IEEE MTT-S Young Professionals Workshop on Electromagnetic Modeling and Optimization

EMO2025

Jeddah, Saudi Arabia · Nov. 23, 2025

Program Book

MTT-S IEEE MICROWAVE THEORY & TECHNOLOGY SOCIETY

IEEE youngprofessionals

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EMO2025

IEEE MTT-S Young Professional Workshop on Electromagnetic Modeling and Optimization

Workshop Agenda (in China Standard Time, UTC+8)

Sunday, November, 23, 2025 Zoom Conference (ID: 808 402 3784, https://us06web.zoom.us/j/8084023784)	
Opening Ceremony **Chair: Wei Liu,** *Abdullah University of Science and Technology, Saudi Arabia*	
08:30～08:35	**Welcome from Advisory Committee Chair** Qi-Jun Zhang, Carleton University, Canada
08:35～08:40	**Welcome from the General Chair** Wei Liu, King Abdullah University of Science and Technology, Saudi Arabia
Young professionals talks **Regular Session: Part I - Morning** **Chair: Jianan Zhang,** *Southeast University* **Weicong Na,** *Beijing University of Technology*	
08:40～09:10	**Invited Talk 1:** **Neuro-Transfer Function: A General Knowledge-Based Neural Network Technique for EM Modeling** Feng Feng, Tianjin University
09:10～09:40	**Invited Talk 2:** **Frequency Selective Surfaces for EMI/EMC Reduction** Syed Muzahir Abbas, GME, Australia

09:40～10:10	**Invited Talk 3:** **Advanced Space-mapping neural network method for parametric modeling of microwave components** Shuxia Yan, Tiangong University
10:10～10:40	**Invited Talk 4:** **Deep-learning-enabled generative design of quasi-free-form metamaterials** Yanhe Lyu, National University of Singapore
10:40～11:10	**Invited Talk 5:** **A Multi-Submodel Soft-Switch ANN Framework for Transistor Modeling** Jinyuan Cui, Carleton University
11:10～11:40	**Invited Talk 6:** **Recent Development of MISL Based Microwave Devices- A Literature Overview** Yi Wu, Tianjin University
Young professionals talks **Regular Session: Part II - Afternoon** **Chair: Jing Jin,** *Central China Normal University* **Wenyuan Liu,** *Shaanxi University of Science and Technology*	
14:00～14:30	**Invited Talk 7:** **Attention Mechanism Combined With Deep Recurrent Network for Nonlinear Circuit Macromodeling** Sayed Alireza Sadrossadat, Yazd University
14:30～15:00	**Invited Talk 8:** **Adaptive frequency-domain sampling and equivalent circuit modeling for efficient microwave design** Francesco Ferranti, Luleå University of Technology
15:00～15:30	**Invited Talk 9:** **Optimization approaches for base station dipole antennas and endfire antennas** Xihui Teng, King Abdullah University of Science and Technology

15:30～16:00	**Invited Talk 10:** **Artificial Intelligence for Electromagnetic Scattering Modeling** Dehua Kong, National University of Singapore
16:00～16:30	**Invited Talk 11:** **Reconfigurable Intelligent Surfaces (RIS) Design Optimization and Hardware Advancements** Ruiqi Wang, King Abdullah University of Science and Technology
16:30～17:00	**Invited Talk 12:** **Surrogate-based microwave modeling and optimization approach for microwave components** Wei Zhang, Beijing University of Posts and Telecommunications
Interaction with senior professionals (Evening Session) **Chair: Wei Liu,** *King Abdullah University of Science and Technology* **Feng Feng,** *Tianjin University*	
21:00～21:05	**Welcome address**
21:05～21:20	**Short presentations and comments from senior professionals** **21:05 – 21:10 Presentation 1** **21:10 – 21:15 Presentation 2** **21:15 – 21:20 Presentation 3**
21:20～21:40	**Suggestions for young professionals** Qi-Jun Zhang, Carleton University, Canada Zhizhang (David) Chen, Dalhousie University, Canada Qingsha Cheng, Southern University of Science and Technology, China
21:40～21:45	**Close the workshop and thanks**

Detailed Zoom Conference Information:

Topic: 2025 IEEE MTT-S Professional Workshop on Electromagnetic Modeling and Optimization (EMO 2025)

Time: Nov 23, 2025, 08:30 AM Beijing, Shanghai (UTC+8)

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Invited Senior Professionals

Qi-Jun Zhang

Qi-Jun Zhang received the B.Eng. degree from the Nanjing University of Science and Technology, Nanjing, China in 1982, and the Ph.D. Degree in Electrical Engineering from McMaster University, Hamilton, Canada, in 1987.

