND provides Maximum Likelihood decoding for any block code, adaptable to statistical noise characteristics like burstiness or interference. Parallelizable and suitable for hardware, GRAND's universality allows the use of various codes, including cryptographic ones, expanding the range of decodable codes beyond traditional methods.*

Muriel Medard
(MIT, USA)

Muriel Médard is the NEC Chair in Software Science and Engineering for the School of Engineering at MIT and a Professor in the Electrical Engineering and Computer Science (EECS) Department at MIT, where she leads the Network Coding and Reliable Communications Group in the Research Laboratory for Electronics at MIT. She obtained three Bachelors degrees (EECS 1989, Mathematics 1989, and Humanities 1991), as well as her M.S. (1991) and Sc.D (1995), all from MIT. She is a Member of Leopoldina (German Academy of Sciences) (elected 2022), the US Academy of Arts and Sciences (elected 2021), the US National Academy of Engineering (elected 2020), a Fellow of the US National Academy of Inventors (elected 2018), and a Fellow of the Institute of Electrical and Electronics Engineers (elected 2008). Muriel was elected president of the IEEE Information Theory Society in 2012 and served on its board of governors for eleven years. She holds Honorary Doctorates from the Technical University of Munich (2020), the University of Aalborg (2022), and the Budapest University of Technology and Economics (2023).

She was co-winner of the MIT 2004 Harold E. Edgerton Faculty Achievement Award and was named a Gilbreth Lecturer by the US National Academy of Engineering in 2007. She received the 2017 IEEE Communications Society Edwin Howard Armstrong Achievement Award and the 2016 IEEE Vehicular Technology James Evans Avant Garde Award. She received the 2019 Best Paper award for IEEE Transactions on Network Science and Engineering, the 2018 ACM SIGCOMM Test of Time Paper Award, the 2009 IEEE Communication Society and Information Theory Society Joint Paper Award, the 2009 William R. Bennett Prize in the Field of Communications Networking, the 2002 IEEE Leon K. Kirchmayer Prize Paper Award, as well as eight conference paper awards. Most of her prize papers are co-authored with students from her group.

She has served as technical program committee co-chair of ISIT (twice), CoNext, WiOpt, WCNC, and of many workshops. She has chaired the IEEE Medals committee and served as member and chair of many committees, including as inaugural chair of the Millie Dresselhaus Medal. She is Editor in Chief of the IEEE Transactions on Information Theory and was the Editor in Chief of the IEEE Journal on Selected Areas in Communications. She has served as editor or guest editor of many IEEE publications, including the IEEE Transactions on Information Theory, the IEEE Journal of Lightwave Technology, and the IEEE Transactions on Information Forensics and Security. She was a member of the inaugural steering committees for the IEEE Transactions on Network Science and for the IEEE Journal on Selected Areas in Information Theory.

She has over eighty US and international patents awarded, the vast majority of which have been licensed or acquired. For technology transfer, she has co-founded companies, CodeOn, Steinwurf, and Optimum. Muriel has supervised over 40 master students, over 20 doctoral students, and over 25 postdoctoral fellows.

Ken R. Duffy
(Professor in Electrical and Computer Engineering (ECE) and Mathematics at Northeastern University, USA)

Ken R. Duffy is a Professor in Electrical and Computer Engineering (ECE) and Mathematics at Northeastern University. He served as chair of ECE at Northeastern and was previously a Professor at Maynooth University in Ireland, where he directed the Hamilton Institute, an interdisciplinary applied mathematics research center. Duffy holds a B.A. (mod) in Mathematics (1996) and a Ph.D. (2000), both from Trinity College Dublin. He was one of the three co-Directors of the Science Foundation Ireland Centre for Research Training in Foundations of Data Science, training over 120 Ph.D. students from 2019 to 2026. His research focuses on applying probability and statistics to science and engineering, leading to publications in diverse journals, including mathematics (Annals of Applied Probability, Journal of Applied Probability, Journal of Mathematical Biology), engineering (IEEE Transactions on Information Theory, IEEE Transactions on Network Science and Engineering, IEEE/ACM Transactions on Networking), and scientific journals (Cell, Nature Communications, Science). Duffy is a co-founder of the Royal Statistical Society's Applied Probability Section (2011), co-authored a cover article in Trends in Cell Biology (September 2012), and received best paper awards at the IEEE International Conference on Communications (2015) and IEEE Transactions on Network Science and Engineering (2019). He has had extended invited visits at the Kavli Institute for Theoretical Physics at UC Santa Barbara, The Research Laboratory of Electronics at MIT, and the Immunology Division at the Walter and Eliza Hall Institute of Medical Research.

