

# 43<sup>RD</sup> IEEE INTERNATIONAL PERFORMANCE COMPUTING <sup>AND</sup> COMMUNICATIONS CONFERENCE



**IEEE IPCCC 2024**

NOVEMBER 22<sup>ND</sup> - 23<sup>RD</sup>

ORLANDO, FLORIDA USA

IPCCC.ORG



## Message from the IPCCC 2024 General Chairs

On behalf of the conference executive committee, it is our immense pleasure to welcome everyone to the 43rd IEEE International Performance, Computing, and Communications Conference (IPCCC 2024) in Orlando, Florida, USA, the home of the “Most Magical Place on Earth.”

IPCCC 2024 brings researchers from all over the world together as a community where they discuss their research insights and innovations through their presentations and interactions in the fields of computing and communication systems. This year’s conference involves both in-person and virtual regular/short paper presentations, workshop and poster sessions, two keynote talks, and an N2Women event, offering various engagement opportunities to all attendees.

We would like to express our heartfelt gratitude to all authors for choosing IPCCC for submitting their high-quality work. We thank all program committee members as well as external reviewers for their valuable time and efforts, and the Program Chairs, Qingxue (Jack) Zhang and Yu Wang, for their commitment that is vital to creating the high-quality IPCCC 2024 program.

It has been a great privilege for us to organize this special event together with a dedicated group of experienced professionals with diverse backgrounds from academia and industry. We would sincerely thank all our Executive Committee members, starting from the Board and Finance Chair Nasr Ullah, General Vice-Chair Zhipeng Cai, Workshop Chairs Matthias Wübbeling and Fang-Jing Wu, Poster Chairs Zhuojun Duan and Yinxin Wan, EDAS Chair Xiaojian Wang and Vice-Chair Nikos Kumar, Publications Chair and Web Chair Neil Nelson, N2Women Chair Eirini Eleni Tsiropoulou, Publicity Chairs Chentao Wu, Florian Klingler, Yue Wang, Local Chair Abdullah Aydeğer, Web Vice-Chair Kristina Sanderson, Registration Chair Jack Chen, Operations Coordinator Osric Nagle and finally Ex-Officio Consultant Kathlene Hurt for their service and supports.

We would like to extend our special thanks to the IEEE Computer Society and Technical Committee on Computer Communications (TCCC). We are grateful for their continuing sponsorship of this conference.

Finally, we would like to thank in advance every in-person and virtual attendee of this conference from all over the world. Your presence and engagement make this conference a unique event. We hope that you will enjoy the conference, learn new things, and make new connections. Hope you all have a wonderful time in Orlando at IPCCC 2024.

■ **Gürkan Solmaz and Ruozhou Yu, IPCCC 2024 General Chairs**

## Message from the IPCCC 2024 Technical Program Chairs

Welcome to the 43rd IEEE International Performance Computing and Communications Conference (IPCCC 2024)! This year, we are glad to host the conference, with most sessions in-person, in Orlando, Florida, USA, whereas some sessions will be remote due to on-going travel constraints.

IPCCC 2024 received 127 paper submissions. Out of these submissions, 39 papers were accepted as full papers (acceptance ratio of 30.7%). Each paper was thoroughly reviewed by at least three reviewers. In addition, 19 papers were accepted as short papers and 8 as poster papers. Full papers, short papers, and poster papers are all included in the IPCCC conference proceedings. The final IPCCC program includes two keynotes, 16 technical sessions, one poster session, and the N2Women panel.

We would like to express our sincere gratitude to all who have contributed to the IPCCC 2024 program. First, we thank the authors of all paper submissions, regardless of the papers’ acceptance status, for their efforts and submitting their quality research work to IPCCC. Second, we are grateful for the support of 70+ Technical Program Committee (TPC) members for their fair, timely, and constructive reviews. The work of the authors and the TPC members contribute to the quality of the conference. Third, we thank the IPCCC 2024 Organizing Committee and Steering Committee for their support. Finally, we would like to welcome all attendees to the conference, and we greatly appreciate your participation. We are sure that you will find the IPCCC 2024 program interesting, and we hope you will enjoy the experiences provided by the conference.