He was a research engineer with Optimization Systems Associates Inc., Dundas, Ontario, Canada during 1988-1990 developing advanced optimization software for microwave modeling and design. He joined the Department of Electronics, Carleton University, Ottawa, Canada in 1990 where he is presently a Chancellor's Professor. His research interests are modeling, optimization, and neural networks for high-speed/high-frequency electronic design. He is an author of the book Neural Networks for RF and Microwave Design (Boston: Artech House, 2000), a coeditor of Modeling and Simulation of High-Speed VLSI Interconnects (Boston: Kluwer, 1994), and a coeditor of Simulation-Driven Design Optimization and Modeling for Microwave Engineering (London, UK: Imperial College Press, 2013).

Dr. Zhang is a Fellow of the IEEE, a Fellow of the Canadian Academy of Engineering, and a Fellow of the Engineering Institute of Canada. He is a Topic Editor on Design Automation for the IEEE Journal of Microwaves. He was the Chair of the Technical Committee on Design Automation (MTT-2) of the IEEE Microwave Theory and Technology (MTT) Society. He is the Guest co-editor of the Special Issue on Machine Learning for Microwave Engineering for the IEEE Microwave Magazine (October 2021), and a Guest-Editor of the Special Issue on AI and Machine Learning Technologies for Microwaves for the IEEE Transactions on MTT (November 2022).

Qi-Jun Zhang, Carleton University
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Invited Senior Professionals

Zhizhang (David) Chen

Zhizhang Chen received a Bachelor’s degree in Radio Engineering from Fuzhou University, China, a Master's degree in Radio Engineering from Southeast University, P. R. China, and a Ph.D. degree in Electrical Engineering from the University of Ottawa, Canada. He was an NSERC postdoctoral fellow at McGill University, Montreal, Canada. He is a professor in Electrical and Computer Engineering. He has been a guest editor, track editor, and associate editor for IEEE journals, including the IEEE Transactions on Microwave Theory and Techniques, IEEE Journal of Microwaves, and the IEEE Journal on Multiscale and Multiphysics Computational Techniques. His research interests include time-domain electromagnetic modelling techniques, ultra-wideband wireless communication systems, and wireless power transfer. He is a Fellow of the IEEE, the Canadian Academy of Engineering, and the Engineering Institute of Canada. He is an Ad-Com Member and the Wireless Power Transfer and Energy Conversion Committee Chair of the IEEE Microwave Theory and Techniques (MTT) Society.

Zhizhang (David) Chen, Dalhousie University, zz.chen@ieee.org .

Invited Senior Professionals

Qingsha S. Cheng

Dr. Qingsha Cheng (SMIEEE) is currently a tenured associate professor with the Department of Electrical and Electronic Engineering, Southern University of Science and Technology (SUSTech), Shenzhen, China. He is also with Shenzhen Key Laboratory of EM Information as a vice director. He received the B.Eng. and M. Eng. from Chongqing University, China. He received his Ph.D. at McMaster University, Canada in 2004. He was with the Department of Computer Science and Technology, Peking University, China. He took positions of post-doctoral fellow, research associate academic, research engineer and lecturer with the Department of Electrical and Computer Engineering and the Faculty of Engineering, McMaster University. In 2014, he joined SUSTech as an assistant professor. He has co-organized and co-chaired special sessions in international conferences such as IEEE NEMO and IEEE ACES. His research interests include smart modelling and optimization of microwave components and antennas, surrogate modelling and optimization, multi-objective optimization, and artificial intelligence. He has authored or co-authored more than 200 publications in book chapters, international technical journals, and refereed conference proceedings. His research is funded by the National Natural Science Foundation of China (NSFC) and the Ministry of Science and Technology (MOST) of China.