6GNet 2024 Tutorials

Tutorial #2 Data-Driven Modelling and Optimization of Green Future Mobile Networks: From Machine Learning to Generative AI

Abstract: *The energy consumption of mobile networks poses a critical challenge. Mitigating this concern necessitates the deployment and optimization of network energy-saving solutions, such as carrier shutdown, to dynamically manage network resources. Traditional optimization approaches encounter complexity due to factors like the large number of cells, stochastic traffic, channel variations, and intricate trade-offs. This tutorial introduces the challenge to optimize the network energy efficiency and overviews the current industrial effort in this context. Then, it introduces a telecom digital twin that harnesses live network data and employs a blend of machine learning (ML)- and expert-based models to accurately characterize the functioning of network components, and predicts network energy efficiency and user equipment (UE) quality of service for any energy carrier shutdown configuration in a specific network. This tutorial details the pipeline employed by the digital twin to decompose the large network energy efficiency modeling problem into ML- and expert-based submodels. We discuss how, by embracing stochasticity, and carefully crafting the relationship between such submodels, the overall computational complexity can be reduced and prediction accuracy enhanced. Finally, the tutorial discusses how GenAI can be used to speed up the overall design of a digital twin, potential benefits, challenges, and present preliminary results.*

Antonio De Domenico
(Senior Researcher at Huawei Technologies, France)

Antonio de Domenico received the M.Sc. degree in telecommunication engineering from the University of Rome La Sapienza in 2008, and the Ph.D. degree in telecommunication engineering from the University of Grenoble in 2012. From 2012 to 2019, he was a Research Engineer with CEA LETI MINATEC, Grenoble, France. In 2018, he was a Visiting Researcher with the University of Toronto, Canada. Since 2020, he has been a Senior Researcher with Huawei Technologies France SASU, Paris, France. He is the main inventor or a co-inventor of more than 25 patents and the authors of around 100 publications. Since 2023, he has been co-leading the network energy efficiency activities within the green future network project of the NGMN Alliance and since 2024 he is co-chairing the activities on dataset and competitions of the IEEE Large Generative AI Models in Telecom Emerging Technology Initiative. His research interests include heterogeneous wireless networks, artificial intelligence for networks, and green communications.

Nicola Piovesan
(Senior Researcher at Huawei, France)

Nicola Piovesan received the Ph.D. degree in network engineering from the Polytechnic University of Catalonia, Barcelona, Spain, in 2020. He is a Senior Researcher with Huawei Technologies, Paris, France. His work focuses on large-scale network modeling, data-driven network optimization, green networking, 2and the integration of artificial intelligence in the telecom domain. He was Awarded a Marie Skłodowska-Curie Fellowship by the European Commission in 2016. He served as an Assistant Researcher with the Centre Tecnològic de Telecomunicacions de Catalunya, Barcelona, from 2016 to 2019. He has authored over 30 research articles and holds co-inventorship in over ten patent applications. His achievements have been recognized with the Huawei GTS President Award in 2021 and the Huawei Quality Star Award in 2024, acknowledging his successful research application into product development.

Monday, October 21, 2024

08:30 - 09:00 Registration

09:00 - 10:30 Tutorial #1: Universal Decoding by Guessing Random Additive Noise Decoding (Part 1)
Speaker : Speaker : Muriel Médard (MIT, USA) & Ken R. Duffy (Northeastern University, USA)
Room : March

10:30 - 11:00 Coffee break

11:00 - 12:30 Tutorial #1: Universal Decoding by Guessing Random Additive Noise Decoding (Part 2)
Speaker : Muriel Médard (MIT, USA) & Ken R. Duffy (Northeastern University, USA)
Room : March

12:30 - 13:30 Lunch break

13:30 - 15:00 Tutorial #2: Data-Driven Modelling and Optimization of Green Future Mobile Networks: From Machine Learning to Generative AI (Part 1)
Speaker : Antonio De Domenico (Huawei Technologies, France) & Nicola Piovesan (Huawei, France)
Room : March