■ **Qingxue (Jack) Zhang and Yu Wang, IPCCC 2024 Technical Program Chairs**

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■ All Program Times are USA Eastern Standard Time (EST: GMT -4) ■

### ANNOUNCING IPCCC 2025

**Austin, Texas USA  
November. 21-23 2025**

■ **PAPER ABSTRACT DUE:**  
**June 1st, 2025**

■ **FULL PAPER DUE**  
(REGULAR, POSTER, WORKSHOP):  
**June 30th, 2025**

■ **CONFERENCE PAPERS ACCEPTANCE NOTICE**  
**NOTICE: August 1, 2025**

**FOR CONFERENCE DETAILS AS  
THEY BECOME AVAILABLE  
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# IPCCC 2024 Day One - Friday, November 22<sup>ND</sup>

▪ **Registration Opens:** 12:00 EST ▪ **Opening Remarks & Introduction:** 13:00-13:15 EST

**Session 1.0: Keynote Speaker:** 13:15-14:30 EST | Lake 1 & 2 ▪ Chair: Gurkan Solmaz (NEC Lab Europe) ▪

## Riding the Waves of Research Hypes: Staying Relevant in IoT and Beyond

▪ **Dr. Kemal Akkaya** ▪

**Eminent Scholar Chaired Professor, Knight Foundation School of Computing and Information Sciences - Florida International University**

[See Page 7 for Keynote Speaker Abstract & Bio]

Break - Lake Atrium : 14:30-14:45

### ▪ **Session 1A: Networking I** ▪

14:45-16:00 EST | Lake 1 & 2

Chair: Chase Q. Wu (New Jersey Institute of Technology & Oak Ridge National Laboratory, USA)

**Combining Dynamic Deterministic Latency Bounds and Networked Control Systems:** Robin Laidig, Jona Herrmann, David Augustat, Frank Dürr and Kurt Rothermel (University of Stuttgart, Germany)

**Optimized Deliverer Selection in Blockchain-based P2P Content Delivery Network:** Zhenchao Yan and Songlin He (Southwest Jiaotong University, China); Chase Q. Wu (New Jersey Institute of Technology & Oak Ridge National Laboratory, USA); Ai Qin Hou (Northwest University, China)

**Algorithms for the Generalized Network Construction Problem:** Fei Li (George Mason University, USA)

### ▪ **Session 1B: System** ▪

14:45-16:00 EST | Lake 3

Chair: Ye Xia (University of Florida, USA)

**Statistical and Shapelet Analysis of HPC Application Performance Using Time-series Heartbeat Data:** Mohammad Tahat and Strahinja Trecakov (New Mexico State University, USA); Jonathan Cook (New Mexico State University, USA)

**Dynamic Task Offloading in Connected Vehicles: Leveraging a Graph Neural Networks Approach for Multi-hop Search:** Assad Waqar and Samee U. Khan (Mississippi State University, USA)

**Fat-B+Tree: Fast B+Tree Indexing with In-network Memory:** Yikai Zhao, Yuanpeng Li, Zicang Xu, Tong Yang and Kaicheng Yang (Peking University, China); Li Chen (Huawei, Hong Kong); Xin Yao and Gong Zhang (Huawei Technologies Co., Ltd., China)

Break - Lake Atrium: 16:00-16:15

### ▪ **Session 2A: AI I** ▪

16:15-17:45 EST | Lake 1 & 2

Chair: Fei Li (George Mason University, USA)

**HEJet: A Framework for Efficient Machine Learning Inference with Homomorphic Encryption:** David Monschein (Karlsruhe University of Applied Sciences, Germany); Oliver P. Waldhorst (Karlsruhe University of Applied Sciences & Distributed Software Systems (DSS) Research Group at the Institute of Applied Research (IAF), Germany)

**Revolutionizing Wireless Modeling and Simulation with Network-oriented LLMs:** Jiwen Liu, Zhiyuan Peng, Dongkuan Xu and Yuchen Liu (North Carolina State University, USA)

**Computation Caching in Mobile Convolutional Neural Network Inference:** James M. Mariani and Li Xiao (Michigan State University, USA)

**A Multimodal Method for Semi-biometric Information Based User Identification Approach In AR and VR Application:** Han Li (John Hopkins University, USA); Ke Lyu, Owen Dossett and Xianglong Feng (Miami University, USA)

### ▪ **Session 2B: Security I** ▪

16:15-17:45 EST | Lake 3

Chair: Diogo Oliveira (Point Park University, USA)

**Differentially Private Selection Using Smooth Sensitivity:** Akito Yamamoto and Tetsuo Shibuya (The University of Tokyo, Japan)

**Curse to Blessing: Leveraging Model Inversion Attacks to Detect Backdoor Attacks in Federated Learning:** Zhaowen Chen, Mingze Zhang, Caleb Mostyn, Honglu Jiang and Xianglong Feng (Miami University, USA)

