WOCC 2026

The 35th Wireless and Optical Communications Conference (WOCC 2026)

May 8th – May 9th, 2026
Newark, New Jersey, USA

www.wocc.org

Welcome Message

On behalf of the Wireless and Optical Communications Conference (WOCC) Planning Committee, we welcome you to our 35th annual event, the WOCC 2026.

Under the theme of "Exploring Intelligent Communication Networks and the Smart World", the WOCC 2026 features four keynote speeches, highlighting the latest technological advances and potential on wireless networks, optical communications, Artificial Intelligence and Big Data Analytics. "Resource Constrained Learning over Wireless Networks" by Prof. Vincent Poor of Princeton University; "6G Enabling scalable mobile connectivity for AI-driven digital society" by Dr. Junyi Li, Vice President of Engineering at Qualcomm; "Smart Infrastructure for Future Urban Mobility" by Prof. Stephen F. Smith of Carnegie Mellon University; and "Research on Heterogeneous VLC-RF Communications for Internet of Vehicles" by Prof. Jian Song of Tsinghua University.

The WOCC 2026 will present invited and peer reviewed papers on three parallel symposiums: Wireless Communications, Optical Communications and Networks, and Artificial Intelligence and Big Data Analytics. Papers presented will be included in WOCC 2026 Conference Proceedings published in IEEE Xplore Digital Library. WOCC Charles K. Kao Best Paper Awards will be presented to authors of selected high quality papers. The WOCC has become a major event for telecommunications professionals both in the U.S. and the Asia-Pacific region throughout the last two decades. This conference provides an excellent forum and opportunity for presenting new research results, discussing emerging technologies, innovative research ideas, and networking among telecommunications professionals.

We hope your participation in the WOCC 2026 is a productive and rewarding experience. Thank you for your involvement and contributions in making our WOCC 2026 Conference a success.

Zhanyang Zhang

City University of New York

Conference Co-chair

Tao Han

New Jersey Institute of Technology

Conference Co-chair

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IEEE Photonics Society

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PROGRAM AT A GLANCE

WOCC, Friday, May 8, 2026			
09:00–15:30	**Registration**		
10:30–10:35	**Opening Remarks**		
10:35–11:35	**K1 Keynote Session** *(Chair: Zhanyang Zhang)*	**Prof. Vincent Poor – Princeton University** *"Resource Constrained Learning over Wireless Networks"*	
11:35–12:35	**K2 Keynote Session** *(Chair: Zhanyang Zhang)*	**Prof. Stephen F. Smith – Carnegie Mellon University** *"Smart Infrastructure for Future Urban Mobility"*	
12:35–13:30	Lunch		
13:30–15:10	**W1 AI/ML for Wireless & Channel Estimation** *Chair: Vinay A. Vaishampayan* *City University of New York, USA*	**O1 Advanced Photonics and Modulation** *Chair: Li Ge* *City University of New York*	**A1 Edge AI and Systems** *Chair: Cong Qi* *New Jersey Institute of Technology, USA*
15:10–15:30	Break		
15:30–17:30	**W2 Wireless Edge Network** *Chair: Tao Han* *New Jersey Institute of Technology*	**O2 Photonic Devices and VLC** *Chair: Liang Zhang* *University of Maryland Eastern Shore, USA*	**A2 Core AI/ML Methods** *Chair: Huaxia Wang* *Rowan University, USA*
WOCC, Saturday, May 9, 2026			
09:00–10:20	**W3 Remote Session** *Chair: Meilong Jiang* *Qualcomm, USA*	**O3 Remote Session** *Chair: Liang Zhang* *University of Maryland Eastern Shore, USA*	**A3 Remote Session** *Chair: Yuanjie Zou* *New Jersey Institute of Technology*
10:00–13:30	**Poster Session Presentations**		
10:30–11:30	**K3 Keynote Session** *(Chair: Tao Han)*	**Dr. Junyi Li – Qualcomm** *"6G Enabling Scalable Mobile Connectivity for AI-Driven Digital Society."*	
11:30–12:30	**K4 Keynote Session** *(Chair: Tao Han)*	**Prof. Jian Song – Tsinghua University** *"Research on Heterogeneous VLC-RF Communications for Internet of Vehicles."*	
12:30–12:40	**Best Paper & Poster Category Award Ceremony**		
12:40–13:30	Lunch		
13:30–15:10	**W4 RIS, UAV & Next-Gen Network Infrastructure** *Chair: Zhengxiang Ma* *Futurewei Technologies, USA*	**O4 Fiber System and Network** *Chair: Xin Jiang* *City University of New York, USA*	**A4 AI Applications and Data-Driven Intelligence** *Chair: Zhanyang Zhang* *City University of New York, USA*

K – Keynote (Room 240)	W – Wireless (Room 230)	O – Optical (Room 235)	A – AI (Room 240)

WOCC Technical Sessions – Friday, May 8th, 2026, 13:30 – 15:10

W1 AI/ML for Wireless & Channel Estimation

Chair: Vinay A Vaishampayan
City University of New York, USA

Communication Cost of a Class of Decentralized Linear Solvers
(Invited Paper)
Nelson G. Brasil Jr; Vinay A Vaishampayan
Univ. of Campinas and City University of New York

Characterizing Failures of Deep-Learning Models Under Data Paucity for Wireless Time-Varying Channel Estimation
Reihaneh Gh. Roshan; Mohammad Rostami; Atik Faysal; Huaxia Wang; Nikhil Muralidhar
Stevens Institute of Technology, USA

Trustworthy Autonomous RAN Orchestration: An Architectural Framework for Zero-Trust Intent-Based Control with Explainable AI
Mukesh Dua; Tarun Kundu; Ankush Gupta
Independent Researcher, Seattle, USA

From Theory to Field: Demonstrating Real-Time AI-powered PUSCH Channel Estimation
(Invited Paper)
Yeqing Hu; Panagiotis Skrimponis; Xiaochuan Ma; Chance Tarver; Kyeong Jin Kim; Mandar N Kulkarni; Yang Li; Yan Xin; Gary Xu; Jianzhong Zhang
Samsung Research America, USA

O1 Advanced Photonics and Modulation

Chair: Li Ge
City University of New York, USA

Potential applications of non-Hermitian photonics in optical switching and quantum communication
(Invited Talk)
Li Ge
City University of New York, USA

Programmable Photonic Front-Ends for Mode Vector Direct-Detection Receivers
(Invited Paper)
Aishik Biswas; Md. Atiqur Rahman; Ioannis Roudas
Montana State University, USA

Experimental study of the crosstalk impact on Stokes vector modulated (SVM) signals
Guohong Zhao; Mark Feuer; Dwight Richards; Nicholas Madamopoulos; Xin Jiang
City University of New York, USA

A1 Edge AI and Systems

Chair: Cong Qi
New Jersey Institute of Technology, USA

XR-GPT: Edge-Deployed Vision-Language Model Powered Extended Reality Conversational Assistant
Mingrui Yin; Jingwen Cui; Wantong Lyu; Tao Han
New Jersey Institute of Technology, NJ, USA

AI-Enabled Cloud-Edge-IoT Continuum for Hyper-Distributed and Trustworthy Applications
Abdullah Aydeger; Engin Zeydan; Ahmet Kurt
Florida Institute of Technology, USA

Drone Recognition Using Deep Learning Methods
Zehua Tang; Hong Man; Victor Lawrence; Yu-Dong Yao
Stevens Institute of Technology, USA

WOCC Technical Sessions – Friday, May 8th, 2026, 15:30 – 17:30

W2 Wireless Edge Network *Chair: Tao Han* *New Jersey Institute of Technology*	O2 Photonic Devices and VLC *Chair: Liang Zhang* *University of Maryland Eastern Shore, USA*	A2 Core AI/ML Methods *Chair: Huaxia Wang* *Rowan University, USA*
Interactive LLMs Beyond the Cloud: Toward Scalable and Embodied AI Systems (Invited Paper) Xueyu Hou **Department of Electrical and Computer Engineering, University of Maine, Orono, ME, USA** *Human-Centered AR: Building Scalable Systems for Shared Experiences (Invited Paper)* Yongjie Guan **Department of Electrical and Computer Engineering, University of Maine, Orono, ME, USA** *ASIoU: A Domain-Informed Frequency-Weighted IoU Loss for RF Spectrogram Drone Detection* Akshat Sharan; Mohammad Rostami; Atik Faysal; Hongtao Xia; Hadi Kasasbeh; Ziang Gao; Huaxia Wang **Rowan University, USA** *A Unified Robust Low-Rank Framework for Time Synchronization in Multi-Drone Networks* Farhan Ali; Rui Zhang; Liyue Xiao; Zhi Quan **Shenzhen University, China**	*Inverse design photonic couplers with machine learning tools (Invited Paper)* Shuwei Guo; Pingfan Wu **Futurewei Technology, USA** *3D Trajectory Optimization for UAV-assisted Covert Visible Light Communication* Tamunoene E Bamson; Liang Zhang **University of Maryland Eastern Shore, USA** *Max-Min Fairness Precoder for Rate-Splitting Multiple Access-based VLC System* Xiaodong Liu; Qian Wang; Liwei Tang; Baolin Lai; Yuhao Wang; Xun Zhang **Nanchang University, China**	*Semi-Supervised Masked Autoencoders: Unlocking Vision Transformer Potential With Limited Data* Atik Faysal; Mohammad Rostami; Reihaneh Gh. Roshan; Nikhil Muralidhar; Huaxia Wang **Rowan University, USA** *Time-Series Classification Using AI Models for Digital Twin Applications* Afshin Eisazadeh Kharabeh; Victor Lawrence; Yu-Dong Yao **Stevens Institute of Technology, USA** *An Empirical Study of Version-Control and Validation Workflows for Enterprise AI Systems* Abhijit Choudhary; Avimanyou K Vatsa; Rohan Puppala; Aarav Rao **Fairleigh Dickinson University, Teaneck, USA**

WOCC Technical Sessions – Saturday, May 9th, 2026, 9:00 – 10:20

W3 **Remote Session** *Chair: Meilong Jiang* *Qualcomm, USA*	O3 **Remote Session** *Chair: Liang Zhang* *University of Maryland Eastern Shore, USA*	A3 **Remote Session** *Chair: Yuanjie Zou* *New Jersey Institute of Technology, USA*
An Improved Expectation Propagation Algorithm for Massive MIMO Signal Detection (Invited Paper) Yong Lei, Congcong Li, Guang Chen, Huan Liu, Xing Huang, and Yueyun Chen **University of Science & Technology Beijing, China** *Software-Defined Networking-Based Topology Management for V2I Collaboration Networks* Lu Yang; Jiujun Cheng; Mengchu Zhou **Tongji University, China** *Timestamp-Free based Cooperative Clock Synchronization for Time-Sensitive Human-Machine Systems* Haiyong Zeng; Long Tang; Shoulin Huang; Xiaohao Wen; Mengchu Zhou **Guangxi Normal University & Harbin Institute of Technology (Shenzhen), China**	*Numerical Simulations of Cross-Coupled Add-Drop Microring Resonator (XMRR) for Next-Generation Optical Interconnects* Mae M Garcillanosa; Benjamin B Dingel; Jennifer Dela Cruz; Wayne Jasper G Sy; Ramon Benedict L. Lapiña; Jonathan L. Mojica; Jerome Fredrich M. Tayamora **Mapúa Malayan Colleges Laguna & Mapúa University, Philippines** *Deterministic Multi-Channel XPM Scalability in Octagonal-Core Nonlinear PCFs with Geometry Polarization and System-Level BER Limits* Nidhi Singh; Yatindra Nath Singh **Indian Institute of Technology, Kanpur, India** *Optoelectronic Beamforming for Integrated Sensing and Communication* Xiaofeng Su; Jian Song; Jintao Wang **Tsinghua University, China**	*Adaptive-Grid Residual KAN for Solving High-Dimensional PDEs with Deep BSDE (Invited Paper)* Xiya Shen; Qinglin Zhao; Li Feng; Mengchu Zhou **Macau University of Science and Technology, China** *Identifying Comorbid Mental Disorders via Causal Multi-Label KNN (Invited paper)* Tiantian Wang; Mengchu Zhou **Zhejiang Gongshang University, China** *Energy-Efficient Hybrid AI Tutor for Learning Varieties of English* Cunqian You; Miao Wei; Xiaojun Wang; Huijuan Lu; Yu-Dong Yao **China Jiliang University, China** *Intent-Driven AI-Native Network Slicing for Rural Broadcasting over ATSC 3.0/B2X: A Reinforcement Learning Approach* Harsh Sahu; Manas Sharma; Priyadarsini K; Preksha Shah; Rashmi Kamran; Leonard Joe Fabiano; Sangsu Kim **SRM Institute of Science and Technology, India**

WOCC Technical Sessions – Saturday, May 9th, 2026, 13:30 – 15:10

W4 RIS, UAV & Next-Gen Network Infrastructure

Chair: Zhengxiang Ma
Futurewei Technologies, USA

CSI-RS Overhead Reduction in 6G
(Invited Paper)
Zhengxiang Ma, Zhigang Rong, Jialing Liu, Baoling Sheen, Ruikang Yang, Juan M. Roa, Renjian Zhao, Weimin Xiao, Miguel Dajer, Anthony C.K. Soong
Futurewei Technologies, USA

RIS Element Phase-Offset Calibration from RSRP Reports
(Invited Paper)
Narayan Prasad; Tao Luo; Meilong Jiang; Junyi Li
Qualcomm, USA

RIS-Assisted UAV Networks with Energy Harvesting and Data Collection
Tassnim Mohamed; Liang Zhang
University of Maryland-Eastern Shore, USA

O4 Fiber System and Network

Chair: Xin Jiang
City University of New York, USA

The Frontier of In-door Networks: A Review of Fiber-To-The-Room (FTTR) Standards
(Invited Paper)
Zhicheng Ye;Jun Cheng;Yan Zeng; Xuming Wu; Shaozheng Yu; Yuanqiu Luo; Liang Zhang
Huawei Technologies Co. Ltd, China