13:30 - 15:00 Workshop: EN-IoT
Room : November

13:30 - 13:35 Welcome

13:35 - 14:20 *Keynote: Energy-aware computing and communications for energy neutral IoT devices*
Speaker: Jeroen Famaey (University of Antwerp & Imec, Belgium)
Session Chair: Ritesh Kumar Singh (Imec University of Antwerp, Belgium)

14:20 - 15:00 W-TS #1
Session Chair: Ritesh Kumar Singh (Imec University of Antwerp, Belgium)

Energy Consumption of Multi-RAT IoT Gateway for UAV-based Communication Infrastructure
Abdul Haseeb, Konstantin Mikhaylov and Tuomo Hänninen (University of Oulu, Finland)

Harnessing Energy from Transient Temperature Differences Using Phase Change Materials
Priyesh Pappinisseri Puluckul (University of Antwerp, Belgium & IDLab, Belgium); Seppe Van de Poel (University of Antwerp, Belgium); Rafael Berkvens (University of Antwerp – imec, Belgium); Ritesh Kumar Singh (Imec University of Antwerp, Belgium)

15:00 - 15:30 Coffee break

15:30 - 17:00 Tutorial #2: Data-Driven Modelling and Optimization of Green Future Mobile Networks: From Machine Learning to Generative AI (Part 2)
Speaker : Antonio De Domenico (Huawei Technologies, France) & Nicola Piovesan (Huawei, France)
Room : March

15:30 - 17:00 Workshop: EN-IoT
Room : November

15:30 - 16:50 W-TS #2
Session Chair: Onel Alcaraz López (University of Oulu, Finland)

Measurement of Coded Backscatter Communication Utilizing Commercial LTE Ambient Signal
Jingyi Liao, Kalle Ruttik, Riku Jäntti and Muhammad Usman Sheikh (Aalto University, Finland); Dinh-Thuy Phan-Huy (Orange, France)

Evaluating Fast and Grant-Free Uplink Access in Next-Generation Cellular IoT Networks
Lars Moons, Samer Nasser and Adnan Sabovic (University of Antwerp, Belgium); Jeroen Famaey (University of Antwerp & Imec, Belgium); Ritesh Kumar Singh (Imec University of Antwerp, Belgium)

Optical- and Induction-based Data and Energy Networking in Light-Based Internet of Things
Malalgodage Amila Nilantha Perera and Marcos Katz (University of Oulu, Finland)

Single versus Multi-Tone Wireless Power Transfer with Physically Large Arrays
Jarne Van Mulders (KU Leuven, Belgium); Benjamin J. B. Deutschmann (Graz University of Technology, Austria); Geoffrey Ottoy (KU Leuven & Technology Campus Ghent, Belgium); Lieven De Strycker and Liesbet Van der Perre (KU Leuven, Belgium); Thomas Wilding (Graz University of Technology, Austria); Gilles Callebaut (KU Leuven, Belgium)

16:50 - 17:00 Closing workshop
Session Chair: Onel Alcaraz López (University of Oulu, Finland) and Ritesh Kumar Singh (Imec University of Antwerp, Belgium)
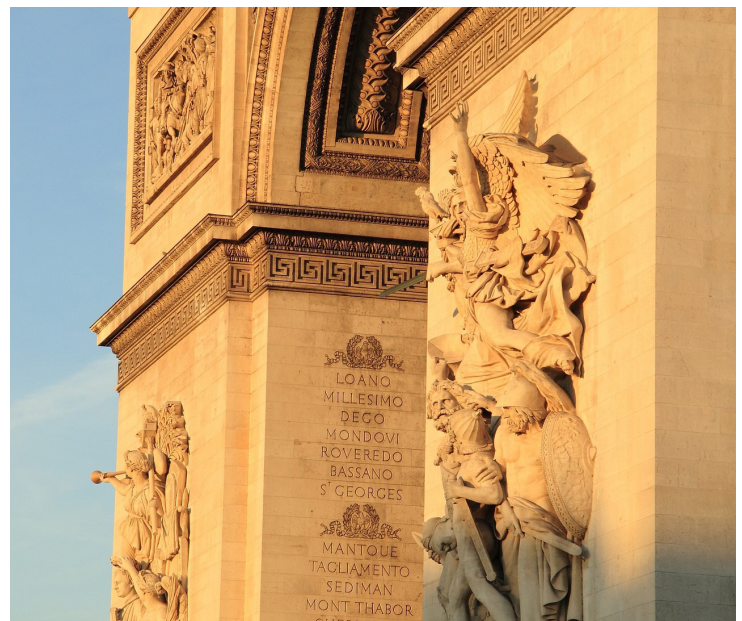
Tuesday, October 22, 2024