**Cluster-BPI: Efficient Fine-grain Blind Power Identification for Defending Against Hardware Thermal Trojans in Multicore SoCs:** Mohamed R. Elshamy (New Mexico State University, USA); Mehdi Elahi (North Carolina A&T University, USA); Ahmad Patooghy (North Carolina A&T University, USA); Abdel-Hameed A. Badawy (New Mexico State University, USA)

**Overlooked Backdoors: Investigating 6to4 Tunnel Nodes and Their Exploitation in the Wild:** Jiaying Guo, Lin He and Ying Liu (Tsinghua University, China)

## Reception and Poster Session

▪ 18:30-20:30 EST | 20Seven North ▪ Chair: Zhuojun Duan (James Madison University) ▪

### ▪ **Poster Session** ▪

**A Review on Quantum Machine Learning in Different Computer Vision Fields:**

Md Majedul Islam and Jing (Selena) He (Kennesaw State University, USA)

**Analyzing Ground-lightning Dataset Using the Density Based Spatial Clustering of Applications with Noise (DBSCAN):**

Zhuojun Duan, James Agresto, Mace Bentley, Tobias Gerken and Dudley Bonsal (James Madison University, USA)

**Analysis of Intermediate Mean Opinion Score (MOS) and QoS in a High-definition Voice Call Conference in Mobile Networks:**

Jussif Junior Abularach Arnez, Lucas B. C. Tribuzy, Fabricio De Souza Oliveira and Isaac Barros Gomes (Sidia Institute of Science and Technology, Brazil); Jéssica Da Silva Gomes (UEA, Brazil); Caio Pedrosa Galvao (Brazil)

**Optimization of Heterogeneous Coded Distributed Computing with Nonuniform Input File Sizes:**

Jiasheng Liang (Binghamton University, USA); Siyu Zhang and Yong Deng (Lakehead University, Canada)

**Bad Neighbors? On the Impact of IEEE 802.11p and Cellular 5G on Vehicular Neighbor Sets:**

Simon Welzel and Florian Klingler (TU Ilmenau, Germany)

**FlexMRS: Multi-objective Optimization for Diverse Application Requirements in MPTCP Scheduling:**

Zekun Zhang and Zhong Lujie (Capital Normal University, China); Xiang Ji (Beijing University of Post and Telecommunications, China)

**Policy Enforcement for IoT: Complexities and Emerging Solutions:**

Shuo Zhang, Luoyao Hao and Henning Schulzrinne (Columbia University, USA)

**Wital: A Whitelist-based IoT Firewall for Mitigating Device Exploitation:**

Heeyun Kim, Wei Xiong Toh, Luoyao Hao and Henning Schulzrinne (Columbia University, USA)

# IPCCC 2024 Day Two - Saturday, November 23<sup>RD</sup>

■ Registration Opens: 08:30-08:45 EST

Session 2.0: Keynote Speaker: 09:00-10:15 EST | Lake 1 & 2 ■ Chair: Yue Wang (Georgia State University) ■

## Heterogeneity-aware Distributed Learning for Collaborative Sensing Over Wireless Networks

■ Professor Zhi Tian ■ Electrical and Computer Engineering - George Mason University

[See Page 7 for Keynote Speaker Abstract & Bio]

Break - Lake Atrium 10:15-10:30

Session 3A: Networking 2 ■ 10:30-12:00 EST | Lake 1 & 2  
Chair: Wenjia Li (New York Institute of Technology, USA)

### Integrating Post-quantum TLS into the Control Plane of 5G Networks:

Yacoub Hanna, Diana S Pineda Andrade, Maryna Veksler, Manish Paudel and Kemal Akkaya (Florida International University, USA);

Mila Anastasova and Reza Azarderakhsh (Florida Atlantic University, USA)

### Adaptive Mitigation of Blackhole Attacks in Blockchain-enhanced Software Defined Networks:

Mehmed K Uludag (University of Michigan, USA); Murat Karakus (Ankara University, Turkey); Evrim Guler (Bartın University, Turkey); Suleyman Uludag (The University of Michigan - Flint, USA)

### Lightweight Secure Communication Scheme Based on PUF for In-vehicle Controller Area Networks:

Haoran Jiang and Yehua Wei (Hunan Normal University, China); Wenjia Li (New York Institute of Technology, USA); Jiangwei Li (Hunan Normal University, USA)

**DecMEN: Scalable Measurement and Impairment Framework for Network Characterization in 5G(+):** Niladri Mondal, Mario Niggemeyer, Simon Welzel and Florian Klingler (TU Ilmenau, Germany)