Invited Talk 1

Neuro-Transfer Function: A General Knowledge-Based Neural Network Technique for EM Modeling

Feng Feng

School of Microelectronics,
Tianjin University

Abstract

Artificial neural networks (ANNs) have emerged as a powerful tool in the modeling and optimization of microwave components and circuits. This talk begins with an overview of the evolution and current landscape of ANN-based technologies in electromagnetic (EM) parameterized modeling, then discusses knowledge-based neural networks (KBNNs), which integrate ANNs with existing equivalent circuit or empirical models to achieve higher modeling accuracy with less training data and improved generalization. The talk further introduces the advanced neuro-transfer function (neuro-TF) approach, including the applications of deep neural network, sensitivity analysis neural networks and the novel format neuro-TF in microwave design and optimization. The neuro-TF approach leverages prior knowledge embedded in transfer functions for parameterized EM modeling, particularly in scenarios where conventional circuit models are unavailable.

Biography

Feng Feng received the B.Eng. degree from Tianjin University, Tianjin, China, in 2012, and the Ph.D. degree in microelectronics from Tianjin University, Tianjin, China, and the Department of Electronics at Carleton University, Ottawa, ON, Canada, in 2017. From 2017 to 2020, he was a Postdoctoral Fellow in the Department of Electronics at Carleton University, Ottawa, ON, Canada. In 2020, he joined the School of Microelectronics at Tianjin University, where he is currently a Full Professor. His research interests include artificial intelligence and machine learning-based electromagnetic parametric modeling and optimization methods for high-speed/high-frequency circuit design. He has authored or co-authored over 100 publications. He serves as an Associate Editor of IEEE Microwave and Wireless Technology Letters, and a Guest Editor for IEEE Microwave Magazine of Special Issues of Young Professionals Workshop on Electromagnetic Modeling and Optimization. He is also selected as an IEEE MTT-S Outstanding Young Professional Lecturer (2025–present).

Dr. Feng is a Vice Chair of the IEEE MTT-S Technical Committee on Design Automation (TC-2), and a member of the IEEE MTT-S Working Group on AI and Machine Learning Based Technologies for Microwaves in the MTT-S Future Directions Committee. He was the TPC Chair of the 2025 IEEE MTT-S International Conference on Numerical Electromagnetic and Multiphysics Modeling and Optimization (NEMO 2025).

Invited Talk 2

Frequency Selective Surfaces for EMI/EMC Reduction

Syed Muzahir Abbas

GME, Australia

Abstract

With the advancement of wireless communication technologies, supporting electronic systems and Radio Frequency (RF) components, such as antennas, filters, couplers, phase shifters, waveguides are becoming significantly important. Coexistance of various wireless technologies and demand to fit multi-frequencies supporting systems have increased the need to address Electromagnetic Interference (EMI) and Electromagnetic Compatibility (EMC) related problems. Moreover, multiple-input-multiple-output (MIMO) systems are another area where EMI/EMC is of great importance in performance of such systems. Frequency Selective Surfaces (FSS) serve as effective tools in mitigating Electromagnetic Interference (EMI) and ensuring Electromagnetic Compatibility (EMC) in various electronic systems. FSS are periodic arrangements of metallic patterns on dielectric substrates, exhibit frequency-dependent reflection and/or transmission characteristics. By selectively blocking or allowing specific frequency bands of electromagnetic waves, FSS can attenuate unwanted signals while permitting the passage of desired frequencies. This property makes them highly suitable for EMI/EMC reduction in electronic devices and systems. They find applications in various sectors, including aerospace, telecommunications, and automotive industries, where stringent EMI/EMC standards must be met. They are employed in shielding enclosures, printed circuit boards, and antenna structures to suppress electromagnetic interference and enhance EMC performance. Despite their effectiveness, challenges remain in the practical implementation of FSS for EMI/EMC reduction. These include achieving broadband performance, integrating FSS with existing electronic systems, and addressing manufacturing complexities. This talk is intended to bridge the gap between the theoretical knowledge and commercialization, introducing the attendees to FSS technology for EMI/EMC reduction, offering insights into design methodologies, applications, and ongoing research efforts aimed at advancing the effectiveness and practicality of FSS-based solutions in ensuring electromagnetic compatibility in modern electronic systems. Moreover, it will provide insight to product development, its various stages, and challenges, to enable the young engineers to get familiar with industrial environment.