08:30 - 09:00 Registration

Room : La Grande Scène

09:00 - 09:30 Opening Session

09:30 - 11:00 FPS #1: Performance
Session Chair : Anna Brunström (Karlstad University, Sweden, and University of Malaga, Spain)

Enhancing 5G Performance: Reducing Service Time and Research Directions for 6G Standards
Laura Landon and Vipindev Adat Vasudevan (Massachusetts Institute of Technology, USA); Jaeweon Kim, Junmo Sung and Jeffery T Masters (JMA Wireless, USA); Muriel Médard (MIT, USA)

Performance Analysis of Integrated 5G-NR Terrestrial and Non-Terrestrial Networks Using System Level Simulations
Moustafa Roshdi (Fraunhofer IIS & Friedrich Alexander University (FAU), Germany); Samhita Roy (Franhofer IIS, Germany); Sahana Raghunandan (Fraunhofer-Gesellschaft, Germany); Thomas Heyn (Fraunhofer IIS, Germany)

Using Edge-Based Packet Trimming for Effective Bandwidth Utilization in 6G
Stuart Clayman (University College London (UCL), United Kingdom (Great Britain)); Muge Sayit (University of Essex, United Kingdom (Great Britain)); David Griffin and Miguel Rio (University College London, United Kingdom (Great Britain))

11:00 - 11:30 Coffee break

11:30 - 12:30 Keynote #1: Beyond Connectivity: Pioneering the Future of Next-Generation Networks
Speaker : Meryem Simsek (Nokia Bell Labs, USA)
Session Chair : Muriel Médard (MIT, USA)

12:30 - 13:30 Lunch break & Demo Session DS #1
Room : Le Foyer

A Scalable and Distributed Hierarchical Architecture for Network Monitoring-on-Demand
Nikolaos Bartzoudis and José Rubio Fernández (CTTC, Spain); David López-Bueno (Centre Tecnològic de Telecomunicacions de Catalunya (CTTC/CERCA), Spain); Godfrey Mirondo Kibalya and Hari Sankar Madhukumar (University of Bristol, United Kingdom); Thomas A Bower (Weaver Labs, United Kingdom); Xenofon Vasilakos, Juan M. Parra and Dimitra Simeonidou (University of Bristol, UK); Maria Lema (King's College London, UK)

Experiences with disaggregated RAN integrations
Moussa Guemdani (Conservatoire national des arts et métiers, France); Dung Chi Phung and Stefano Secci (Cnam, France)

Generative Open xG Network Simulation with Multi-Agent LLM and ns-3 (GenOnet)
Farhad Rezazadeh (Centre Tecnològic de Telecomunicacions de Catalunya (CTTC), Spain); Amir Ashtari Gargari (Centre Tecnologic de Telecomunicacions de Catalunya (CTTC), Spain); Sandra Lagen and Josep Mangues-Bafalluy (Centre Tecnològic de Telecomunicacions de Catalunya (CTTC), Spain); Dusit Niyato (Nanyang Technological University, Singapore); Lingjia Liu (Virginia Tech, USA)

Immersive Situational Awareness for Robotic Assistance of FirstResponders Enabled by Reliable 6G Multi-X Communications
Manuel Patchou, Tim Gebauer, Florian Schmickmann, Stefan Böcker and Christian Wietfeld (TU Dortmund University, Germany)

13:30 - 15:00 FPS #2: Anomaly Detection
Session Chair : Meriem Kassar (University Tunis El Manar, Tunisia)

ML-based Anomaly Detection in 6G Networks: A Survey on the Current Status, Challenges, and Future Directions
Nasim Nezhadsistani (University of Zurich & Isfahan University of Technology, Switzerland); Burkhard Stiller (University of Zürich, Switzerland)

Adversarial Deep Domain Adaptation Method for Unsupervised Anomaly Detection
Yoichi Matsuo and Kengo Tajiri (NTT, Japan)