Capacity Enhancement with Multicore Fibers for Next Generation Subsea Systems
(Invited Talk)
Govind Vedala
SubCom LLC, USA

Providing 10-Gigabit Optical Home Using 50G-Passive Optical Network and Fiber-to-the-Room
(Invited Paper)
Yuanqiu Luo; Frank Effenberger; Yan Zeng; Xuming Wu; Dekun Liu
Futurewei Technology, USA

A4 AI Applications and Data-Driven Intelligence

Chair: Zhanyang Zhang
City University of New York, USA

Modeling and Prediction Urban Floods with Wireless Flood Sensor Data Assimilation – A Machine Learning Approach
(Invited Talk)
Jason Liao; Zhanyang Zhang
City University of New York, USA

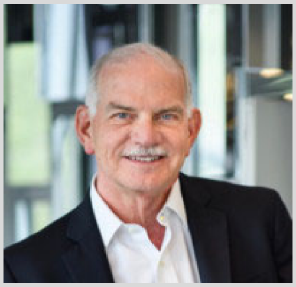
Sentiment Forecasting by Data-Driven Models
Othoniel Joseph; Prathyusha Sukumar; Rayner Ulloa; Avimanyou K Vatsa; Alexander Casti
Fairleigh Dickinson University, USA

Empirical Analysis of Risk for Sports Facilities
Neel Prajapati; Adarsh Dhorajiya; Burhan Petiwala; Avimanyou K Vatsa; Alexander Casti
Fairleigh Dickinson University, USA

Friday, May 8th, 2026, 10:35–11:35

K1 – Keynote Session

Keynote Speaker



Vincent Poor

Michael Henry Strater University Professor at Princeton University

Princeton University

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Resource Constrained Learning over Wireless Networks

ABSTRACT:

It is anticipated that the next generation of wireless networks will incorporate AI to a significant degree at all network layers. A major part of this trend is the migration of AI and machine learning functions to the network edge. There are several reasons for this: (i) a growing number of AI applications demand implementations involving end-user devices, (ii) much data of interest is collected at the network edge, and (iii) fog/edge computing has emerged to take advantage of the increasing sophistication of end-user devices. A notable framework for engaging the wireless network edge in machine learning is wireless federated learning, in which multiple end-user devices collaborate with the help of an aggregator to build a common model, each using its local data. In this framework, exchanges between end-user devices and the aggregator necessarily take place over wireless links. Since wireless networks are notoriously resource-limited, this creates a situation in which the interactions between the wireless medium and machine learning algorithms must be considered as a factor in the design and implementation of AI applications. This talk will explore aspects of this problem, including tradeoffs among energy consumption and other criteria such as bandwidth efficiency, learning rate and data privacy.

BIOGRAPHY:

H. Vincent Poor is the Michael Henry Strater University Professor at Princeton University, where his interests include information theory, machine learning and network science, and their applications in wireless networks, energy systems, and related areas. He is a member of U.S. National Academy of Engineering and U.S. National Academy of Sciences, and also a foreign member of the Chinese Academy of Sciences, the Royal Society and other national and international academies. Other recognition of his work includes the 2017 IEEE Alexander Graham Bell Medal and honorary doctorates from several universities in Asia, Europe and North America.

K2 – Keynote Session

Keynote Speaker

Stephen F. Smith

Research Professor in the Robotics Institute at Carnegie Mellon University

Carnegie Mellon University

Pittsburgh, PA 15213

ssmith@andrew.cmu.edu

Friday, May 8th, 2026, 11:35–12:35

Smart Infrastructure for Future Urban Mobility

ABSTRACT:

Real-time traffic signal control presents a challenging multi-agent planning problem, particularly in urban road networks where (unlike simpler arterial settings) there are competing dominant traffic flows that shift through the day. Further complicating matters, urban environments require attention to multi-modal traffic flows (vehicles, pedestrians, bicyclists, buses, etc.) that move at different speeds and may be given different priorities. For many years now, my research group has focused on utilizing AI techniques and technologies to produce better solutions to this and other interconnected problems in urban mobility. Our initial work produced Surtrac, a real-time adaptive traffic signal control system unique in its ability to optimize movement of the actual traffic on the road, as opposed to optimizing a prediction of current traffic based on recent historical traffic flow information. Surtrac treats traffic signal control as a decentralized online planning process, where each intersection (agent) repeatedly solves a type of single machine scheduling problem locally and then communicates expected traffic flows and congestion to its neighboring intersections to achieve network level coordination. Pilot tests of the system showed significant reductions in both vehicle travel times and emissions, and it is now deployed in over 40 North American cities. Given this success, more recent work has focused on making this approach to smart traffic signals smarter, safer, and more sustainable. One thrust has explored opportunities for further optimizing network traffic flows that are made possible by emerging connected vehicle technology and real-time vehicle-to-infrastructure (V2I) connectivity, demonstrating the reciprocal traffic flow optimization benefit of vehicles sharing their route information with the traffic signal system and establishing a novel basis for revenue generation via voluntary tolling at the intersection. Another thrust has developed a smartphone app for pedestrians with disabilities that utilizes real-time connectivity to the traffic signal system to influence traffic control decisions and promote safe intersection crossing. Other current work centers on techniques for integrated optimization of signal control and vehicle route choice decisions, for utilizing machine learning to derive more accurate transit signal priority information, and for utilizing large language model technology to achieve cooperative perception and navigation on urban roadways by multiple connected autonomous vehicles. In this talk, I'll summarize this overall research effort and discuss the open research challenges that remain.

BIOGRAPHY:

Stephen F. Smith is a Research Professor of Robotics at Carnegie Mellon University, where he heads the Intelligent Coordination and Logistics Laboratory. Smith's research focuses broadly on the theory and practice of next-generation technologies for automated planning, scheduling, and control of large multi-actor systems. He pioneered the development and use of constraint-based search and optimization models for solving planning and scheduling problems and has successfully fielded AI-based planning and scheduling systems in a range of application domains. One principal application focus for many years now has been urban mobility and smart transportation infrastructure. His work on smart traffic signals, which combines concepts from artificial intelligence and traffic theory, led to development of Surtrac - an innovative decentralized system for real-time urban traffic signal control that is now deployed in over 40 North American cities. His more recent work in this area has focused on the additional benefits made possible by real-time connectivity of the traffic signal control system with vehicles. Smith has published over 325 technical papers in the areas of automated planning and scheduling, search-based optimization, multiagent systems and machine learning, and he has received numerous research and best paper awards. He is a Fellow of the Association for the Advancement of Artificial Intelligence (AAAI) and currently serves as AAAI President.

K3 – Keynote Session

Keynote Speaker

Junyi Li

Vice President of Engineering and Qualcomm Fellow at Qualcomm

Qualcomm

Bridgewater, NJ 08807

junyil@qti.qualcomm.com

Saturday, May 9th, 2026, 10:30–11:30

6G Enabling Scalable Mobile Connectivity for AI-Driven Digital Society

ABSTRACT:

6G development is accelerating and shaping the next air interface to meet the demands of a more connected, capable future. In this talk, we will focus on how foundational air interface innovations are enabling 6G to deliver greater coverage, capacity, and efficiency without requiring more infrastructure. These advances are not only technical milestones, but they are also essential to meeting the growing demands of mobile broadband, AI-powered services on the move, and emerging use cases that will shape how we live, work, and interact in the decade ahead.

BIOGRAPHY:

Junyi Li is a Vice President of Engineering and Qualcomm Fellow at Qualcomm. Junyi was a key inventor of Flash-OFDM, the first commercially deployed OFDMA-based mobile broadband wireless communications system. He was a co-founder of Flarion Technologies, a startup acquired by Qualcomm in 2006. Prior to that, he was with Bell Labs research. Since joining Qualcomm, Junyi has spearheaded research projects on D2D communications, V2V communications, and mmWave communications. He received the Qualcomm IP Excellence Award in 2020 and the 2024 Thomas Edison Patent Award. Currently he holds more than 2,700 U.S. granted patents. He is a Fellow of the IEEE and co-authored two books, “OFDMA Mobile Broadband Communications,” published by Cambridge University Press, and “Millimeter Wave Communications in 5G and Towards 6G,” published by CRC Press.

K4 – Keynote Session

Keynote Speaker

Jian Song

Professor of Electronic Engineering Department at Tsinghua University

Director of National Digital Television Engineering Lab of China

Tsinghua University

Beijing, China

jsong@tsinghua.edu.cn

Saturday, May 9th, 2026, 11:30–12:30

Research on Heterogeneous VLC-RF Communications for Internet of Vehicles

ABSTRACT:

Vehicle-to-everything (V2X) communication is fundamental for the internet of vehicles to enhance traffic safety and efficiency. Although radio frequency (RF) communication provides wide coverage, it suffers from spectrum scarcity and communication interference, hence inevitable severe congestions under dense traffic scenarios. Visible light communication (VLC) has advantages, by nature just opposite to that of RF communications. Therefore, the heterogeneous VLC-RF communication network has been proposed and investigated, seeking for its complementary benefits. In this talk, optical intelligent reflecting surface (OIRS)-assisted multi-cell cooperative structure for VLC will be introduced with associated resource allocation scheme for the fairness of achievable data rates among vehicles. The intelligent reflecting surface (IRS)-assisted heterogeneous VLC-RF V2X system is then proposed with energy efficiency optimization considering various resource constraints including power, subchannels, and IRS/OIRS.

BIOGRAPHY:

Jian Song, who is also Director of National Digital Television Engineering Lab of China in Beijing, is a full Professor of Department of Electronic Engineering, Tsinghua University in 2025 after working with the industry in USA, and with Tsinghua Shenzhen International Graduate School. He has been working in quite different areas including wireless communications, satellite communications, visible light communications, digital broadcasting, and the network convergence with primary focus on physical layer technologies. He is quite active with the International Telecommunication Union and is the founding Editor-in-Chief of its academic journal "The Intelligent and Converged Networks". Dr. Song is Fellow of IEEE, IET, Chinese Institute of Communications, and Chinese Institute of Electronics.

Technical Session: Program Chairs

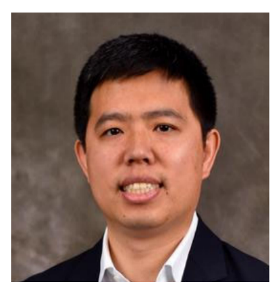
Wireless Communication Symposium

Meilong Jiang

Qualcomm Technologies, Inc.
500 Somerset Corporate Blvd, Bridgewater, NJ 08807

BIOGRAPHY:

Meilong Jiang received his Ph.D. in Electrical Engineering from the University of Hong Kong in 2006. He was a research staff member at NEC Labs America from 2008 to 2012, where he worked on WiMAX, LTE, and 3GPP standardization projects. From 2012 to 2015, he was with InterDigital, focusing on technology development and performance evaluation for 3GPP RAN1 standardization. Between 2015 and 2019, he worked as a Senior Staff Engineer at FutureWei Technologies, where his research focused on massive MIMO and active antenna system (AAS) enhancements for 5G. He is currently a Senior Staff Engineer at Qualcomm, where his work focuses on beam management, CSI acquisition, and MIMO enhancements for 6G standardization. He is an IEEE Senior Member and holds 40 issued U.S. patents with over 100 patent applications pending. He has served in several IEEE leadership roles, including Wireless Symposium Chair / Conference Co-Chair for IEEE WOCC 2020, WOCC 2023, and WOCC 2026, IEEE ICC 2024 Workshop Co-Chair, and Industry Forum/Demos Co-Chair for IEEE ICC 2019 and IEEE Globecom 2026.



Tao Han

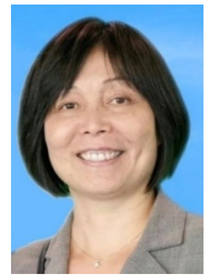
Electrical and Computer Engineering
New Jersey Institute of Technology
Newark, NJ

BIOGRAPHY:

Tao Han is an Associate Professor in the Department of Electrical and Computer Engineering at New Jersey Institute of Technology (NJIT) and an IEEE Senior Member. Before joining NJIT, Dr. Han was an Assistant Professor in the Department of Electrical and Computer Engineering at the University of North Carolina at Charlotte. Dr. Han received his Ph.D. in Electrical Engineering from NJIT in 2015 and is the recipient of NSF CAREER Award 2021, Newark College of Engineering Outstanding Dissertation Award 2016, NJIT Hashimoto Prize 2015, and New Jersey Inventors Hall of Fame Graduate Student Award 2014. His papers win IEEE International Conference on Communications (ICC) Best Paper Award 2019 and IEEE Communications Society's Transmission, Access, and Optical Systems (TAOS) Best Paper Award 2019. His research interest includes mobile edge computing, machine learning, mobile X reality, 5G system, Internet of Things, and smart grid.

Technical Session: Program Chairs

Optical Communication and Networks Symposium



Xin Jiang

Engineering and Environmental Science
College of Staten Island, CUNY
Staten Island, NY

BIOGRAPHY:

Xin Jiang is a professor in Engineering and Environmental Science department at the College of Staten Island (CSI), City University of New York (CUNY). Dr. Jiang received her Ph.D. degree in Electronics Engineering and Opto-electronics from Tsinghua University, Beijing, China. Her research interests include advanced photonic transmission technologies, optical fiber and photonic devices, broadband networks and data center interconnections. She has extensive experience in both industrial R&D and academic research in the field of optical fiber communications.

Liang Zhang

Department of Engineering
University of Maryland Eastern Shore

BIOGRAPHY:

Dr. Liang Zhang received his Ph.D. degree in Electrical Engineering at New Jersey Institute of Technology (NJIT), Newark, NJ, USA, in 2020, and his M.S. degree in Electronic Engineering and Information Science from University of Science and Technology of China (USTC), Hefei, China, in 2014. He has been working as a Postdoctoral Research Fellow for three years with the Department of Electrical and Computer Engineering at George Mason University, Fairfax, VA, USA. He is now an Assistant Professor in the Department of Engineering at the University of Maryland Eastern Shore. Dr. Liang Zhang was a recipient of the Outstanding Dissertation Award at NJIT in 2023, the Hashimoto Prize at NJIT for the best doctoral dissertation in 2020, the Best Paper Award of IEEE ICNC in 2014. His research interests include machine learning and Internet of Things, mobile edge computing, wireless communications and UAV communications, energy optimization and visible light communication.