Session 4A: AI 2 ■ 13:45-15:15 EST | Lake 1 & 2

Chair: Bobin Deng (Kennesaw State University, USA)

### Activation Sparsity Opportunities for Compressing General Large Language Models:

Nobel Dhar, Bobin Deng, Md Romyull Islam, Kazi Fahim Ahmad Nasif, Liang Zhao and Kun Suo (Kennesaw State University, USA)

### Characterizing and Understanding the Performance of Small Language Models on Edge Devices:

Md Romyull Islam, Nobel Dhar, Bobin Deng, Tu N. Nguyen, Jing (Selena) He and Kun Suo (Kennesaw State University, USA)

### HANNA: Harvesting-aware Neural Network Architecture Search for Batteryless Intermittent Devices:

Rohit Sahu, Vishal Deep and Henry Duwe (Iowa State University, USA)

### The Robustness of Spiking Neural Networks in Communication and its Application towards Network Efficiency in Federated Learning:

Amin Sarihi (MIPS, USA & New Mexico State University, USA); Ahmad Patooghy (North Carolina A&T University, USA); Abdel-Hameed A Badawy (New Mexico State University, USA); Peter A Jamieson (Miami University, USA)

Peter A Jamieson (Miami University, USA)

Break - Lake Atrium: 15:15 - 15:30

Session 5A: Application ■ 15:30-17:30 EST | Lake 1 & 2

Chair: Abdullah Aydeger (Florida Institute of Technology, USA)

### Precision Tracking in Geofencing Systems using Deep Reinforcement Learning:

Alireza Famili, Shihua Sun and Tolga O Atalay (Virginia Tech, USA); Angelos Stavrou (Virginia Tech & Kryptowire, USA); Bo Sun (National Computer Network Emergency Response Technical Team/Coordination Center of China, China)

### Experimental Analysis of LoRaWAN for Optimizing Water Quality Monitoring with Reinforcement Learning-Driven Scheduling:

Yumeng Jui Mhatre, Minh Hung Nguyen, Ahyoung Lee and Hoseon Lee (Kennesaw State University, USA)

### Towards A Computational Model for Learning Affective Empathy Responses:

Mark Allison (The University of Michigan-Flint, USA)

Session 3B: Computing ■ 10:30-12:00 EST | Lake 3  
Chair: Kuai Xu (Arizona State University, USA)

### Optimal Sequencing for a Class of Task Offloading Problems in Edge-Cloud Computing:

Ye Xia (University of Florida, USA)

### An Extension of Pathfinding Algorithms for Randomly Determined Speeds:

Visvam K. Rajesh (Hunterdon Central Regional High School, USA); Chase Q. Wu (New Jersey Institute of Technology & Oak Ridge National Laboratory, USA)

### Less is More: Exploring Sampled Twitter Data Steams for Pandemic Surveillance and Monitoring:

Kuai Xu, Feng Wang and Mitchell Hoikka (Arizona State University, USA)

### LSAFE: a Lightweight Static Analysis Framework for Binary Executables:

Xiao Yue and Guangzhi Qu (Oakland University, USA)

Lunch - Lake Atrium: 12:00-13:45

Session 4B: Security 2 ■ 13:45-15:15 EST | Lake 3

Chair: Xiaojian Wang (North Carolina State University)

### The Seeker's Dilemma: Realistic Formulation and Benchmarking for Hardware Trojan Detection:

Amin Sarihi (MIPS, USA & New Mexico State University, USA); Ahmad Patooghy (North Carolina A&T University, USA); Abdel-Hameed A Badawy (New Mexico State University, USA);

Peter A Jamieson (Miami University, USA)

### Content Security Policy Deployment Issues Related to Third-party Scripts among Builder-generated Websites and Other Websites:

Mengxia Ren and Chuan Yue (Colorado School of Mines, USA)

### Enhanced Outsourced and Secure Inference for Tall Sparse Decision Trees:

Andrew Quijano (New York University & Amazon, USA); Spyros T. Halkidis (University of Macedonia, Greece); Kevin Gallagher (NOVA LINCS, NOVA School of Science and Technology, Portugal); Nikolaos Samaras (University of Macedonia, Greece); Kemal Akkaya (Florida International University, USA)

### Cryptocurrency Price Forecasting Using XGBoost Regressor and Technical Indicators:

Abdelatif Hafid (Université de Montréal, Canada); Maad M A Ebrahim (Ericsson, Canada); Mohamed Rahouti (Fordham University, USA); Diogo Oliveira (Penn State University, USA)