Biography

Syed Muzahir Abbas received the Ph.D. degree in electronics engineering at Macquarie University, North Ryde, N.S.W., Australia. He has been a Transmission Engineer for Alcatel-Lucent, Pakistan, RF Engineer with CommScope, Australia, and Senior Antenna Design Engineer and Senior Principal Engineer with Benelec Technologies, Australia. He has lectured various courses at CIIT, Islamabad, Pakistan, and in Australia with Western Sydney University, Macquarie University and University of Sydney. Currently, he is working as Lead Antenna Design Engineer with GME, Australia. He has been a visiting researcher at ElectroScience Laboratory, Ohio State University, USA, and Queen Mary University of London, UK. He has also received several prestigious awards and fellowships, including 2020 IEEE 5G World Forum Best Paper Award, 2019 IEEE NSW Outstanding Young Professional Award, 2018 Young Scientist Award (Commission B - Field and Waves) from the International Union of Radio Science (URSI), 2013 CSIRO Postgraduate Fellowship, 2012 iMQRES Award for Ph.D., and Research Productivity Awards in 2012 and 2010 from CIIT, Pakistan. He is co-inventor on about 20 patent applications and co-author on more than 200 research publications. His research interests include wireless mobility solutions, base station antennas, 5G antennas, mmWave antennas, 3D printed technology, metamaterials and metasurfaces, high impedance surfaces (HIS), frequency selective surfaces (FSS), electromagnetic bandgap structures (EBG), artificial magnetic conductor (AMC), beam steering, UWB, multiband antennas, flexible/embroidered antennas, CNT yarns, CNT/graphene-based antennas, reconfigurable antennas/electronics, RFID, Sensors and the development of antennas for UWB, VHF, UHF and WBAN applications. He is IEEE EMC-S Young Professionals Ambassador, Region-10 Coordinator for IEEE MTT-S Young Professionals, and Chair for IEEE New South Wales section, Australia.

Invited Talk 3

Advanced Space-mapping neural network method for parametric modeling of microwave components

Shuxia Yan
School of Electronics and Information Engineering,
Tiangong Universityy

Abstract

Space-mapping neural network (SMNN) technology has been widely applied for parametric modeling of microwave components. By establishing a mathematical relationship between fine model and coarse model, SMNN combine the accuracy of fine models with the efficiency of coarse models to accelerate the design of microwave components.

This talk will introduce two types of enhanced SMNN for microwave components modeling. An efficient sensitivity-driven stepwise method incorporating transfer learning is explored to achieve a much faster training convergence speed through effective knowledge transfer and reuse, consequently achieving high accuracy in a shorter training time. A dynamic scaling layer is incorporated into the SMNN structure to address the challenges posed by the unknown and unevenly distributed numerical outputs of the mapping neural network. Microwave modeling examples are showed to demonstrate the advantages of the advanced methods.

Biography

Shuxia Yan received the B.Eng. degree in communication engineering from Tiangong University, Tianjin, China, in 2010, and the M.E. and Ph.D. degree in electromagnetic field and microwave technology from Tianjin University, Tianjin, China, in 2012 and 2015, respectively. She is currently an Associate Professor with the School of Electronics and Information Engineering, Tiangong University. Her main research interests are neural-network-based methods for microwave device modeling and circuit design.

Invited Talk 4

Deep-learning-enabled generative design of quasi-free-form metamaterials

Yanhe Lyu

Department of Electrical and Computer Engineering,
National University of Singapore

Abstract

Generative deep learning (DL) has emerged as a powerful paradigm for high-degree-of-freedom electromagnetic design, capable of mapping targeted performance directly to optimized structures. By integrating physical priors, this approach enables efficient synthesis of quasi-free-form metamaterials, offering enhanced multi-objective management and high-dimensional feature representation compared with conventional and surrogate-assisted optimizations.

This talk presents the development and application of DL-enabled generative design frameworks for microwave metamaterials. Two representative cases will be discussed: a conditional generative adversarial network (cGAN)-based model for TE–TM mode-balanced angular-stable metasurfaces, and a multi-channel conditional generative adversarial network (Mc-cGAN) for dual-polarized, wide-angle, multi-task frequency-selective surfaces. The proposed frameworks provide a data-efficient exploration for diverse, beyond-logic, yet physically consistent structural solutions, highlighting the potential of generative DL in electromagnetic modelling and optimization.