Technical Session: Program Chairs

Artificial Intelligence and Big Data Analytics Symposium

Zhi Wei

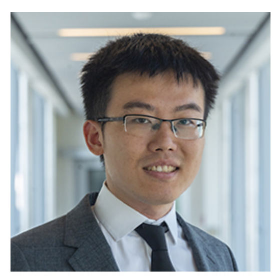
New Jersey Institute of Technology
Newark, NJ 07102

BIOGRAPHY:

Zhi Wei received the B.S. degree from Wuhan University, China, and the Ph.D. degree from the University of Pennsylvania, USA, in 2008. He is currently a Professor of computer science and statistics (joint appointment) at the New Jersey Institute of Technology. He has authored or coauthored more than 150 publications with over 8000 citations and an H-index of 39. His research interests include statistical modeling, machine learning, and big data analytics. He has served as a PC member for the IEEE ICDM, ACM SIGKDD, the IEEE BigData, AAAI, and CIKM. He is an Editorial Board Member of BMC Genomics, BMC Bioinformatics, PLOS ONE, IEEE Internet of Things Journal, and the IEEE TRANSACTIONS ON COMPUTATIONAL SOCIAL SYSTEMS.

Huaxia Wang

Electrical and Computer Engineering
Rowan University
Glassboro, NJ 08028



BIOGRAPHY:

Huaxia Wang is an Assistant Professor of Electrical and Computer Engineering at Rowan University (RU), Glassboro, NJ. Before joining RU, He received the B.Eng. degree in information engineering from Southeast University, Nanjing, China, in 2012, and the Ph.D. degree in Electrical Engineering from the Stevens Institute of Technology, Hoboken, NJ, USA, in 2018. From Jan. 2020 to Aug. 2023, He was an Assistant Professor at Oklahoma State University (OSU). His current research interests include Deep Reinforcement Learning, Adversarial Networks, Meta-Learning, Graph Neural Networks, and Wireless Communications.

W1 – Technical Session: AI/ML for Wireless & Channel Estimation (Friday, May 8^{th}, 13:30–15:10)

W1.1: Communication Cost of a Class of Decentralized Linear Solvers

(Invited)

Nelson Brasil Jr.[1] **and Vinay A. Vaishampayan**[2]

[1]Univ. of Campinas
[2]City University of New York

ABSTRACT:

We consider the problem of multiple parties iteratively solving a system of linear equations in a decentralized manner. Specifically, we solve an n-by-n system of linear equations Mx=b, when each party only knows their row of the matrix M and a single component of the n-vector b. Our objective is to determine the tradeoff between the accuracy of the solution and the total communication cost measured in bits. A fully connected, reliable mesh network is assumed to connect the different parties. We develop a general formulation that applies to a large class of standard linear solvers, and provide a rate-distortion analysis. This allows for the comparison of the communication cost for different methods. The results of numerical experiments are also provided.

BIOGRAPHY:

Vinay A. Vaishampayan obtained the BTech degree from the Indian Institute of Technology, Delhi, and MS and PhD degrees from the University of Maryland, College Park. He has served as a faculty member in the electrical engineering department at Texas A&M university, (1989-1996), as a member of technical staff at AT&T Labs-Research (1996-2013), visiting professor at DIMACS, Rutgers (2013-2014) and professor, electrical engineering, City University of New York (2014– present). His research interests are in communications, signal processing, information theory, coding theory and distributed systems. His current research is on communication efficient methods for distributed machine learning and signal processing. He was Distinguished Member of Technical Staff at AT&T Labs-Research, NJ, where he also served as the head of the Communication Sciences Research Department. He is a Fellow of the IEEE for contributions to error resilient data compression.

Nelson Brasil Jr. earned his bachelor's, master's, and Ph.D. degrees in Applied Mathematics from the Institute of Mathematics, Statistics and Scientific Computing (IMECC) at the University of Campinas (Unicamp). He currently works as a Specialist Data Scientist at iFood, Brazil's largest food delivery company, where he applies numerical optimization and machine learning techniques. His academic and professional expertise centers on applied mathematics, with a focus on discrete mathematics, lattices, coding theory, optimization, and machine learning.

W1 – Technical Session: AI/ML for Wireless & Channel Estimation (Friday, May 8th, 13:30–15:10)

W1.2: Characterizing Failures of Deep-Learning Models Under Data Paucity for Wireless Time-Varying Channel Estimation

Reihaneh Gh. Roshan[1], Mohammad Rostami[2], Atik Faysal[2], Huaxia Wang[2], and Nikhil Muralidhar[1]

[1]Stevens Institute of Technology, Hoboken, NJ, USA
[2]Rowan University, Glassboro, NJ, USA

ABSTRACT:

Fast time-varying propagation environments in 5G/6G wireless systems require channel estimators that can rapidly adapt to unseen channel conditions with very limited labeled data. Conventional pilot-based estimators such as least squares (LS) are robust but inaccurate in low-SNR regimes. Deep learning-based approaches improve reconstruction accuracy but often require retraining across heterogeneous channel statistics, Signal-to-Noise Ratio (SNR) levels, often with a large training data volume. However, most wireless environments incur a high cost during training data collection and hence channel estimation in such scenarios requires models that are effective training under data paucity. Despite its importance, this question has not been investigated thoroughly in wireless channel estimation. To this end, this work presents a rigorous investigation of the performance of deep learning-based channel estimation models, compared to traditional channel estimators, under time-varying channels also suffering from data paucity. We undertake this investigation across multiple line-of-sight (LOS) and non line- of-sight (NLOS) channel models under varying noise conditions. Our findings reveal that deep learning models exhibit significant degradation under data paucity, particularly in noisy, high- dimensional, and distribution-shifted environments, while classical estimators remain robust. These results highlight fundamental limitations of current data-driven approaches for wireless channel estimation under limited data.

BIOGRAPHY:

Reihaneh Gh. Roshan is a Ph.D. student in Computer Science at Stevens Institute of Technology. Her research focuses on developing meta-learning models for wireless communication and e-commerce recommender systems, with an emphasis on data-scarce scenarios. Her work aims to design adaptive and data-efficient learning methods for dynamic real-world environments.

W1 – Technical Session: AI/ML for Wireless & Channel Estimation (Friday, May 8th, 13:30–15:10)

W1.3: Trustworthy Autonomous RAN Orchestration: An Architectural Framework for Zero-Trust Intent-Based Control with Explainable AI and Distributed Trust

Mukesh Dua, Tarun Kundu, and Ankush Gupta

Independent Researcher
Seattle, WA, USA

ABSTRACT:

As sixth-generation (6G) networks move toward more autonomous orchestration, operators face a key challenge where they need to use AI-driven, intent-based systems across different vendors, but they do not have clear ways to verify how policies are created, review decision logic, or build trust without sharing sensitive network data. We introduce a framework combining zero-trust principles with intent-based RAN orchestration, explainable AI (XAI), and federated threat detection. The framework is built on four layers: (1) Intent Translation, where LLM agents decompose high-level intents into domain rules with full reasoning provenance; (2) Zero-Trust Validation, which checks policies against 3GPP standards [1], [2], [3], history, and network state before deployment; (3) Federated Trust Coordination, which enables edge-trained threat detection while keeping raw data private; and (4) Auditable Orchestration, that links every decision to its source, model version, and fallback options. We also lay out architectural patterns that help multi-vendor RICs work together, explain how to detect model drift before it becomes a problem, and offer safe ways for autonomous networks to explore and learn on their own. Instead of relying on opaque, black-box automation, this framework builds AI-driven RAN control on clear verification, transparent reasoning, and distributed trust, giving operators the confidence they need to deploy next-generation networks.

BIOGRAPHY:

Tarun Kundu is an Embedded Systems Engineer at Ericsson Software Technology and a Senior Member of IEEE with more than 21 years of experience in software architecture, design, and development. His expertise spans robust, scalable systems across embedded and cloud platforms, with a strong focus on embedded Linux networking, cloud-native systems, observability, security, and large-scale distributed platforms. Prior to Ericsson, he held engineering roles at Cisco, Amazon Web Services, and Capgemini Engineering, where he developed a strong systems-oriented approach to problem-solving and operational excellence. He is also an AI enthusiast with a keen interest in applying emerging AI techniques to real-world engineering challenges.

W1 – Technical Session: AI/ML for Wireless & Channel Estimation (Friday, May 8th, 13:30–15:10)

W1.4: From Theory to Field: Demonstrating Real-Time AI-powered PUSCH Channel Estimation

(Invited Paper)

Yeqing Hu, Panagiotis Skrimponis, Xiaochuan Ma, Chance Tarver, Kyeong Jin Kim, Mandar N Kulkarni, Yang Li, Yan Xin, Gary Xu, and Jianzhong Zhang

Samsung Research America, USA

ABSTRACT:

The uplink of wireless communication networks is becoming increasingly critical to support emerging user initiated applications, yet faces significant challenges due to limited user transmission power and highly dynamic environment. While artificial intelligence (AI) techniques have shown considerable promise for enhancing physical-layer performance in simulation-based studies, there remains a critical gap with very few prototype implementations validating AI effectiveness under realistic conditions. This paper presents a comprehensive study of AI-based channel estimation for Physical Uplink Shared Channel (PUSCH) reception, implemented and validated in a real-world testbed. Our demonstration at Mobile World Congress 2025 achieved more than 30% system throughput gain compared to conventional channel estimation methods. This paper reveals the end-to-end implementation embracing the practical challenges and design considerations, showcasing potential impact of AI in a realistic network, offering valuable insights for bridging the gap between simulation-based research and real-world deployment.

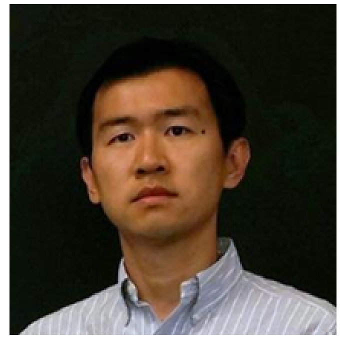
BIOGRAPHY:

Yang Li (yang.li1@samsung.com) is a Director at Samsung Research America (SRA) in Plano, TX, USA. He is the head of Network Innovation at SRA, where he leads advanced algorithm design for Samsung 5G RAN products and also leads AI RAN (PHY&MAC) R&D for both 5G and 6G. Prior to SRA, he was a funding member for satellite connectivity at Apple and also led development of various 4G baseband features. He has expertise in wireless communication, signal processing and deep learning, and has more than 30 journal and conference papers and over 150 patents. He received his B.S./M.S. from Shanghai Jiaotong University and Ph.D. from The University of Texas at Dallas.

O1 – Technical Session: Advanced Photonics and Modulation (Friday, May 8th, 13:30–15:10)

O1.1: Potential applications of non-Hermitian photonics in optical switching and quantum communication

(Invited)



Li Ge

Department of Physics and Astronomy, College of Staten Island, City University of New York (CUNY), Staten Island, NY, USA The Graduate Center, CUNY, New York, NY, USA

ABSTRACT:

In this talk, I will discuss several potential applications of non-Hermitian photonics in optical switching and quantum communication. For example, using a platform of III-V materials on silicon, optical activation can induce a spontaneous parity-time symmetry breaking, which switches input optical signals from bottom silicon waveguides to top III-V waveguides. Utilizing another non-Hermitian symmetry, namely particle-hole symmetry analogous to electronic materials, a laser array can switch between different spatial modes while maintaining the same lasing wavelength.

BIOGRAPHY:

Li Ge is a Professor of Physics at the City University of New York (CUNY), affiliated with the College of Staten Island (CSI) and the CUNY Graduate Center. His current research interest includes quantum-inspired symmetries and topologies in non-Hermitian systems as well as laser physics in complex and random media. Dr. Ge has published over 100 articles in high-impact journals, including Nature and Science. Dr. Ge received an NSF CAREER award in 2019 and a Dolphin Award for Outstanding Scholarly Achievements from CSI in 2023. He was elected a fellow of Optica (formerly OSA) in 2024.

O1 – Technical Session: Advanced Photonics and Modulation (Friday, May 8th, 13:30–15:10)

O1.2: Programmable Photonic Front-Ends for Mode Vector Direct-Detection Receivers

(Invited)

Aishik Biswas, Md. Atiqur Rahman, and Ioannis Roudas

Department of Electrical and Computer Engineering, Montana State University-Bozeman

ABSTRACT:

Mode vector modulation (MVM) improves receiver sensitivity for short-reach optical links but typically requires complex direct-detection front-ends. Starting from an asymmetric hybrid design, we implement it as a programmable photonic integrated circuit using two interferometric architectures: a rectangular Clements mesh and a triangular Reck mesh using Mach-Zehnder Interferometer (MZI) architectures. Monte Carlo simulations including realistic fabrication tolerances show SNR penalties under 4 dB and fidelity above 0.98 for two- and four-mode operation under ASE- and thermal-noise-limited conditions.

BIOGRAPHY:

Aishik Biswas is a Ph.D. candidate in Electrical Engineering at Montana State University, advised by Prof. Ioannis Roudas. He received his M.S. in Optical Sciences from the University of Arizona in 2020 and his B.Tech. in Electronics and Instrumentation Engineering from West Bengal University of Technology in 2017. His research focuses on optical communication systems and integrated photonics.

O1 – Technical Session: Advanced Photonics and Modulation (Friday, May 8th, 13:30–15:10)

O1.3: Experiment Study of the Crosstalk Impact on Stokes Vector Modulated (SVM) Signals

Guohong Zhao[1,2], Mark Feuer[1], Dwight Richards[1], Nicholas Madamopoulos[2], and Xin Jiang[1]

[1] College of Staten Island, City University of New York, USA
[2]City College of New York, City University of New York, USA

ABSTRACT:

We experimentally investigate crosstalk in polarization-based Stokes vector modulation (SVM) signals employing a special optimized 8-point constellation for a direct detection SVM system. Bit-error-rate (BER) performance is evaluated for 1.25 Gsym/s and 2.5 Gsym/s symbol rates. We quantified the constellation distortion and BER degradation induced by crosstalk and analyzed the impacts of crosstalk on SVM signals.