XAInomaly: Explainable, Interpretable and Trustworthy AI for xURLLC in 6G Open-RAN
Osman Tugay Basaran (Technical University of Berlin, Germany); Falko Dressler (TU Berlin, Germany)

15:00 - 15:30 Coffee break & Demo Session DS #1

15:30 - 17:15 SPS #1: Performance Improvements of 5G and 6G Networks
Session Chair : Eric Hardouin (Orange Labs,France)

Efficient Radio Resource Management for Rate Maximization in LEO Multi-satellite Systems
Musbah Shaat (CTTC, Spain); Màrius Caus (Centre Tecnològic de Telecomunicacions de Catalunya (CTTC/CERCA), Spain)

DL-enabled Road Traffic Monitoring Services using 6G mmWave Channel State Information
Marcus Haferkamp, Simon Häger and Christian Wietfeld (TU Dortmund University, Germany)

Towards 6G: Leveraging Advanced Sleep Modes to Improve Energy Performance
Juan Guillermo Borja (Ericsson, Germany); Philipp Bruhn (Ericsson Research, Germany); Marina Petrova (RWTH Aachen University, Germany & KTH Royal Institute of Technolgy, Sweden)

DoA Estimation in RIS-Assisted Network via Element Sampling and Sparse Reconstruction
Shraddha Tripathi (Indian Institute of Technology Kanpur, India); Ahmet M. Elbir (University of Luxembourg, Luxembourg); Tushar Sandhan (IIT Kanpur, India); Rajesh M Hegde (Indian Institute of Technology Kanpur, India)

Reconfigurable Intelligent Surfaces in Dynamic Rich Scattering Environments: BiLSTM-Based Optimization for Accurate User Localization
Anum Umer, Ivo Müürsepp and Mahtab Alam (Tallinn University of Technology, Estonia)

18:00 Welcome Reception
Room : Le Foyer

Wednesday, October 23, 2024

08:30 - 09:00 Registration

Room : La Grande Scène

09:00 - 11:00 FPS #3: Resource Allocation
Session Chair : Zwi Altman (Orange Labs, France)

Learning-Based Resource Allocation for MBRLLC and Homogeneous Slices in 6G Networks
Hussein Awada, Sara Berri & Arsenia Chorti (ETIS UMR 8051, CY University, ENSEA, CNRS & ETIS, France)

In-Network Computing and Split-AI in 6G: Enablers and Proof-of-Concept Studies
Mattia Giovanni Spina and Darwin Victoriano Soto Lebron (University of Calabria, Italy); Susanna Schwarzmann (Huawei Technologies, Germany); Riccardo Guerzoni (DOCOMO Communications Laboratories Europe, Germany); Riccardo Trivisonno (Huawei Technologies, Germany); Antonio Iera and Floriano De Rango (University of Calabria, Italy); George T. Karetsos (University of Thessaly, Greece); Thomas Zinner (NTNU, Norway); Daniel Corujo (University of Aveiro & Instituto de Telecomunicações, Portugal)

RIS as a Network Resource: Pricing and User Multiplexing Algorithms
Alexandros Ioannis Papadopoulos (University of Ioannina, Greece & Information Technologies Institute, Greece); Antonios Lalas (Centre for Research and Technology – Hellas (CERTH), Greece); Konstantinos Votis (Information Technologies Institute, Centre For Research and Technology Hellas, Greece); Stefan Schmid (TU Berlin, Germany); Kostas Katsalis (DOCOMO Euro-Labs, Germany); Christos Liaskos (University of Ioannina, Greece & Foundation of Research and Technology Hellas, Greece)

Online Frequency Scheduling by Learning Parallel Actions
Anastasios Giovanidis and Mathieu Leconte, Sabrine Aroua &Tor Kvernvik and David Sandberg (Ericsson Research, Sweden)

11:00 - 11:30 Coffee break

11:30 - 12:30 Keynote #2: Semantics-native Communication and Protocol Learning in the 6G Era
Speaker : Mehdi Bennis (University of Oulu, Finland)
Session Chair : Dragan Samardzija (Nokia Bell Labs, USA)

12:30 - 13:30 Lunch break & Poster Session PS #1
Room : Le Foyer

Micro-orchestration of RAN functions accelerated in FPGA SoC devices
Nikolaos Bartzoudis, José Rubio Fernández ans David López-Bueno (CTTC/CERCA, Spain); Godfrey Mirondo Kibalya and Angelos Antonopoulos (Nearby Computing, Spain)