Biography

Yanhe Lyu received a B.E. degree and a Ph.D. degree in Electronic Information Science and Technology and in Radio Physics from the Institute of Applied Physics, University of Electronic Science and Technology of China, China, in 2017 and 2022. Since August 2022, he has been with the Department of Electrical and Computer Engineering, National University of Singapore, Singapore, as a Research Fellow. His research interests include deep learning-enabled electromagnetic design, metamaterial, antenna array, time reversal, and integrated radiation and reflection

He was a recipient of the Best Student Paper Award of 2019 National Conference on Antennas (NCANT). He serves as reviewer for many IEEE scientific publications, including IEEE TAP. IEEE TMTT, IEEE TVT, and IEEE AWPL, and has been awarded the Top 200 Reviewers 2024/2025 by IEEE Antennas and Propagation Society. He served as a Secretary of the 2025 13th APCAP, a Publicity Chair 2025 8th IEEE IWRF&AT, and a Publicity Chair of the 2026 9th IEEE IWRF&AT. Dr. Lyu also serves as Secretary of the IEEE Singapore RFID Chapter.

Invited Talk 5

A Multi-Submodel Soft-Switch ANN Framework for Transistor Modeling

Jinyuan Cui
School of Microelectronics, Tianjin University
Department of Electronics, Carleton University

Abstract

Artificial neural networks (ANNs) have been widely applied to transistor modeling and show good overall fitting performance. In general, ANNs can effectively learn the main device behavior from measured data. However, in practical circuit simulations, convergence often becomes a bottleneck when ANN-based models are used in harmonic balance, and this convergence issue remains an open problem.

This talk analyzes the root causes of the convergence issue in standard ANN models and identifies key problems in low-voltage and extrapolated regions, such as non-physical current behavior and discontinuous derivatives. To address these issues, a multi-submodel ANN framework is developed. Compared with standard ANN models, the proposed approach improves accuracy, physical consistency, and convergence in DC, small-signal, and large-signal tests. In particular, it remains accurate and reliable in large-signal simulations where standard ANN models do not converge.

Biography

Jinyuan Cui received the B.Eng. degree from Qingdao University of Science and Technology, Qingdao, China, in 2019. He is currently pursuing the Ph.D. degree at the School of Microelectronics, Tianjin University, Tianjin, China and the Department of Electronics, Carleton University, Ottawa, Canada. His research interests include ANN-based transistor modeling, Bayesian methods for automated ANN model generation, and EDA tool development.

Mr. Cui serves as reviewer for IEEE Transactions on Microwave Theory and Techniques, IEEE Transactions on Electron Devices and IEEE Microwave and Wireless Technology Letters. He received the Best Oral Finalist at the 14th UK, Europe, China Millimeter Waves and THz Technology Workshop (UCMMT).

Invited Talk 6

Recent Development of MISL Based Microwave Devices- A Literature Overview

Yi Wu

School of Microelectronics, Tianjin University, Tianjin, China

Abstract

With the rapid advancement of communication technologies, the demand for novel transmission line structures continues to grow. As an emerging technology, Substrate Integrated Suspended Line (SISL) has been widely adopted in various microwave devices. In comparison, Metal Integrated Suspended Line (MISL) technology offers significant advantages for designing microwave and millimeter-wave devices, including lower loss, self-packaging capability, and miniaturization.

This overview offers a succinct yet detailed examination of the latest advancements in devices engineered utilizing MISL technology. It encompasses a thorough review of a diverse array of components, including both single-band and multi-band microwave filters, couplers, advanced antennas, efficient triplers, and mixers. Each of these meticulously designed components has consistently exhibited outstanding performance metrics across various testing phases, from intricate simulations to precise empirical measurements. This consistent excellence capabilities and significant potential of MISL technology, positioning it as a very good platform in the field of microwave device development.

Biography

Yi Wu (Member, IEEE) was born in Tai'an, Shandong, China. He received his Ph.D. degree from the Institut National des Sciences Appliquées de Rennes, Institut d'Électronique et des Technologies du numéRique (INSA-RENNES-IETR), Rennes, France, in July 2021. From October 2021 to November 2024, he served as a postdoctoral researcher at the School of Microelectronics, Tianjin University. Now, he has been an associate professor at the same institution.