BIOGRAPHY:

Guohong Zhao is a Ph.D. student at the City University of New York (CUNY), pursuing research through the College of Staten Island (CSI) and The City College of New York (CCNY). He received his Bachelor of Science in Electrical Engineering from CSI in 2024. His academic interests include modern communication systems, signal processing, and data analysis, with a focus on applying analytical methods to real-world engineering problems.

A1 – Technical Session: Edge AI and Systems (Friday, May 8th, 13:30–15:10)

A1.1: XR-GPT: Edge-Deployed Vision-Language Model Powered Extended Reality Conversational Assistant

Mingrui Yin[1], Jingwen Cui[2], Wantong Lyu[3], and Tao Han[1]

[1]New Jersey Institute of Technology, USA
[2]Beijing 21st Century School, China
[3]New York University Tandon School of Engineering, USA

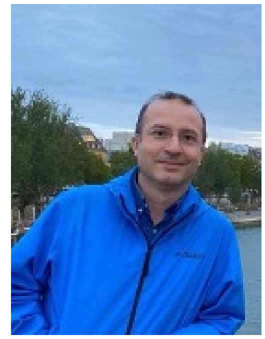
ABSTRACT:

XR-GPT presents an edge-assisted extended reality (XR) framework that enables real-time, object-grounded conversational assistance through a closed perception–feedback loop. Using Microsoft HoloLens 2 as the front-end interface, XR-GPT captures egocentric RGB-D observations and interaction cues and offloads vision–language inference to a nearby edge server. Unlike prior approaches relying on separate language model stacks, XR-GPT adopts a single locally deployed lightweight vision–language model (VLM) for scene understanding and grounded question answering. To ensure responsiveness under bandwidth constraints, the system transmits compact semantic representations instead of heavy intermediate features. Experimental results demonstrate end-to-end latency around 160–170 ms and stable 3D grounding accuracy, validating the feasibility of real-time immersive conversational XR assistants.

BIOGRAPHY:

Mingrui Yin is a Ph.D. student at the New Jersey Institute of Technology (NJIT). His research focuses on edge intelligence, O-RAN systems, and immersive extended reality (XR) applications. His recent work explores vision–language models, edge-cloud collaborative systems, and low-latency intelligent services for next-generation immersive computing.

A1 – Technical Session: Edge AI and Systems (Friday, May 8th, 13:30–15:10)



A1.2: AI-Enabled Cloud-Edge-IoT Continuum for Hyper-Distributed and Trustworthy Applications

Abdullah Aydeger[1], Engin Zeydan[2], and Ahmet Kurt[3]

[1]Florida Institute of Technology, Melbourne, FL, USA
[2]Centre Tecnològic de Telecomunicacions de Catalunya (CTTC/CERCA), Castelldefels, Spain
[3]East Texas A&M University, RELLIS Campus, Bryan, TX, USA

ABSTRACT:

The increasing complexity and scale of AI workloads, including generative AI and large language models, strains centralized cloud execution due to latency, bandwidth, and data governance constraints. This paper presents an AI-enabled architecture spanning the cognitive cloud-edge-Internet of Things (IoT) continuum that supports dynamic and secure execution of AI workflows across heterogeneous infrastructures. We propose a multi-plane orchestration framework integrating federated and swarm learning, reinforcement learning based task scheduling, and trust mechanisms including secure enclaves and privacy-preserving computation. We evaluate the framework via a Monte Carlo simulation comparing cloud-only, edge-only, and continuum-aware placement strategies, demonstrating substantial reductions in composite latency, energy, and trust cost, with simulation parameters grounded in large-scale edge and cloud measurements. The framework addresses interoperability via ONNX and OCI-aligned execution, and supports compliance by design aligned with GDPR principles.

BIOGRAPHY:

Dr. Engin Zeydan is a Senior Researcher in the Services as networks (SaS) at Centre Tecnologic de Telecomunicacions de Catalunya (CTTC) in Barcelona, Spain. He received his PhD degree from the Department of Electrical and Computer Engineering at Stevens Institute of Technology, Hoboken, NJ, USA in 2011 and M.S. and B.S. degrees from the Department of Electrical and Electronics Engineering at Middle East Technical University, Ankara, Turkey, in 2006 and 2004, respectively. Before joining CTTC in 2018, he worked as an R&D Engineer for Avea (a Turkish mobile operator) between 2011 and 2016, as Senior R&D Engineer in Turk Telekomunikasyon A.S between 2016 and 2018 and a part-time instruction at the Electrical and Electronics Engineering department of Ozyegin University between January 2015 and June 2018. Dr. Zeydan has been primarily responsible for carrying out European Commission and nationally funded research activities at CTTC, Türk Telekomunikasyon, Avea.
He is currently the Project Coordinator of the Horizon Europe UNITY-6G European Project (January 2025-December 2027). He was the Project Coordinator of the Horizon 2020 MonB5G European Project (November 2021-April 2023). He has also been involved in other European level projects such as H2020 projects 5Growth (2019-2022) and Clear5G (as WP leader, 2017-2018), FP7 projects MOTO (as WP leader, 2012-2015) and CROWD (2014-2015) in collaborations with various industries and universities. He is co-author of over 200+ papers in international journals and conferences, 12 patents (11 granted in Turkish Patent Institute and 1 granted under European Patent Office). In addition, he has delivered 28+ tutorials on data engineering for networking as well as on quantum-secure 6G at various events/conferences such as IEEE CCNC 2025, ACM SIGAPP 2025, NoF (2025, 2024, 2022), IEEE ICMLCN (2025, 2024), IEEE MeditCom 2024, ACM HPDC 2024, IEEE WF-IoT 2023, IEEE HPSR 2023, COST CA20120 INTERACT, IEEE/IFIP NOMS (2023, 2016), CNSM 2022, IEEE SM 2024 and CITS 2024. He is a member of the editorial board of the Wiley Security and Privacy journal. He has also served Guest Editor in IEEE Communications Standards Magazine. His research interests are in the areas of telecommunications, data engineering/science and network security.

A1 – Technical Session: Edge AI and Systems (Friday, May 8th, 13:30–15:10)

A1.3: Drone Recognition Using Deep Learning Methods

Zehua Tang, Victor Lawrence, Hong Man, and Yu-Dong Yao

Department of Electrical and Computer Engineering, Stevens Institute of Technology, Hoboken, NJ, USA

ABSTRACT:

Bird and drone detection is a critical visual classification task in intelligent monitoring systems, with practical applications in airport surveillance, low-altitude airspace management, and public safety. However, reliable classification remains highly challenging due to the typically small size of flying targets and their susceptibility to changes in viewpoint, motion blur, background interference, and significant intra-class variation in bird samples. In this paper, we systematically compare the performance of eight deep learning models—including four convolutional neural networks and four visual Transformer models—on the bird–drone closed-set classification task under a unified experimental protocol. All models were initialized with ImageNet pre-trained weights and trained and tested under the same data partitioning, training strategies, and evaluation metrics. The results indicate that all models achieved high classification accuracy on the current dataset, but significant differences still exist among different architectures. The optimal model achieved the highest classification accuracy, while models exhibiting a better balance between accuracy and training efficiency demonstrated superior overall performance. Confusion matrix analysis further indicates that classifying the “Bird" class is generally more challenging than the “Drone” class, with the primary error pattern being the misclassification of “Bird" as “Drone". These results provide a clear closed-set comparison baseline for bird–drone recognition and offer guidance for model selection in small-object visual classification tasks.

BIOGRAPHY:

Zehua Tang is currently pursuing the M.S. degree in Electrical Engineering at Stevens Institute of Technology, Hoboken, NJ, USA. His current research focuses on computer vision, deep learning, and open-set recognition, with a particular interest in aerial object recognition under closed-set and open-set scenarios.

W2 – Technical Session: Wireless Edge Network (Friday, May 8th, 15:30–17:30)

W2.1: Interactive LLMs Beyond the Cloud: Toward Scalable and Embodied AI Systems

(Invited)

Xueyu Hou

Department of Electrical and Computer Engineering, University of Maine, Orono, ME, USA

ABSTRACT:

Large language models (LLMs) are increasingly used in human-interactive applications such as chatbots, assistants, and embodied AI systems, where language models must operate in close coordination with sensors, robots, and extended reality (XR) devices. However, current serving systems demand heavy computation (e.g., tens to hundreds of GPU hours for a single fine-tuned deployment), large memory footprints (often exceeding 80 GB for models with tens of billions of parameters), and stable network access with low latency (typically <100 ms to maintain natural interaction). These requirements make LLM serving costly to deploy and unreliable in heterogeneous environments. In embodied AI scenarios, this challenge is especially acute: autonomous robots in fields or factories, XR headsets in mobile use, and IoT devices in rural or bandwidth-limited settings often face unstable connectivity and constrained on-device resources. This motivates the need for more robust and resource-efficient serving solutions. First, the talk examines the need and challenges of live LLM-based text streaming systems, which aim to reduce latency and improve interactivity by delivering outputs incrementally, even under fluctuating network conditions. Second, a distributed speculative decoding method is presented, where draft and target models collaborate across heterogeneous devices to accelerate inference while maintaining accuracy. Third, the speaker introduces long-context prompt compression and decomposition, a technique for condensing and restructuring large inputs to fit into resource-constrained edge environments without losing critical information. In conclusion, the talk offers new perspectives on building robust and resource-efficient LLM serving systems that bridge human-AI interaction with embodied intelligence, paving the way for scalable, responsive, and context-aware AI applications in the physical world.

BIOGRAPHY:

Dr. Xueyu Hou is an Assistant Professor in the Department of Electrical and Computer Engineering at the University of Maine (UMaine) and an IEEE Member. Dr. Hou received her Ph.D. in Electrical Engineering from New Jersey Institute of Technology (NJIT) in 2024 and is the recipient of NJIT Hashimoto Prize 2024. Her current research spans large language model (LLM) serving, embodied AI, mobile edge computing, and in-network computing, with a focus on enabling intelligent and efficient distributed systems. Her work has been recognized and published in several prestigious venues, including mobile edge computing (e.g., MobiCom, MobiSys, and SECON), distributed processing (e.g., TCC, IPDPS, and ICPP), and wireless communication (e.g., InfoCom and Globecom).

W2 – Technical Session: Wireless Edge Network (Friday, May 8th, 15:30–17:30)

W2.2: Human-Centered AR: Building Scalable Systems for Shared Experiences

(Invited)

Yongjie Guan

Department of Electrical and Computer Engineering, University of Maine, Orono, ME, USA

ABSTRACT:

This talk will provide a human-centered computing perspective on the future of Augmented Reality (AR), from single-user applications to the complex challenges of multi-user and cooperative AR systems. While AR holds great promise for enhancing how we interact with the world, its true transformative power lies in creating shared, cooperative experiences where multiple users can collaborate seamlessly. However, building these systems for mobile devices introduces significant systems-level challenges. The core problem is maintaining precise spatial synchronization—ensuring every user sees the same consistent virtual world—which often overwhelms device resources and breaks the user's sense of immersion. The speaker will delve into a research vision for building the lightweight, decentralized systems needed for truly cooperative AR. Key strategies to be discussed include: First, outlining the stringent requirements of cooperative AR from a human-centered perspective, where maintaining immersion demands low-latency and high-accuracy synchronization. Second, presenting a systems-level approach that addresses these requirements through intelligent, multi-modal data fusion, which reduces both network and computational overhead. Third, discussing the design of decentralized, peer-to-peer architectures as a robust and scalable foundation for real-world collaborative experiences. In conclusion, the speaker will provide insights into this research, showing how it is critical for creating more fluid and natural human experiences and for laying the groundwork for the next generation of embodied AI.

BIOGRAPHY:

Dr. Yongjie Guan is an Assistant Professor in the Department of Electrical and Computer Engineering at the University of Maine (UMaine) and an IEEE Member. Dr. Guan received his Ph.D. in Electrical Engineering from New Jersey Institute of Technology (NJIT) in 2024. His current research spans immersive computing, extended reality, wireless network, and unmanned aerial vehicle, with a focus on enabling intelligent and user-interactive systems. His work has been recognized and published in several prestigious venues, such as MobiCom, MobiSys, InfoCom, and Globecom.

W2 – Technical Session: Wireless Edge Network (Friday, May 8^{th}, 15:30–17:30)

W2.3: ASIoU: A Domain-Informed Frequency-Weighted IoU Loss for RF Spectrogram Drone Detection

Akshat Sharan[1], Mohammad Rostami[1], Atik Faysal[1], Hongtao Xia[2], Hadi Kasasbeh[2], Ziang Gao[2], and Huaxia Wang[1]

[1]Rowan University, Glassboro, NJ, USA
[2]AeroDefense, Oceanport, NJ, USA

ABSTRACT:

Standard bounding box regression losses are spatially isotropic, treating temporal and spectral errors as equivalent. In RF spectrogram-based drone detection, this is operationally dangerous: A frequency-axis error directs Electronic Countermeasures to jam the wrong channel, directly causing mission failure. We propose Anisotropic Spectral-IoU (ASIoU), a frequency-weighted regression loss integrated into a lightweight YOLOE architecture, which explicitly penalizes spectral misalignment over temporal drift. Evaluated on the CageDroneRF (CDRF) dataset, our model achieves 0% FAR, 97.87% precision, and 91.77% mAP@0.90–0.95, surpassing all baselines at strict localization thresholds. On a challenging out-of-distribution real-world rooftop deployment, the proposed model achieves a 3.7× FAR reduction over a heavyweight baseline and 8.8× over standard YOLOe, while maintaining a competitive 93.1% classification rate, demonstrating that aligning the training objective with RF domain physics is a more effective path to operational reliability than scaling model capacity. Codes are available at https://github.com/Akshat-Sharan/YOLOE.