Profiling AI Models: Towards Efficient Computation Offloading in Heterogeneous Edge AI Systems
Juan M. Parra, Oscar Dilley, Hari Sankar Madhukumar and Dimitra Simeonidou (University of Bristol, UK)

The Impact of Positional Accuracy in 6G Networks on Urban Traffic Participant Classification
Florian Langenstein, Christof Rauber and Christoph Fischer (German Research Center for Artificial Intelligence, Germany); Hans D. Schotten (University of Kaiserslautern, Germany)

A Platform for Implementing a Full Protocol Stack over Sub-Terahertz Communication Links
Tianyi Su, Duschia M Bodet and Sherif Badran & Josep M Jornet (Northeastern University, USA)

13:30 - 15:00 FPS #4: Design
Session Chair : Muge Sayit (University of Essex, United Kingdom)

Design Aspects for Efficient Beam Training in 6G Millimeter-Wave Networks with Mobile Users
Simon Häger, Bara Sabbah and Christian Wietfeld (TU Dortmund University, Germany)

Building Network Digital Twins Part I: State Synchronization
John Sengendo and Fabrizio Granelli (University of Trento, Italy)

Pragmatic Semantic Communication through Quantum Channel
Nikhitha Nunavath (Technische Universität Dresden, Germany); Emilio Calvanese Strinati (CEA-LETI, France); Riccardo Bassoli & Frank H.P. Fitzek (Technische Universität Dresden, Germany)

15:00 - 15:30 Coffee break & Poster Session PS #1

15:30 - 17:15 SPS #2: 5G & 6G Concepts and Use Case
Session Chair : Konstantin Mikhaylov (University of Oulu, Finland)

Micro Core Networks Assessment in the Cloud-Native beyond 5G/6G Mobile Network Operator Deployments Context
Marius Corici (Fraunhofer FOKUS, Germany); Hemant Zope (Fraunhofer Fokus, Germany); Thomas Magedanz (Fraunhofer Institute FOKUS / TU Berlin, Germany); Masayuki Kurata and Masaki Suzuki (KDDI Research, Inc., Japan)

Pushing the Boundaries of Scalable 5G Core Networks: Cloud-Native NEF and CAPIF Interplay
João Fernandes (OneSource, Portugal); Luis Rosa (University of Coimbra, Portugal); João Gameiro (University of Aveiro, Portugal); Pedro Valente (Instituto de Telecomunicações, Portugal); Eduardo Henriques Ramos (OneSource, Portugal); José Vicente de Oliveira & Duarte Raposo (Instituto de Telecomunicações, Portugal); Arturo Jose Torrealba Ferrer & Jesus Macias Portela (Telefonica, Spain); Pedro Rito (Instituto de Telecomunicações, Universidade de Aveiro, Portugal); Luis Cordeiro (OneSource, Portugal); Susana Sargento (Instituto de Telecomunicações, Universidade de Aveiro, Portugal)

Multi-3GPP Connectivity Concept, Architecture and Specific Implementation Details
Marius Corici and Eric Troudt (Fraunhofer FOKUS, Germany); Benjamin Barth and Roshith Sebastian (German Aerospace Center (DLR), Germany); Christian Scheich (Fraunhofer FOKUS, Germany); Tomaso De Cola (German Aerospace Center (DLR), Germany)

Flexible Transceiver Platform for Holistic Radio Design Analysis
Bitan Banerjee, Carl R. Collmann, Ahmad Nimr and Gerhard P. Fettweis (Technische Universität Dresden, Germany)

Enhancing Healthcare Remote Education with 6G and XR Technologies
Mohammad Rajiullah and Giuseppe Caso (Karlstad University, Sweden); Anna Brunstrom (Karlstad University, Sweden & University of Malaga, Spain); Karl-Johan Grinnemo, Jonas Karlsson, Anna Nordin, Jörgen Jansson and Anders Sidenblad (Karlstad University, Sweden)

20:00 Conference Dinner

Thursday, October 24, 2024

08:30 - 09:30 Registration

Room : La Grande Scène

09:30 - 11:00 FPS #5: Mobile and Wireless Communications
Session Chair : Salah-Eddine El Ayoubi (Centrale Supelec, France)