Dr. Wu has authored or co-authored over 60 journal articles and international conference papers, with a recent research focus on the synthesis and design of microwave components using MISL (Metal Integrated Suspended Line) technology. Specifically, his work centers on microwave passive filters and other filtering devices. In addition to his research contributions, Dr. Wu has served as a reviewer for publications such as IEEE Transactions on Microwave Theory and Techniques, IEEE Transactions on Circuits and Systems—I: Regular Papers and IEEE Transactions on Circuits and Systems—II express briefs, IET Microwaves, Antennas &Propagation, Microelectronics Journal, and various other IEEE journals and conferences.

Invited Talk 7

Attention Mechanism Combined With Deep Recurrent Network for Nonlinear Circuit Macromodeling

Department of Computer Engineering, Yazd University, Yazd, Iran

Abstract

This article proposes a novel macromodeling method for high-frequency nonlinear circuits, utilizing an attention-based deep recurrent neural network (ATDRNN). This method leverages the attention mechanism within the RNN, comparing each time step with other time steps to determine their similarities. It then applies some coefficients as weights to the features of each time step based on these similarities, enhancing the RNN's ability to focus on more informative features. Consequently, this approach allows for more accurate modeling of nonlinear circuits. Additionally, having comprehensive signal information and similarities between various time steps mitigates the vanishing gradient problem commonly faced by RNNs. The models derived from this method not only exhibit superior accuracy compared to the conventional RNNs, but also run much faster than existing transistor-level models in circuit simulators. The effectiveness of the proposed method is demonstrated by modeling two nonlinear circuits, namely 2-coupled and 3-coupled line high-speed interconnects driven by multi-stage buffers.

Biography

Sayed Alireza Sadrossadat (Senior Member, IEEE) received the B.Sc. degree from the University of Tehran, Tehran, Iran, in 2007, the master’s degree from the University of Waterloo, Waterloo, ON, Canada, in 2010, and the Ph.D. degree from Carleton University, Ottawa, ON, Canada, in 2015. He is currently an assistant professor in the Artificial Intelligence Group, Department of Computer Engineering, Yazd University, Yazd, Iran and affiliated with the Electronics Group, Department of Electrical Engineering, Yazd University. His current research interests include optimization and neural network-based modeling of linear/nonlinear components and circuits, computer-aided design, deep learning, very large-scale integration design, probabilistic design, and yield maximization. He has been a Technical Reviewer for several IEEE/IET journals, such as IEEE TRANSACTIONS ON NEURAL NETWORK AND LEARNING SYSTEMS, IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUE, IEEE TRANSACTIONS ON VERY LARGE-SCALE INTEGRATION SYSTEMS, IET Microwave and Propagation, IET Electronic Letters, and IEEE CANADIAN JOURNAL OF ELECTRICAL AND COMPUTER ENGINEERING.

Invited Talk 8

Adaptive frequency-domain sampling and equivalent circuit modeling for efficient microwave design

Francesco Ferranti

Department of Computer Science, Electrical and Space Engineering, Luleå University of Technology, Sweden

Abstract

Electromagnetic (EM) solvers are of paramount importance to simulate the behavior of complex microwave devices and systems, which have many applications in domains as communication, sensing, and imaging. However, EM solvers can result very computationally expensive. In a design flow it is needed to carry out design tasks such as optimization and variability analysis, and therefore a high number of EM simulations can be required. The direct use of EM solvers into a design flow then can easily become unfeasible.

In this talk, advanced modeling techniques will be presented for simulation and design in the microwave area. These modeling techniques can be used to tremendously speed-up the design flow, while preserving the accuracy of the results. Adaptive frequency-domain sampling and equivalent circuit modeling methods will be illustrated and validated with multiple numerical results. The adaptive frequency-domain sampling allows an automated selection of frequency samples in frequency-domain solvers, while the equivalent circuit modeling technique is used to transform EM responses into equivalent circuits that are then used into a very efficient optimization step.

Biography

Francesco Ferranti received the Ph.D. degree in Electrical Engineering from Ghent University, Ghent, Belgium, in 2011. He is currently a Full Professor at the Department of Computer Science, Electrical and Space Engineering at Luleå University of Technology, Sweden. He is also an Adjunct Professor at the Indian Institute of Technology (IIT) Madras, Chennai, India and at Carleton University, Ottawa, Canada.