BIOGRAPHY:

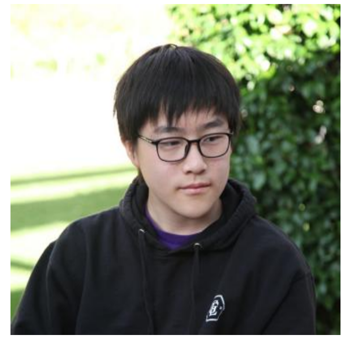
Akshat Sharan received his undergraduate degree in Computer Science and Systems Engineering from Kalinga Institute of Industrial Technology, India. Following graduation, he worked as a Trainee Decision Scientist at Mu Sigma. He is currently pursuing a Master of Science in Data Science at Rowan University, where he also serves as a Research Assistant at the AeroDefense, Oceanport, NJ, USA and a Research Intern at the Surgical Robotics Lab, Camden, NJ, USA. His research spans deep reinforcement learning, computer vision, signal processing, UAV and drone detection, optical wireless communication, and Vehicle-to-Everything (V2X) networks. His research has been published in IEEE conferences and peer-reviewed journals. Upon completing his Master's degree, in Fall 2026 he will begin his Ph.D. in Electrical and Computer Engineering at Rowan University.

W2 – Technical Session: Wireless Edge Network (Friday, May 8th, 15:30–17:30)

W2.4: A Unified Robust Low-Rank Framework for Time Synchronization in Multi-Drone Networks

Farhan Ali, Rui Zhang, Liyue Xiao, and Zhi Quan

College of Electronics and Information Engineering, Shenzhen University, China



ABSTRACT:

This paper addresses the challenge of clock synchronization in multi-drone networks operating within dynamic, interference-prone low-altitude airspace. In such environments, interference and packet loss frequently lead to clock misalignment and drift accumulation. We model the measured clock data as a decomposition of low-rank, sparse, and noise components. The study evaluates five synchronization strategies: a classical Baseline, standard low-rank recovery methods (Fill+SVD, Soft Impute), robust decomposition (GoDec), and our proposed Graph-Regularized Robust Low-Rank (GR-RLR) model. The GR-RLR model uniquely integrates spatial graph Laplacian smoothness with temporal-fused regularization to fully exploit spatio-temporal priors. Simulation results validate the framework, demonstrating that GR-RLR offers superior robustness and stable synchronization accuracy under heavy jamming and packet-loss conditions, significantly outperforming conventional methods in suppressing impulsive errors.

BIOGRAPHY:

Farhan Ali holds a Ph.D. from Hefei University of Technology and is a postdoctoral candidate at the College of Electronics and Information Engineering, Shenzhen University. He has authored 32 peer-reviewed papers and holds several editorial positions: Editor for PLOS ONE (SCI) and Current Advances in Robotics, Associate Editor for the International Journal of Sensors, Wireless Communications and Control (Scopus), and Reviewer Board member for Journal of Communications (Scopus). His research interests include wireless communication, UAV, the Internet of Things (IoT), Artificial Intelligence (AI), and cognitive radio spectrum.
Rui Zhang earned his Ph.D. from the University of Sydney in 2020 and is currently an Assistant Professor at the College of Electronics and Information Engineering, Shenzhen University. Prior to this, he was a Postdoctoral Fellow at The Chinese University of Hong Kong (2021–2024). He published several research papers. His research interests include machine learning for wireless communications and wireless sensing on mobile robots.
Liyue Xiao completed an internship at Shenzhen University on a UAV time synchronization project, participating in scheme design, simulation, and performance verification. He has also actively participated in advanced extension programs such as the UCLA Math Circle, gaining in-depth knowledge of higher-order mathematical concepts. His research focuses primarily on distributed systems, real-time synchronization, and the interaction between hardware and network environments.
Zhi Quan (Senior Member IEEE) is a Distinguished Professor at Shenzhen University, holding a Ph.D. from UCLA and a B.E. from BUPT. He previously worked as a Senior System Engineer at Qualcomm and RF System Architect at Apple, contributed to IEEE 802.11ac/ah with over 30+ U.S. patents, published 70+ papers (5,000+ citations), and received the UCLA Outstanding Ph.D. Award, IEEE SPS Best Paper Award, China National Excellent Young Scientist Foundation, and First Prize Technology Innovation Award (China Institute of Communications). His research focuses on 6G, RF measurement, data-driven signal processing, and machine learning, and serves as Associate Editor for China Communications and IEEE Transactions on Signal Processing.

O2 – Technical Session: Photonic Devices and VLC (Friday, May 8th, 15:30–17:30)

O2.1: Inverse design photonic couplers with machine learning tools

(Invited)

Shuwei Guo and Pingfan Wu

Futurewei Technologies
645 Martinsville Road, Basking Ridge, NJ 07920

ABSTRACT:

We present an inverse design framework that explicitly incorporates the fabrication constraints. We introduce a titanium dioxide (TiO_2) based height varying metasurface, as a visible-light color router for CMOS image sensor. Besides superior color splitting and light concentrating capabilities, this height-varying metasurface also performs like an anti-reflection coating.

BIOGRAPHY:

Pingfan Wu received his bachelor's degree in Optical Science from Zhejiang University, China, and earned his Ph.D. in Mechanical and Aerospace Engineering from Princeton University. He subsequently conducted research in high-power laser systems at GE Global Research Center in Niskayuna, New York, and developed optical and thermal-acoustic materials at 3M in St. Paul, Minnesota. In 2022, Dr. Wu joined Futurewei Technologies in Basking Ridge, New Jersey, where he serves as a Senior Technical Director. His research focuses on photonic materials, devices, and links enabled by machine learning–assisted design techniques. His team conduct cutting-edge research in computational photography, CMOS image sensors, low-power-consumption electronics materials, and thermal management.

O2 – Technical Session: Photonic Devices and VLC (Friday, May 8th, 15:30–17:30)

O2.2: 3D Trajectory Optimization for UAV-assisted Covert Visible Light Communication

Tamunoene Bamson and Liang Zhang

Department of Engineering
University of Maryland Eastern Shore

ABSTRACT:

UAV-assisted visible light communication (VLC) enables on-demand connectivity by leveraging license-free spectrum, high flexibility, mobility, and rapid deployment capabilities. However, covert transmission remains challenging due to the line-of-sight (LoS) characteristics of optical channels. In this paper, we investigate a UAV-enabled covert VLC system in which a UAV communicates with a legitimate user while remaining undetectable to a passive warden. A Kullback–Leibler (KL) divergence constraint is adopted to enforce covertness. We formulate a joint UAV–VLC optimization problem to maximize the average covert throughput by jointly designing the UAV's 3D trajectory and transmission intensity. The optimization problem is NP-hard due to the mixed-integer and continuous variables, as well as the trajectory, channel gain, and covertness constraints. To address this challenge, we decompose the problem into tractable convex subproblems and propose a 3D Covert SCA-BCD (3D-CSB) algorithm for the efficient solution. Numerical results demonstrate that the 3D-CSB algorithm achieves up to a $30 - 35\%$ throughput improvement as compared with baseline methods, highlighting the critical role of altitude and trajectory design in UAV-assisted covert VLC networks.

BIOGRAPHY:

Tamunoene Eugene Bamson received his B.S. degree in Electrical Engineering from Louisiana State University (LSU), USA. He is currently pursuing his M.S. degree in the Department of Engineering at the University of Maryland Eastern Shore (UMES), where he also serves as a Graduate Research Assistant. His research interests include wireless communications, channel modeling, vehicular communication, and visible light communications (VLC).

O2 – Technical Session: Photonic Devices and VLC (Friday, May 8th, 15:30–17:30)

O2.3: Max-Min Fairness Precoder for Rate-Splitting Multiple Access-based VLC System

Xiaodong Liu[1], Qian Wang[2], Liwei Tang[1], Baolin Lai[1], Yuhao Wang[1], and Xun Zhang[3]

[1]Nanchang University, Nanchang, China
[2]Zhuzhou CRRC Electromechanical Technology Co., Ltd., China
[3]Institut Supérieur d'électronique de Paris

ABSTRACT:

Rate-split multiple access (RSMA), characterized by its low complexity and high spectral efficiency, provides a powerful way to integrate with visible light communication (VLC) systems to achieve high-speed and massive connections, addressing the growing demand for terminal numbers and data traffic. Although RSMA bridges the service gap between different users, the issue of user fairness in VLC broadcast services remains prominent because the channel attenuation disparity between far and near users is more pronounced than in traditional radio frequency communication. To tackle the user fairness issue, a precoder is designed to achieve the maximum-minimum (max-min) fairness in multiple-input single-output RSMA-VLC system. Specifically, a max-min fairness optimization problem is firstly formulated by considering average power constraint, which is intractable non-convex problem. Then, the semi-definite relaxation and convex-concave procedure are exploited to transform the original problem into the feasible convex optimization problem and the corresponding algorithm is proposed. Simulation results demonstrate that the proposed precoder algorithm of RSMA-VLC system can achieve superior performance compared with both space-division and non-orthogonal multiple access-based VLC system under both underload and overload cases.

BIOGRAPHY:

Xun Zhang (Senior Member, IEEE) received the Ph.D. degree in instrumentation and microelectronics (IM) science from the University of Nancy, Nancy, France, in October 2009. From 2009 to 2011, he undertook a post-doctoral position at the SCEE Laboratory, CentraleSupélec, Gif-sur-Yvette, France, where he focused on applying auto-reconfigurable management methods and control strategies in FPGAs for cognitive radio systems. In 2011, he joined the LISITE Laboratory, Institut Supérieur d'Électronique de Paris (ISEP), Paris, France, as an Associate Professor. He is currently a Professor with ISEP and conducts permanent research at the LISV Laboratory, University of Saclay-Versailles, Versailles, France. His research primarily revolves around PHY layer optimization for 5G cellular networks and visible light communication (VLC) systems. He is also pioneering the development of VLC-based indoor high-accuracy positioning and tracking algorithms. Dr. Zhang is a member of the BTS Awards Committee. He serves as an Associate Editor for *IEEE Transactions on Broadcasting*.

A2 – Technical Session: Core AI/ML Methods (Friday, May 8th, 15:30–17:30)

A2.1: Semi-Supervised Masked Autoencoders: Unlocking Vision Transformer Potential with Limited Data

Atik Faysal[1], Mohammad Rostami[1], Reihaneh Gh. Roshan[2], Nikhil Muralidhar[2], and Huaxia Wang[1]

[1]Department of Electrical and Computer Engineering, Rowan University, Glassboro, NJ, USA
[2]Department of Computer Science, Stevens Institute of Technology, Hoboken, NJ, USA

ABSTRACT:

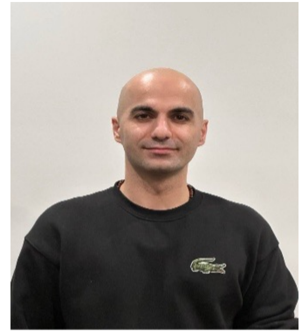
We address the challenge of training Vision Transformers (ViTs) when labeled data is scarce but unlabeled data is abundant. We propose Semi-Supervised Masked Autoencoder (SSMAE), a framework that jointly optimizes masked image reconstruction and classification using both unlabeled and labeled samples with dynamically selected pseudo-labels. SSMAE introduces a validation-driven gating mechanism that activates pseudolabeling only after the model achieves reliable, high-confidence predictions that are consistent across both weakly and strongly augmented views of the same image, reducing confirmation bias. On CIFAR-10 and CIFAR-100, SSMAE consistently outperforms supervised and self-supervised baselines, with the largest gains in low-label regimes (+9.24% over ViT-B on CIFAR-10 with 10% labels). Our results demonstrate that when pseudo-labels are introduced is as important as how they are generated for data-efficient transformer training. Codes are available at https://github.com/atik666/ssmae.

BIOGRAPHY:

Atik Faysal is currently working as a research scientist at Quantum Computing Inc.. He holds a PhD in Electrical and Computer Engineering from Rowan University (2026) an MS in Engineering from University Malaysia Pahang (2021) and a BSc in Electrical and Electronic Engineering from Pabna University of Science & Technology (2017). His research spans machine learning applications in wireless communications, fault diagnosis, and signal processing, with expertise in semi-supervised learning, meta-learning, and multi-modal learning. Atik Faysal has published in high-impact venues, including IEEE journals, and serves as a reviewer for IEEE and Scopus-indexed journals. His research has been supported by multiple funding sources, including NSF I-Corps, Department of Energy, and Oklahoma Center for the Advancement of Science and Technology grants, reflecting the practical impact and innovation potential of his work in advancing AI applications.

A2 – Technical Session: Core AI/ML Methods (Friday, May 8th, 15:30–17:30)

A2.2: Time-Series Classification Using AI Models for Digital Twin Applications



Afshin Eisazadeh Kharabeh, Victor Lawrence, and Yu-Dong Yao

Department of Electrical and Computer Engineering, Stevens Institute of Technology, Hoboken, NJ, USA

ABSTRACT:

Digital Twin (DT) technology enables real-time monitoring and optimization through virtual replicas that stay synchronized with physical systems. This paper reviews AI-based time-series classification methods for DT applications, covering both classical machine learning and deep learning architectures, including CNNs, RNNs, TCNs, and Transformers. We discuss integration challenges such as real-time requirements, edge–cloud deployment, and multimodal data fusion, and highlight applications across manufacturing, healthcare, and infrastructure. Key challenges, including data scarcity, interpretability, and scalability, are identified as important directions for future research.

BIOGRAPHY:

Afshin Eisazadeh Kharabeh is a Ph.D. student in Electrical and Computer Engineering at Stevens Institute of Technology, Hoboken, NJ, USA. His research focuses on deep learning for time-series classification, with applications in digital twin systems and biomedical signal analysis, particularly sleep stage classification using EEG. He also serves as an instructor and Head Teaching Assistant for undergraduate engineering laboratories.