Fundamental and Practical Performance Assessment in Monostatic ISAC: From Sub-6GHz to Sub-THz
Ehsan Moeen Taghavi, Harri Saarnisaari and Markku Juntti (University of Oulu, Finland)

Bi-Static Sensing in OFDM Wireless Systems for Indoor Scenarios
Vijaya Parampalli Yajnanarayana (Ericsson Research, India); Philipp Geuer (Ericsson Research, Germany)

Applicability of Fully Homomorphic Encryption in Mobile Communication
Sogo Pierre Sanon (German Research Center for Artificial Intelligence, Germany)

11:00 - 11:30 Coffee break

11:30 - 12:30 Keynote #3: Digital Twins for Communications: How to Create and Use Them
Speaker : Jakob Hoydis (NVIDIA, France)
Session Chair : Prosper Chemouil (Cnam, France)

12:30 - 13:30 Lunch break

13:30 - 15:00 FPS #6: AI-Enhanced Networks
Session Chair : Jean-Claude Belfiore (Huawei Technologies, France)

Towards a Meta-Learning Assisted Universal Neural Receiver: An Empirical Study
Yufan Wei, Wei Ye and Steven Sleder & Zhi-Li Zhang (University of Minnesota, USA)

A Deep Learning Approach for Predicting Radio Channels across Frequency in Mobile Networks
Apostolos Destounis & Pegah Alizadeh (Ericsson, France)

Integrate: Intent-Driven Router Queue Depth Configuration via Reinforcement Learning
Ajay Kattepur (Ericsson Research, India); Pedro dos Santos Batista and Alessandro Previti & Konstantinos Vandikas (Ericsson, Sweden)

15:00 - 15:30 Coffee break

15:30 - 17:00 Panel: AI-enhanced 6G: Hype or Reality?
Moderator : Dragan Samardzjia (Nokia Bell Labs, USA)

Panel members:
Jean-Claude Belfiore (Huawei France Research Center, France)
Eric Hardouin (Orange Innovation, France)
Jakob Hoydis (Nvidia, France)
Stefano Secci (Cnam, France)
Alvaro Valcarce Rial (Nokia Bell Labs, France)

17:00 Best Paper Award and Closing Session

6GNet 2024 Diner

The conference dinner will take place on Wednesday October 23, 2024 at 8:00 p.m. at

"Bel Canto Paris"
72 Quai de l'Hôtel de ville,
75004 Paris

By Metro:
Take Metro 13 to "Champs-Elysées-Clémenceau", then take Metro 1 to "Hôtel de Ville", walk ~ 5mins

By Bus/Metro:
Take bus 388 to "Porte d'Orleans", then take Metro 4 to "Châtelet", walk ~ 10mins

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(MIT, USA)

Prosper Chemouil
(CNAM, France)

TPC Co-Chairs

Frank Fitzek
(Technical University of Dresden, Germany)

Anna Brunström
(Karlstad University, Sweden, and University of Malaga, Spain)

Keynote & Panel Co-Chairs

Dragan Samardzija
(Nokia Bell Labs, USA)

Merouane Debbah
(Khalifa University of Science and Technology of Abu Dhabi, UAE)

Demos and Posters Co-Chairs

Rabia Yazicigil Kirby
(Boston University, USA)

Josep Miquel Jornet
(Northeastern University Boston, USA)

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Wolfgang John
(Ericsson Research, Sweden)

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Tutorial Co-Chairs

Sławomir Kukliński
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Samson Lasaulce
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Razvan Stanica
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Publicity Co-Chairs
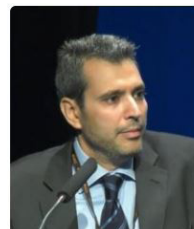
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(National Centre for Scientific Research Demokritos, Greece)

Hamzeh Khalili
(CTTC, Spain)

Kohei Shiomoto
(Tokyo City University, Japan)

Diala Naboulsi
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Guillaume Boulmier
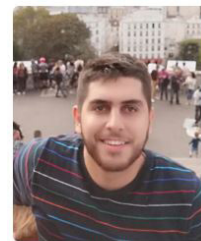(Orange Innovation, France)

Overall Oganization Chair

Aziza Lounis
(DNAC, France)

Web/IT Chair

Elia Kallas
(DNAC, France)

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Mohammad Ali Salahuddin (University of Waterloo, Canada)
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Christian Wietfeld (TU Dortmund University, Germany)
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Notes

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