He is an IEEE Senior Member. He was the recipient of the Anile-ECMI Prize for Mathematics in Industry 2012 and the Electromagnetic Compatibility Society President’s Memorial Award 2012. He was the Program Chair of the IEEE Workshop on Signal and Power Integrity (SPI) 2014 and the Secretary of the International Workshop on Integrated Nonlinear Microwave and Millimetre-wave Circuits (INMMIC) 2014. He has been a member of the Technical Program Committees of the IEEE Workshop on Signal and Power Integrity (SPI) and the IEEE

International Conference on Numerical Electromagnetic and Multiphysics Modeling and Optimization (NEMO), and of the Paper Review Committee of the IEEE Conference on Electrical Performance of Electronic Packages and Systems (EPEPS). He has been a Member of the Technical Committee on Design Automation (MTT TC-2) and an Associate Editor of the IEEE Microwave Theory and Techniques (MTT) Society.

His current research interests include machine learning, artificial intelligence, surrogate modeling, model order reduction, uncertainty quantification, optimization, computational electromagnetics, microwave, electronic, and photonic design and characterization, and fault diagnosis in arrays of antennas. He has authored or co-authored more than 150 papers in peer-reviewed journals and conferences, and 3 book chapters. He serves as a regular reviewer for several international journals and conferences.

Invited Talk 9

Optimization approaches for base station dipole antennas and endfire antennas

Xihui Teng

School of Computer, Electrical and Mathematical Science and Engineering Division (CEMSE),
King Abdullah University of Science and Technology

Abstract

Antennas, as critical components in communication systems, can generally be classified into two categories based on their radiation direction: broadside antennas and endfire antennas. These two types operate on different principles and therefore require distinct design and optimization methodologies. This talk focuses on both antenna types, using base station dipole antennas and periodic leaky-wave endfire antennas as examples to introduce their respective design and optimization strategies.

For base station dipole antennas, a broadband and multifunctional design is achieved by proposing an orthogonal key-parameter optimization method. This approach enables wideband performance and multi-band coverage while maintaining a low-profile structure.

For periodic leaky-wave endfire antennas, a dual-degree-of-freedom optimization method is developed to achieve a uniform aperture field distribution, leading to enhanced gain and improved gain-to-length ratio.

Finally, prototypes are fabricated and measured to experimentally validate the effectiveness of the proposed optimization approaches.

Biography

Xihui Teng received the B.Sc. degree from Jilin University, Changchun, China, in 2019, and the Ph.D. degree from Tianjin University, Tianjin, in 2025.

Since 2025, she has been with the integrated microwaves packaging antennas and circuits technology, King Abdullah University of Science and Technology, where she is currently a postdoctoral fellow. Her primary research interests lie in the field of antenna theory and technology, with a specific focus on the design of millimeter-wave high-gain antennas, phased array antennas, Antenna on chip, and endfire antennas. Her designed antennas can be applied in various advanced systems, including 5G phased array communication systems, 6G applications, 77GHz automotive radar systems, and shipborne communication systems.

Ms. Zeng was a recipient of the Hong Kong Ph.D. Fellowship.

Invited Talk 10

Artificial Intelligence for Electromagnetic Scattering Modeling

Dehua Kong

the Department of Electrical and Computer Engineering, National University of Singapore

Abstract

Conventional computational electromagnetics (CEM) has high threshold for beginners mainly because of the request of high-quality meshing, discretization of continuous equations, and solution of massive matrix equation. Artificial intelligent (AI) method gives a possibility to accelerate or skip these processes. In the prevailing manners of AI-based EM scattering analysis, the NN predicts the corresponding response to a certain excitation, which requires analyzing many different incident scenarios.

This talk introduces an alternative approach to let the NN extract the inherent features of the target, which are independent of the excitation and scattering directions. After predicting the inherent feature, we can easily and quickly get the response with an excitation by post processing. In addition, traditional end-to-end learning methods face two main challenges: one is the high dataset generation cost and the other is the poor generalization ability. This talk introduces the method of active learning and incremental learning to alleviate these two challenges respectively.

Biography

Dehua Kong received the B.Eng. degree in electromagnetics and wireless technology from Beihang University, Beijing, China, in 2020, and the Ph.D. degree in electromagnetics and microwave technology from Peking University, Beijing, China, in 2025.