A2 – Technical Session: Core AI/ML Methods (Friday, May 8th, 15:30–17:30)

A2.3: An Empirical Study of Version-Control and Validation Workflows for Enterprise AI Systems

Abhijit Choudhary[1], Avimanyou Vatsa[2], Rohan Puppala[3], and Aarav Rao[4]

[1]Global Product Development, ADP, Parsippany, NJ, USA
[2]Dept. of Computer Science & Math, Fairleigh Dickinson University, Teaneck, NJ, USA
[3]STEM, Denmark High School, Alpharetta, GA, USA
[4]STEM, T.C. Jasper High School, Plano, TX, USA

ABSTRACT:

Today, AI systems have been embedded in enterprise software and are surrounded by a large array of infrastructure, supporting code, and processes of traditional software. An AI system inherits all the challenges of regular code, as well as AI-specific system-level challenges, thereby introducing risks of technical debt and costly future maintenance. This warrants a hybrid framework that, on the one hand, mitigates AIspecific issues through a validation approach that caters to both stochastic and deterministic behaviors typically observed in LLM-powered systems. On the other hand, it emphasizes adopting standard software version control practices, in which every feature promotion passes through quality gates that involve both automated checks and human-in-the-loop review, ensuring controlled evolution and backward compatibility of the system. Therefore, this study revisits the underpinnings of enterprise workflows across key system boundaries in software development and introduces and employs an LLM-as-a-Judge approach to mitigate AI system drift.

BIOGRAPHY:

Abhijit Choudhary is a seasoned data scientist with over 15 years of hands-on experience across major technology shifts, from information management and digital transformation to today's generative AI era. His work lies at the intersection of AI product strategy, applied research, and scalable implementation, with a strong record of translating emerging technologies and rapid prototypes into measurable business impact. Across multiple greenfield projects, he has helped organizations transform new technical capabilities into practical, enterprise-ready solutions.

He is a language technology expert specializing in NLP, NLU, large language models, and generative AI, with experience addressing high-impact problems in enterprise-scale document intelligence, Google Document AI implementations, contextual disambiguation, information retrieval, text classification, and scalable GenAI pipelines. He also brings strong data storytelling skills, enabling him to communicate the purpose, methodology, and value of data science solutions to diverse audiences, including executives, technical teams, and cross-functional stakeholders.

W3 – Technical Session: Remote Session (Saturday, May 9th, 9:00–10:20)

W3.1: An Improved Expectation Propagation Algorithm for Massive MIMO Signal Detection

Yong Lei, Congcong Li, Guang Chen, Huan Liu, Xing Huang, and Yueyun Chen

University of Science and Technology Beijing, Beijing, China

ABSTRACT:

In Massive Multi-input Multi-output (Massive MIMO) technology, signal detection at the receiver faces the dual challenges of computational complexity and bit error rate (BER) performance. The Expectation Propagation (EP) algorithm performs message passing through iterative updates of the posterior distribution. It achieves a trade-off between computational complexity and BER performance, yet still faces challenges such as the high complexity from matrix inversion and slow convergence speed. To address the issues, we propose a low-complexity signal detection algorithm based on the EP framework, named Diagonal Preprocessing (DP)-EP-Successive Over-Relaxation (SOR). To highlight the channel hardening characteristics, we construct a diagonally dominant matrix through diagonal preprocessing. Then, the matrix inversion for the posterior mean of received symbols in the EP algorithm is transformed into a linear iterative solution using the SOR method, which effectively reduces complexity. Simulation results show that the proposed DP-EP-SOR algorithm reduces the computational complexity by one power compared to the EP algorithm, while maintaining comparable BER performance.

BIOGRAPHY:

Yong Lei is currently pursuing a master's degree at the University of Science and Technology Beijing in China. His research interests primarily focus on the physical layer, MIMO-NOMA technology, and receiver-side signal detection.

W3 – Technical Session: Remote Session (Saturday, May 9th, 9:00–10:20)

W3.2: Software-Defined Networking-Based Topology Management for V2I Collaboration Networks

Lu Yang, Jiujun Cheng, and Mengchu Zhou

Tongji University, Shanghai, China

ABSTRACT:

Maintaining an accurate and real-time network topology is a fundamental challenge in Vehicle-to-Infrastructure (V2I) collaboration networks due to high vehicle mobility and dynamic connectivity. Traditional distributed routing protocols, like Dynamic Source Routing (DSR), rely on reactive route discovery, which leads to significant control overhead and routing delays, thus hindering scalability. This paper presents a novel Software-Defined Networking (SDN)-based topology management algorithm to address these issues. It proactively maintains a dynamic global network view through four stages: 1) node discovery via Cooperative Awareness Messages, 2) kinematics-based link evaluation, 3) threshold-driven topology updates, and 4) flow table computation with Dijkstra's algorithm. Theoretical analysis shows its per-epoch time complexity of O(N+MlogM) and steady-state communication overhead of O(N). Experimental results on the Jiading dataset demonstrate that it achieves a 92.1% packet delivery ratio with a 51.6 ms end-to-end delay in high-density scenarios, outperforming DSR. Furthermore, it reduces control overhead from DSR's 482.6 Kbps to 52.1 Kbps, confirming its scalability and efficiency of SDN-based topology management in intelligent V2I systems.

BIOGRAPHY:

Lu Yang is currently pursuing the Ph.D. degree in Computer Technology with the School of Computer Science, Tongji University, Shanghai, China. Her current research interests include computer vision, autonomous driving, V2X collaboration.

W3 – Technical Session: Remote Session (Saturday, May 9th, 9:00–10:20)

W3.3: Timestamp-Free based Cooperative Clock Synchronization for Time-Sensitive Human-Machine Systems

Haiyong Zeng[1,2], Long Tang[1], Shoulin Huang[1], Xiaohao Wen[1], and Mengchu Zhou[3]

[1] Guangxi Normal University
[2] Harbin Institute of Technology (Shenzhen), China
[3] New Jersey Institute of Technology

ABSTRACT:

With the widespread application of Human-Machine Systems (HMS), clock synchronization has become a fundamental technology for enabling cooperative operation and ensuring the validity of perceptual data and the accuracy of collaborative decision-making in situational awareness enhancement. Nevertheless, existing synchronization solutions for HMS confront challenges such as excessive communication overhead caused by timestamp exchange and insufficient synchronization accuracy, all of which hinder performance in time-sensitive scenarios. To address these limitations, we put forward a timestamp-free based cooperative clock synchronization (T-CCS) mechanism where a set of associated relay agents collaboratively synchronize with an unsynchronized node to achieve superior and robust synchronization. To the best of our knowledge, this is the first attempt to investigate cooperative timestamp-free clock synchronization for time-sensitive HMS. Thanks to the timestamp-free design, T-CCS can be seamlessly integrated into the periodic perceptual data collection process inherent to HMS, thus incurring no additional communication overhead dedicated to clock synchronization. Furthermore, the maximum likelihood estimator is developed to jointly estimate the clock skew and fixed delay, with the corresponding Cramer-Rao Lower Bounds derived for validation. Simulations demonstrate that T-CCS achieves higher estimation accuracy and stronger robustness compared to existing noncooperative method.

BIOGRAPHY:

Long Tang is with Guangxi Normal University, China.

O3 – Technical Session: Remote Session (Saturday, May 9th, 09:00–10:20)

O3.1: Numerical Simulations of Cross-Coupled Add-Drop Microring Resonator (XMRR) for Next-Generation Optical Interconnect

Jonathan L. Mojica[1], Jerome Fredrich M. Tayamora[1], Wayne Jasper G. Sy[3], Ramon Benedict L. Lapiña[3], Jennifer C. Dela Cruz[2], Benjamin B. Dingel[3], and Mae M. Garcillanosa[1],

[1]Electronics Engineering Program, Mapúa Malayan Colleges Laguna, Cabuyao City, Laguna, Philippines
[2]Electrical, Electronics, and Computer Engineering, Mapúa University, Manila, Philippines
[3]Department of Physics, School of Science and Engineering (SOSE), Ateneo de Manila University, Quezon City, Philippines

ABSTRACT:

This paper presents a numerical characterization of a Cross-Coupled Add-Drop Ring Resonator (XMRR) derived from our previously reported cross-coupled microring architecture. The mathematical formulation was established in earlier work; here, we focus on standalone simulation-based validation. Intensity, phase response, group delay, and chromatic dispersion were analyzed under asymmetric coupling conditions. Results indicate that the XMRR preserves the fundamental spectral and temporal characteristics of a conventional add-drop micro-ring resonator, including identical resonance envelopes and delay magnitudes. The primary distinction is a deterministic resonance displacement of approximately 1 nm induced by the engineered cross-coupling pathway. Although this offset does not intrinsically enhance standalone filtering metrics, it introduces a controllable phase shift that has been shown to enable richer spectral responses when implemented in nested configurations, as demonstrated in our recent work. The XMRR therefore serves as a phase-engineered building block for advanced photonic interconnect architectures.

BIOGRAPHY:

Mae M. Garcillanosa earned her Bachelor of Science in Electronics Engineering from Ateneo de Naga University and a Master of Science in Electronics Engineering from Mapúa University. She is currently a Ph.D. candidate in Electronics Engineering at Mapúa University. She has also served as a visiting researcher at the Ateneo Research on Optical Sciences, Engineering, and Systems (ROSES) Laboratory. Her research interests include analog microelectronics design, photonic integrated circuit design and systems, and applied electronics.

O3 – Technical Session: Remote Session (Saturday, May 9th, 09:00–10:20)

O3.2: Deterministic Multi-Channel XPM Scalability in Octagonal-Core Nonlinear PCFs with Geometry Polarization and System-Level BER Limits

Nidhi Singh and Yatindra Nath Singh

Department of Electrical Engineering
Indian Institute of Technology Kanpur, Kanpur, India

ABSTRACT:

Deterministic nonlinear phase manipulation via cross-phase modulation (XPM) enables compact and ultrafast all-optical signal processing in highly nonlinear dispersion flattened octagonal-core photonic crystal fibers (PCFs). However, the scalability of multi-channel XPM under wavelength-division multiplexed (WDM) loading in short-reach nonlinear platforms remains insufficiently quantified. In this work, a geometry and polarization-aware analytical framework is developed for deterministic multi-channel XPM in dispersion-flattened octagonal core PCFs. Closed-form expressions are derived for aggregate nonlinear phase accumulation, inter-channel XPM-induced deviation, maximum admissible channel count under a physically justified phase tolerance margin, and deterministic power scaling for target phase operation. The analysis reveals that nonlinear phase scales with aggregate optical power according to the deterministic factor $1 + 2(N - 1)$ for fully co-polarized channels, establishing a geometry-dependent scalability constraint governed by γL_{eff}. A polarization extension generalizes the model to arbitrary alignment, while an analytical BER formulation links deterministic phase rotation to Q-factor degradation. Split-step Fourier simulations validate the analytical predictions within 2% deviation for $N = 1$–8. The results establish quantitative scalability limits and provide design guidelines for energy-efficient, WDM-compatible Kerr-based optical processing in compact photonic networks.

BIOGRAPHY:

Nidhi Singh (Graduate Student Member, IEEE) is currently pursuing the Doctor of Philosophy degree with the Department of Electrical Engineering, IIT Kanpur, India, with a specialization in optoelectronics and optical communication. She was an Assistant Professor with the Department of Electronics and Instrumentation Engineering, Shri Ramswaroop Memorial Group of Professional Colleges, Lucknow, India, from 2010 to 2016. During her M.Tech degree, she was associated with research activities at the Defence Research and Development Organisation (DRDO), Delhi, India. Her research interests include optical fiber communication, nonlinear fiber optics, all-optical signal processing, phase-sensitive amplification, wireless optical communication, and elastic optical communication networks.

O3 – Technical Session: Remote Session (Saturday, May 9th, 09:00–10:20)

O3.3: Optoelectronic Beamforming for Integrated Sensing and Communication

Xiaofeng Su[1], Jian Song[2] , and Jintao Wang[1]

[1] Department of Electronic Engineering, Tsinghua University, Beijing, China
[2] Research Institute of Tsinghua University in Shenzhen
Key Lab of DTV System of Guangdong and Shenzhen, China

ABSTRACT:

Driven by 6G requirements and emerging low-altitude applications, cellular networks are evolving from communication-centric operation toward integrated sensing and communication (ISAC), a key paradigm for enhancing service capability and improving resource utilization. Although substantial advances have been made in ISAC waveform design and resource management, beamforming design remains comparatively underdeveloped. Most existing studies focus on conventional radio frequency base stations, where phase shifter network induced structural constraints restrict the set of realizable beamformers and reduce the degrees of freedom for joint communication-sensing optimization. By contrast, optoelectronic base stations (OE-BSs) enable joint amplitude-phase control in the photonic analog domain, thereby alleviating the unimodular constraint and enlarging the feasible beamforming space. Leveraging this capability, an OE-BS-oriented ISAC beamforming design is formulated to jointly serve communication users and sensing targets under a total transmit power constraint, with the objective of improving overall ISAC performance. Compared with communication-only beamforming, the proposed design achieves a more favorable communication-sensing performance and delivers pronounced sensing gains, exhibiting promising potential for large-scale antenna array deployments.

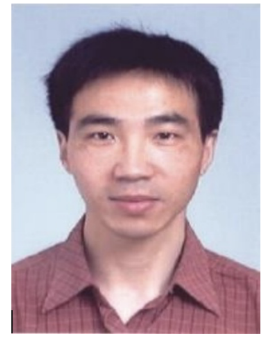
BIOGRAPHY:

Xiaofeng Su received the Ph.D. degree from Fudan University. She is currently a Postdoctoral Research Associate with the Department of Electronic Engineering, Tsinghua University.

A3 – Technical Session: Remote Session (Saturday, May 9th, 9:00–10:20)

A3.1: Adaptive-Grid Residual KAN for Solving High-Dimensional PDEs with Deep BSDE

(Invited)



Xiya Shen[1], Qinglin Zhao[1], Li Feng[1], and Mengchu Zhou[2]

[1]School of Computer Science and Engineering, Macau University of Science and Technology, Taipa, Macau, China
[2]Department of Electrical and Computer Engineering, New Jersey Institute of Technology, Newark, NJ, USA

ABSTRACT:

The Deep Backward Stochastic Differential Equations (BSDE) method solves high-dimensional semilinear partial differential equations (PDEs) by approximating the control process with a stochastic reformulation. Most implementations rely on multilayer perceptrons (MLPs) with fixed architectures. Kolmogorov–Arnold Networks (KANs) provide a spline-based alternative in which activation functions are defined over prescribed grids. However, uniform grid constructions may lead to inefficient resolution allocation, and layered spline compositions may increase or decrease gradient magnitudes due to products of local spline derivatives. We propose an Adaptive-grid Residual KAN (ARKAN) that integrates residual connections with terminal-error guided grid adaptation. The proposed method jointly updates the spline coefficients and grid structures within the Deep BSDE framework, forming a coupled parameter–structure learning scheme. Experiments on 100-dimensional PDE benchmarks indicate improved stability and accuracy over the recent KAN- and MLP-based baselines under comparable settings.

BIOGRAPHY:

Qinglin Zhao (Senior Member, IEEE) received his Ph.D. degree from the Institute of Computing Technology, Chinese Academy of Sciences, Beijing, China, in 2005. From 2005 to 2009, he worked as a postdoctoral researcher at the Chinese University of Hong Kong and the Hong Kong University of Science and Technology. He is currently a Professor with the School of Computer Science and Engineering, Macau University of Science and Technology.
His research interests include blockchain and decentralized computing, machine learning and its applications, Internet of Things, wireless communications, and cloud/fog computing. He is also interested in emerging areas such as quantum computing and quantum machine learning. He serves as an Associate Editor of IEEE Transactions on Mobile Computing and IET Communications.

A3 – Technical Session: Remote Session (Saturday, May 9th, 9:00–10:20)

A3.2: Identifying Comorbid Mental Disorders via Causal Multi-Label KNN

(Invited)

Tiantian Wang[1] and Mengchu Zhou[2]

[1]School of Statistics and Mathematics, Zhejiang Gongshang University, Hangzhou, China
[2]Department of Electrical and Computer Engineering, New Jersey Institute of Technology, Newark, NJ, USA

ABSTRACT:

Accurate and efficient identification of comorbid mental disorders is a critical challenge in intelligent healthcare. Existing multi-label classification methods often neglect causal dependencies among disorders and between patient features and diagnostic outcomes, which limits their interpretability and clinical reliability. To address this issue, we propose a novel framework called Causal Inference K-Nearest Neighbors (CI-KNN). It integrates causal discovery into the multi-label classification process. Specifically, it introduces a causal feature label subspace optimization strategy to eliminate spurious correlations and constructs a label-label causal network to capture directional influences among comorbid disorders. Furthermore, a causality-based probability correction mechanism is applied to refine prior and posterior probabilities. We have evaluated the proposed framework on a large-scale psychiatric dataset containing 8,079 clinical cases from the Seventh People's Hospital in Hangzhou. Experimental results demonstrate that CI-KNN achieves superior performance in terms of accuracy, F1 score, and interpretability compared to state-of-the-art baselines. By bridging causal inference with diagnostic automation, this work provides reliable support for clinical decision-making in mental health assessment.

BIOGRAPHY:

Tiantian Wang received the B.S. degree in information and computing science from the School of Information and Network Engineering, Anhui Science and Technology University, China, in 2020, and the M.S. degree in applied statistics from the School of Science, Hunan University of Technology and Business, China, in 2024. She is currently pursuing the Ph.D. degree in big data statistics with the School of Statistics and Mathematics, Zhejiang Gongshang University, China. Her research interests include causal inference, artificial intelligence, and machine learning.

A3 – Technical Session: Remote Session (Saturday, May 9th, 9:00–10:20)

A3.3: Energy-Efficient Hybrid AI Tutor for Learning Varieties of English

Cunqian You[1], **Miao Wei**[1], **Xiaojun Wang**[1], **Huijuan Lu**[1], **and Yu-Dong Yao**[2]

[1]China Jiliang University
[2]Department of Electrical and Computer Engineering, Stevens Institute of Technology, Hoboken, NJ, USA

ABSTRACT:

Energy-aware design is becoming a practical constraint for speech-first language tutors, especially when learners expect fluent interaction across multiple varieties of English (AmE, BrE, Indian English, AusE, and CanE). We study three end-to-end architectures for an AI learning assistant: on-device inference, cloud-only inference, and a hybrid edge-cloud design that offloads selectively. The comparison uses a dialect-balanced workload of short drills, pronunciation checks, and open conversation, and reports system-wide energy per session, latency, and learning proxies. In our simulations, the hybrid design cuts total energy by about 25–35% relative to a naive cloud deployment while keeping response accuracy within 1–2 points of the cloud model on dialect-sensitive prompts. A lightweight cache further reduces repeated-query cost, consistent with prior evidence that caching lowers voice-assistant energy and latency (Montoya Benitez et al., 2025). The paper contributes a compact evaluation recipe for "learning per watt", plus a deployable hybrid blueprint that preserves offline usability and still benefits from cloud capacity when the local model is uncertain.

BIOGRAPHY:

Cunqian You is an IEEE Senior Member and AI development leader at the Modern Technology College, China Jiliang University, China. He has over 20 years of experience in artificial intelligence systems, software engineering, digital infrastructure, and academic administration. His research interests include multimodal learning and fusion, intelligent agents and large language model integration, knowledge graphs, semantic technologies, big data governance, and AI-enhanced education. He has led and participated in multiple research and technology projects, including national-level initiatives, and has contributed to the planning and construction of several innovation laboratories in intelligent systems, big data analytics, and AIGC applications. His recent publications focus on multimodal personalized learning, medical image analysis, and AI-driven educational systems. He is also active in professional service as a standards contributor, reviewer, track chair, and mentor for student innovation and ACM/ICPC-related competitions.

A3 – Technical Session: Remote Session (Saturday, May 9th, 9:00–10:20)

A3.4: Intent-Driven AI-Native Network Slicing for Rural Broadcasting over ATSC 3.0 / B2X: A Reinforcement Learning Approach

Harsh Sahu[1], Manas Sharma[1], Priyadarsini K[1], Preksha Shah[2], Rashmi Kamran[3], Leonard J Fabiano III[4], and Sangsu Kim[5]

[1]Department of Data Science and Business Systems, SRM Institute of Science and Technology. Chennai, India
[2]Free Stream Technologies, New Delhi, India
[3]AdCore Local, Norcross, GA, USA
[4]EdgeBeam Wireless, Boston, MA, USA
[5]ONE Media 3.0, Cockeysville, MD, USA

ABSTRACT:

This paper presents an intent-driven network slicing framework for Advanced Television Systems Committee (ATSC) broadcast networks and for their evolution toward B2X (Broadcast-to-Everything) networks. A closed-loop control architecture is implemented to orchestrate physical layer resources (a network slicing approach) by jointly dynamically adapting modulation, coding rate, and transmit power using a Proximal Policy Optimization (PPO) reinforcement learning agent to satisfy high-level operator intents such as maximizing service availability under high-demand conditions. The proposed architecture for Artificial Intelligence (AI)-driven broadcasting introduces a multi-layer solution including an intent translation layer mapping operator goals to utility functions; a spatial digital twin modeling to validate AI-recommended physical layer level resource configurations (for example, B2X Virtual Bandwidth Part (VBP) allocations); and a human-in-the-loop governance workflow, which is modeled as a formal state machine. This framework evaluation focuses on AI-supported offloading to broadcast networks by predicting coverage, spectral efficiency, and emergency reliability that impact any change in the live broadcast chain. Simulation-based evaluation on a custom rural environment yields a substantial reduction in the decision latency and improvement in coverage and reliability over static configurations.

BIOGRAPHY:

Dr. Preksha Shah is currently a Senior Research Scientist at Free Stream Technologies, working on global standardization efforts in TSDSI, ITU-T, 3GPP, and ATSC. Prior to this, she was a Research Scientist in IIT Bombay. Her interests include spectrum-efficient D2M and B2X systems, convergence of broadcast and cellular networks, AI-driven network optimization, and energy-efficient communications. She has served as Co-Chair of WG4 in the ITU-T Focus Group on AI-Native for Telecommunication Networks (FG-AINN). She was recognized among the “100 Brilliant and Inspiring Women in 6G" (2024) by Women in 6G. She received her Ph.D. and M.‘Tech in Electronics and Communication Engineering from Lovely Professional University, India.

W4 – Technical Session: RIS, UAV & Next-Gen Network Infrastructure (Saturday, May 9th, 13:30–15:10)

W4.1: CSI-RS Overhead Reduction in 6G

(Invited)

Zhengxiang Ma, Zhigang Rong, Jialing Liu, Baoling Sheen, Ruikang Yang, Juan M. Roa, Renjian Zhao, Weimin Xiao, Miguel Dajer, and Anthony C.K. Soong

Wireless Standards and Research, Futurewei Technologies, USA

ABSTRACT:

This paper explores techniques to reduce the CSI-RS overhead for massive MIMO in 6G. A structured mapping between antenna ports and CSI-RS REs is introduced to facilitate lowering the CSI-RS density in terms of RE/RB/port. Its performance advantage over unstructured mapping is studied. Although these techniques are powerful, the performance improvements were limited. Hence, AI/ML based algorithms are also explored and our results showed that significant CSI-RS overhead reduction is possible without impacting performance

BIOGRAPHY:

Dr. Zhengxiang Ma obtained his M.S. and Ph.D. degrees in Applied Physics at Stanford University in 1991 and 1995 respectively. He joined Bell Labs afterwards to conduct research in wireless communications. He left Bell Labs in 2008 as a Distinguished Member of Technical Staff and joined Futurewei Technologies, where he is currently a Technical VP. He is an IEEE member and his research interest includes AI/ML in 5G PHY layer, antenna design and array architecture, antenna system network performance, radio signal processing and power amplifier architecture.

W4 – Technical Session: RIS, UAV & Next-Gen Network Infrastructure (Saturday, May 9th, 13:30–15:10)

W4.2: RIS Element Phase-Offset Calibration from RSRP Reports

(Invited)

Narayan Prasad, Tao Luo, Meilong Jiang, and Junyi Li

Qualcomm Technologies, Inc., USA

ABSTRACT:

Calibration of a reconfigurable intelligent surface (RIS) in cellular systems is constrained by a practical obstacle: low-complexity user equipment (UE) typically reports only reference signal received power (RSRP), not the complex-valued channel state information (CSI) or in-phase/quadrature (I/Q) measurements assumed by most prior art. This paper develops a complete framework for RIS phase-offset calibration from magnitude-only feedback. We formulate RSRP-based calibration as a constrained phase-retrieval problem under a single-offset-per- element impairment model, and propose a family of phaseonly calibration codebooks based on—Hadamard-randomization, adjacent-element grouping, dither-plus-binary-quantization, and a hybrid schedule—that explicitly balance reflected power toward a designated buddy receiver against the pattern diversity required for magnitude-only recovery. We introduce a oneshot manifold-optimization solver that jointly updates the element drifts and unknown measurement phases on a single torus manifold, and extend it to an uncertainty-aware variant that accommodates bounded cascade-channel errors. We further adapt a zero-shot calibration principle from phased arrays to RISs for commissioning-time initialization. Simulations on quaternary RISs with one or more buddy receivers show that the proposed codebooks and solvers substantially outperform naive and independent and identically distributed (i.i.d.) random baselines and closely approach a genie upper bound.

BIOGRAPHY:

Dr. Narayan Prasad received the B. Tech degree in Electrical engineering from IIT- Delhi, India and the PhD degree in Electrical Engineering from the University of Colorado-Boulder, USA. He is presently a Principal Engineer at Qualcomm Technologies Inc., and is broadly interested in devising and applying optimization tools to enhance communication systems. Prior to joining Qualcomm, he was a Principal Researcher/Engineer at Futurewei Technologies and prior to that he was a Senior Researcher at NEC Laboratories America. He has conducted research and extensively published on Reconfigurable Intelligent surfaces, Low resolution MIMO communications and Channel reconstruction problems in Massive MIMO, mmWave communications, robust communications and several optimization problems arising in radio resource management. He has also been involved in several 3GPP standardization activities spanning B5G Shared Spectrum, Multi-user MIMO, MIMO Codebook design and CoMP.

W4 – Technical Session: RIS, UAV & Next-Gen Network Infrastructure (Saturday, May 9th, 13:30–15:10)

W4.3: RIS-Assisted UAV Networks with Energy Harvesting and Data Collection

Tassnim Mohamed and Liang Zhang

Department of Engineering, University of Maryland Eastern Shore, Princess Anne, MD, USA

ABSTRACT:

Unmanned aerial vehicles (UAVs) are widely used in wireless powered communication networks (WPCNs) to deliver energy and collect data from distributed Internet of Things (IoT) sensors. However, conventional Harvest-Then-Transmit (HTT) protocols may suffer from limited efficiency when multiple sensors share the same communication frame. In this paper, we propose a mini-frame communication scheme assisted by the reconfigurable intelligent surface (RIS) to improve energy transfer and uplink data transmission efficiency in UAV-enabled WPCNs. A low-complexity heuristic algorithm is developed to search for the time-splitting factor, align RIS phases to strengthen wireless channels, and allocate uplink time among sensors using a fairness-based rule. Simulation results show that the proposed mini-frame and RIS approach achieves higher throughput as compared with the conventional HTT-based schemes and maintains consistent performance gains across different numbers of sensors, RIS elements, and various transmission power levels in UAVs.

BIOGRAPHY:

Tassnim Mohamed is a graduate research assistant and graduate student in the Department of Engineering at the University of Maryland Eastern Shore (UMES). Her research interests include wireless communications and UAV communication, channel modeling, reconfigurable intelligent surfaces (RIS), network infrastructure, and data center networks.