From October 2023 to April 2024, he was a Visiting Ph.D. Student with National University of Singapore, Singapore. He is currently a Research Fellow with the Department of Electrical and Computer Engineering, National University of Singapore, Singapore. His current research interests include computational electromagnetics (CEM), EM forward and inverse problems, rough sea surface scattering, characteristic mode theory (CMT), artificial intelligence and machine learning methods.

Invited Talk 11

Reconfigurable Intelligent Surfaces (RIS) Design Optimization and Hardware Advancements

Ruiqi Wang

King Abdullah University of Science and Technology

Abstract

Recent progress in RIS hardware optimization has demonstrated that carefully engineered unit-cell designs, switching mechanisms, and fabrication strategies can significantly enhance bandwidth, reduce quantization effects, and lower manufacturing complexity. This talk presents a series of our recent RIS design innovations that tackle these practical challenges from a hardware-oriented perspective.

This talk introduces a series of RIS hardware optimization techniques developed from practical bandwidth, quantization, and fabrication considerations. By refining the electromagnetic structure and switching configuration, a wideband 1-bit RIS was realized with stable phase and magnitude responses across the 5G n257 and n258 bands. Extending the same design principles, a wideband 2-bit RIS was further developed to suppress sidelobes and quantization lobes through enhanced phase resolution and modulation-depth engineering. To enable low-cost and scalable deployment, a fully printed 30-GHz RIS was finally demonstrated, where VO_2 switches are directly integrated into metallic patterns via screen printing.

Together, these RIS hardware optimization strategies and prototypes offer promising pathways toward scalable, cost-effective, and high-performance reconfigurable wireless environments—bringing RIS technologies one step closer to practical 6G deployment.

Biography

Ruiqi Wang received the B.S. degree in Electronic Engineering from the University of Electronic Science and Technology of China (UESTC), Chengdu, China, in 2021, and the M.S. degree in Electrical and Computer Engineering from King Abdullah University of Science and Technology (KAUST), Thuwal, Saudi Arabia, in 2022, where he is currently pursuing the Ph.D. degree.

His research interests include reconfigurable intelligent surfaces, reconfigurable antennas, and antenna radiation pattern synthesis. He was the recipient of an Honorable Mention Award in the 2023 IEEE AP-S Student Paper Competition held in Portland, USA, and the Second Prize in the 2024 IEEE IMS Student Design Competition.

Invited Talk 12

Surrogate-based microwave modeling and optimization approach for microwave components

Wei Zhang
School of Electronic Engineering,
Beijing University of Posts and Telecommunications

Abstract

The design of modern microwave components (e.g., filters, antennas, power dividers) is increasingly challenging, often requiring numerous computationally intensive full-wave electromagnetic (EM) simulations. Traditional optimization routines that rely on direct EM analysis can become prohibitively slow, impeding the rapid iteration necessary for complex, high-performance designs.

This research introduces a surrogate-based approach for the modeling and optimization of microwave components, offering a more efficient alternative to conventional methods. By leveraging advanced machine learning techniques, surrogate models are developed to approximate the behavior of microwave devices with high accuracy and low computational cost. These models are then used to guide the optimization process, enabling rapid design iterations and more effective solutions. The approach is demonstrated across a variety of microwave components, including filters, antennas, and waveguides, showing substantial reductions in both simulation time and design complexity. The proposed method not only enhances the design process but also facilitates the exploration of design spaces that would otherwise be computationally prohibitive. This work represents a significant step toward more efficient and accessible microwave design and optimization in both research and industrial contexts.

Biography

Wei Zhang received the B.Eng. degree from Shandong University, Shandong, China, in 2013. He received the Ph.D. degree from the School of Microelectronics, Tianjin University, and the Department of Electronics, Carleton University, Ottawa, ON, Canada, in 2020. From 2020 to 2021, he was a Postdoctoral Fellow in the Department of Electronics at Carleton University, Ottawa, ON, Canada. He is currently an Associate Researcher with the School of Electronic Engineering at Beijing University of Posts and Telecommunications, Beijing, China.

His research interests include neural-network-based methods for microwave device modeling, electromagnetic centric multiphysics modeling and optimization, space mapping algorithm and surrogate model optimization, and computational electromagnetics. Dr. Zhang serves as reviewer for many IEEE scientific publications, including IEEE Transactions on Microwave Theory and Techniques, IEEE Antennas and Wireless Propagation Letters, etc. He received the Best Paper Award at the IEEE NEMO 2025.

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