O4 – Technical Session: Fiber System and Network (Saturday, May 9th, 13:30–15:10)

O4.1: The Frontier of In-door Networks: A Review of Fiber-To-The-Room (FTTR) Standards

(Invited)

Zhicheng Ye[1], Jun Cheng[1], Yan Zeng[2], Xuming Wu[1], Shaozheng Yu[1], Yuanqiu Luo[3], and Liang Zhang[1]

[1]Huawei Technologies Co. Ltd., Wuhan, China
[2]Huawei Technologies France S.A.S.U., Paris, France
[3]Futurewei Technologies, Inc., Basking Ridge, USA

ABSTRACT:

FTTR (Fiber-To-The-Room) is the last-mile optical connection to meet the surging demands of in-door environments to address signal attenuation, dead zones, and unstable connections of traditional in-door networks. Although global FTTR adoption faces challenges such as installation costs and deployment complexity, its standardization is accelerating widespread application. This paper systematically reviews the standard development of FTTR, including core concepts, use cases and requirements, architecture and technologies, fiber infrastructure, and AI applications.

BIOGRAPHY:

Zhicheng Ye is the Head of Research Department, Optical Product Line, Huawei Technologies Co. Ltd. Zhicheng Ye graduated from Nankai University in 2011. He has served as the head of the Optical and Quantum Lab of Huawei Munich Research Center, director of the Access Optical Technology Lab, and chief architect of FTTR, and he is now head of research department in Huawei Optical product line. He has 15+ years of background in optical access technology development and research. He has a deep understanding of the architecture, service, and technology evolution direction of optical access OLT, ODN, and home network systems. He has 40+ patents and 20+ international academic papers.

O4 – Technical Session: Fiber System and Network (Saturday, May 9th, 13:30–15:10)

O4.2: Capacity Enhancement with Multicore Fibers for Next Generation Subsea Systems

(Invited)

Govind Vedala

SubCom LLC, USA

ABSTRACT:

Modern data-centric applications such as artificial intelligence, hyperscale computing, and video streaming are driving the need for increased capacities in subsea fiber optic cables connecting data centers across continents. Enhancements to cable capacity surpassing the ~ 0.5 Pb/s limit of present-day systems with single-mode fibers can be realized by extending the usable spectrum beyond the C-band into the L-band and/or by adopting multicore fiber (MCF) technology. Multicore fibers, in which light propagates in two or more cores housed in the same cladding, have the potential to reduce costs in subsea systems by enabling more compact cable solutions. This talk focuses on capacity scaling with uncoupled or weakly coupled multicore fibers, which are particularly attractive due to their compatibility with existing standard DSP transceivers. We review recent developments in fiber characteristics of both 2-core and 4-core MCFs, and their impact on overall system performance, with emphasis on the importance of managing crosstalk between neighboring cores (arising from their close proximity) in order to minimize performance degradation on data channels. Lastly, we present experimental characterization of transmission performance in uncoupled 4-core MCF over transatlantic distance, demonstrating the potential capacity improvements offered by MCF technology.

BIOGRAPHY:

Govind Vedala received his Ph.D. in Electrical Engineering from the University of Kansas, USA, in 2019. Since then, he has been with SubCom LLC, USA, serving as a Senior Member of Technical Staff in the System Research group, where he focuses on conducting transmission experiments, signal processing, and investigating technologies for next-generation subsea systems.

O4 – Technical Session: Fiber System and Network (Saturday, May 9th, 13:30–15:10)

O4.3: Providing 10-Gigabit Optical Home Using 50G-Passive Optical Network and Fiber-to-the-Room

(Invited)

Yuanqiu Luo[1], Frank Effenberger[1], Yan Zeng[2], Xuming Wu[2], and Dekun Liu[3]

[1]Technology Strategy Department, Futurewei Technologies, Inc., Basking Ridge, USA
[2]Department of Europe Standardization & Industry Development, Huawei Technologies France S.A.S.U., Paris, France
[3]Research Department of Optical Product Line, Huawei Technologies Co. Ltd, Wuhan, China

ABSTRACT:

This paper presents a 10-gigabit optical home solution based on the integration of 50G-Passive Optical Network (50G-PON) and Fiber-to-the-Room (FTTR) architecture. The proposed system extends high-capacity optical fiber from the central office to individual rooms within the home, enabling seamless gigabit-class connectivity for bandwidth-intensive applications such as 4K/8K video streaming, cloud gaming, smart home services, and immersive digital experiences. The architecture leverages 50G-PON to provide sufficient upstream and downstream capacity at the access network level, while FTTR distributes fiber to multiple sub-fiber units (SFUs) inside the home. Each SFU integrates optical and Wi-Fi functionalities, enabling coordinated wireless access across rooms. Two key techniques are developed to achieve this goal. First, a coordinated transmission scheme among multiple SFUs is introduced to coordinate wireless access and mitigate inter-AP interference. Second, the design supports an upgrade to 10 Gb/s FTTR by reusing commercially available 2.5G optical components, including DFB transmitters and PIN receivers. Experimental results demonstrate stable 10G-class transmission using reused 2.5G optics. In addition, coordinated transmission among SFUs provides improved throughput stability and consistent user experience throughout the home. The proposed approach offers a practical and scalable pathway for next-generation FTTR evolution.

BIOGRAPHY:

Yuanqiu Luo is a Director of Optical Access Standards of Futurewei Technologies, USA. Before joining Futurewei, she was with NEC Laboratories America, Princeton, NJ. She received the Ph.D. degree in Electrical Engineering from the New Jersey Institute of Technology, Newark, USA.

Dr. Luo has been involved in the areas of broadband high-speed networks for more than 20 years. She is leading the IEEE high-speed optical access standards. She is the IEEE 802.3dk Task Force Chair and was the Chief Editor of IEEE standards 802.3cp. She was a Clause Editor of IEEE standards 802.1AS.

Dr. Luo serves as an Editor of more than 10 ITU recommendations and supplements, such as G.987.3 (XG-PON), G.988 (OMCI), G.989.2 (NG-PON2), G.9802 (multiwave PON), G.9803 (Radio over fiber), G.9804.2 (50G-PON), G.9807.1(XGS-PON). She was a key technical contributor to ITU PON protocol layer specifications. As an active member of IEEE and ITU, Dr. Luo has made more than 200 technical contributions to drive network and communication technologies as international standards.

Dr. Luo is a member of the IEEE ComSoc Educational Services Board and the ComSoc Standards Development Board. She serves as a Technical Editor of IEEE Wireless Communications, IEEE Internet of Things Journal, and IEEE Network. She has authored more than 60 publications and holds over 30 US patents. She received the Best Paper Award from IEEE & OSA Journal of Lightwave Technology in 2013. She was a two-time recipient of the IEEE Standards Award for contributions to 802.3AS (2011) and 802.3cp (2021). She was selected to the 2021 N^2Women: Stars in Computer Networking and Communications. For her contributions to the standardization of high-speed optical access protocols, Dr. Luo was elevated as an OPTICA Fellow and an IEEE Fellow.

A4 – Technical Session: AI Applications and Data-Driven Intelligence (Saturday, May 9th, 13:30–15:10)

A4.1: Modeling and Prediction Urban Floods with Wireless Flood Sensor Data Assimilation - A Machine Learning Approach

(Invited Talk)

Jason Liao[1] and Zhanyang Zhang[2]

[1]Computer Science Department, Macaulay Honor College, City University of New York
[2]Computer Science Department, College of Staten Island, City University of New York

ABSTRACT:

New York City (NYC) is increasingly affected by floods from extreme weather and rising sea levels. Coastal neighborhoods undergo high-tide floods that destroy infrastructure and reduce property value. Hurricanes Henri and Ida (2021) hit NYC with unprecedented rainfall causing property damage and people deaths. Models and numerical simulations utilizing high performance computers can provide valuable information for city agencies, first responders and local communities to evaluate flood impacts and manage risks. Most of the models are physical models since they use physical environment parameters as inputs, such as rainfall, meteorological conditions, storms, terrain elevations, land uses, ground infiltration and storm sewer systems, as well as surrounding infrastructure, such as highways, dams, blue belts, and seawalls. The precision of model results critically depends on the accuracy of the input data. It is an extremely difficult, time-consuming and labor-intensive task for model builders to assess the values for the input parameters, since the data often are unavailable, uncertain or incomplete. Very often people have to estimate or best guess the input values to run the model. Even with the most experienced flood experts, their best guesses could lead to bias or misleading results. Machine learning approach uses computational methods to "learn" information directly from data without relying on a predetermined equation as a model. It has a wide range of applications with successful results. FloodNet is a collaboration project with partners from City University of New York, New York University, New York City agencies and New York Sea Grant. Its mission is to develop tools for real-time urban flood monitoring, implement these tools to measure flooding in NYC, and make flood data available to stakeholders including residents, community-based organizations, government agencies, and researchers. Our project goal is to investigate the feasibility of using machine learning models with flood sensor data, made available by the NYC FloodNet, to train the physical model and optimize the input parameter values for the best accuracy. The figure below shows our overall model architecture design to couple a physical flood model and a machine learning layer with flood data assimilation. Our results show the proposed machine learning models (Random Forest and Supervise Regression) achieved higher accuracy compared with using physical models alone.

BIOGRAPHY:

Dr. Zhanyang Zhang acquired his PhD degree in computer science from the City University of New York. He received a MS degree in computer science from the College of Staten Island and a BE degree in computer engineering from Jilin University, Changchun, China. He is currently a faculty member of Computer Science Department at both College of Staten Island and the Graduate Center, the City University of New York (CUNY). His current research interests include wireless networks, numerical modeling and simulations, IoT/sensor networks in smart city applications, high performance and cloud computing. Before joining CUNY, he was a member of technical staff (MTS) at Bell Labs, Lucent Technology where he worked on several Research and development projects in in advance wireless networks.

A4 – Technical Session: AI Applications and Data-Driven Intelligence (Saturday, May 9th, 13:30–15:10)

A4.2: Sentiment Forecasting By Data-Driven Models

Othoniel Joseph, Prathyusha Sukumar, Rayner Ulloa, Avimanyou Vatsa, and Alexander Casti

Dept. of Computer Science & Math, Fairleigh Dickinson University, Teaneck, NJ, USA

ABSTRACT:

Forecasting stock prices and corresponding emotions is a complex process. Economic and financial forecasting leverages financial planning and growth predictions for the country and the industrialist, significantly impacting investors' lives and financial losses. Therefore, this study investigates the impact of integrating sentiment analysis data on the accuracy of LSTM sequential models and Graph Neural Networks (GNNs) for predicting semiconductor stocks' daily closing prices. Also, the predictive performance of models trained solely on historical prices and technical indicators (Volume, RSI, MACD) versus models augmented with a general sentiment score derived from financial news, with missing sentiment values imputed using forward-fill. The performance metrics, Root Mean Squared Error (RMSE), Mean Absolute Error (MAE), and Directional Accuracy, are used to evaluate the models. In conclusion, results indicate that incorporating forward-filled sentiment data marginally improved average directional accuracy across the tested stocks but did not consistently reduce RMSE or MAE compared to models without sentiment features. Moreover, the Spatio-Temporal Graph Neural Network (ST-GNN) outperforms sequential models. The ST-GNN enhances predictive performance through dynamic edge modeling, improved data fusion, and adaptive learning. It also demonstrates that fusing quantitative and qualitative data within a graph-based deep learning framework can yield more stable, accurate stock forecasts by incorporating financial indicators, stock data, and sentiment analysis.

BIOGRAPHY:

Prathyusha Sukumar received the M.S. degree in Management Information Systems from Fairleigh Dickinson University, USA, and a B.S. in Biology from India. Her research interests include natural language processing, graph neural networks, and machine learning for financial prediction. She is also interested in blockchain technology with a focus on real-world adoption.

A4 – Technical Session: AI Applications and Data-Driven Intelligence (Saturday, May 9th, 13:30–15:10)

A4.3: Empirical Analysis of Risk for Sports Facilities

Neel Prajapati, Adarsh Dhorajiya, Burhan Petiwala, Avimanyou Vatsa, and Alexander Casti

Dept. of Computer Science & Math, Fairleigh Dickinson University, Teaneck, NJ, USA

ABSTRACT:

In today's digital landscape, organizations depend on intricate information systems to manage sensitive data, maintain operations, and ensure business continuity. As these systems become more complex, the need for effective risk management strategies grows. Improving facilities, student satisfaction, event attendance, and sustainability are great successes in operational policies, procedures, and event management. Additionally, the sports building serves a diverse community, including students, faculty, staff, and external guests, supporting daily recreation, varsity athletics, and large-scale events. Therefore, this study presents a focused risk management approach based on the NIST Cybersecurity Framework (CSF 2.0) for athletics centers in sports facilities, such as indoor game spaces, fitness centers, and outdoor game spaces, at academic institutions. Thus, this study aims to evaluate asset management practices and identify physical and logical vulnerabilities by conducting in-depth interviews with students, coaches, and other supporting staff, and by gathering firsthand insights into operational workflows, physical security measures, and system-level safeguards. These qualitative findings, combined with realistic frameworks, form the foundation of analysis. In conclusion, sports operations and this study underscore the institution's commitment to technical reliability, risk awareness, and corresponding mitigation, as well as 24/7 assistant services.

BIOGRAPHY:

Avimanyou Vatsa is an Associate Professor of Computer Science and Director, Deep Chain Lab, Fairleigh Dickinson University (FDU), Teaneck, NJ. Before joining FDU as an Assistant Professor in 2018, he was an assistant professor at West Texas A&M University. Dr. Vatsa received the Distinguished Faculty Award for Student Success and Belonging. He earned his MS and Ph.D. in Computer Science from the University of Missouri-Columbia. Dr. Vatsa teaches and conducts research in data science, cybersecurity, bioinformatics, and computational biology, including work on skin cancer and related diseases. Additionally, Dr. Vatsa is an opinion leader and a public speaker who has delivered several keynote addresses, delivered invited talks, and been invited to serve as the chief guest or guest of honor at conferences and events. He is an active volunteer of IEEE North Jersey Section.

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