Diogo Oliveira (Penn State University, USA)

Session 5B Workshop ■ 15:30-17:30 EST | Lake 3

■ Chair: Fang-Jing Wu (National Taiwan University, Taiwan)

### Dynamic Traffic Load Rebalancing for Hardware-accelerated 6G UPF Resilient Architecture:

Dongjin Lee (SK Telecom, Korea (South)); Seongsu Park (Rexordium Co., Ltd., Korea (South)); BumJun Lee (Newgens, Korea (South))

### An Analytical Study on the Evolution and Impact of Chatbots in Tourism Over the Past Decade:

Lama Benaddi and Charaf Ouaddi (GL-ISI Team, FST Errachidia, UMI-Meknes, Morocco); Jakimi Abdeslam (University Mohamed V, Morocco); Saadane Rachid (EHPT, Canada & SIRC LaGeS EHPT, Morocco); Brahim Ouchao (FST of Errachidia, Morocco); Mohamed Rahouti (Fordham University, USA); Abdelatif Hafid (Université de Montréal, Canada); Diogo Oliveira (Penn State University, USA)

### Formulating a Comprehensive Cybersecurity Framework for Uncrewed Aerial Vehicles:

Anice K Thompson (Troy University, USA); Dev D Patel and Mustafa I Akbaş (Embry-Riddle Aeronautical University, USA)

### Formal Modeling of Road Network-Based Autonomous Vehicle Validation Scenarios with Intersections and Pedestrians:

Ilke Kutlu (Istanbul Technical University, Turkey); Quentin Goss (Embry-Riddle Aeronautical University, USA); Tahir Cetin Akinci (University of California Riverside, USA); Mustafa I Akbaş (Embry-Riddle Aeronautical University, USA)

### Digital-Twin Architecture of a Spiking Neuron Using Carbon Nanotube Field Effect Transistors:

Shelby Williams and Prosen Kirtonia (University of Louisiana at Lafayette, USA); Kasem Khalil (University of Mississippi, USA); Magdy Bayoumi (University of Louisiana Lafayette, USA)

N2Women Panel Session

■ 17:45-18:45 EST | Lake 1 & 2 ■

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# IPCCC 2024 Day Two (Continued) ■ Saturday, November 23<sup>RD</sup>

**N2Women Panel Session ■ Moderator: Xiaojian Wang** (North Carolina State University)  
■ 17:45-18:45 EST | Lake 1 & 2 ■

## N2Women Panel Session

■ **Dr. Asli Soyler Akbas** ■  
(Universal Destinations & Experiences)

■ **Dr. Sneha Sudhakaran** ■  
(Florida Institute of Technology)

■ **Dr. Mahbuba Sheba Ullah** ■  
(University of Texas at Austin)

■ **Dr. Fang-Jing Wu** ■  
(National Taiwan University)

The N2Women panel session at the IPCCC program is designed to foster a supportive and engaging environment for women in networking and communications. This session brings together established professionals and emerging researchers to discuss critical topics such as career development, navigating industry and academia, and overcoming challenges unique to women in technology. Through interactive dialogue and mentorship opportunities, the panel aims to empower attendees, promote diversity, and inspire the next generation of leaders in computing and communications.

### Dr. Asli Soyler Akbas

**Assistant Director, Modeling and Simulation**  
Universal Destinations & Experiences

#### BIOGRAPHY

Dr. Akbas is a simulation and analytics specialist with a strong background in data-driven complex system modeling. Over the past 10 years at Universal Destinations & Experiences, she has designed and implemented simulation frameworks that optimize design processes and improve operational efficiency for more than 25 new attractions, restaurants, and themed areas. Prior to that, she spent 8 years in the defense and energy industries, where she leveraged advanced analytics to transform data into actionable insights, delivering value and solving intricate business challenges across various sectors.



### Dr. Mahbuba Sheba Ullah

**Signal Processing Research Scientist**  
University of Texas at Austin

#### BIOGRAPHY

Dr. Mahbuba Sheba Ullah is a Signal Processing Research Scientist with more than 20 years of research and development experiences applied in wireless communications for industry and acoustic signal processing for Naval research. She has developed innovative signal processing concepts and algorithms for improving 5G, LTE, CDMA2000, IS95, GSM, EDGE, and IS136 transceiver design and baseband signal processing for base stations and mobile devices at Freescale, National Instruments, Texas Instrument, Sequoia Communications and Anritsu. Her research goal is to come up with signal processing solutions to practical problems that combines her theoretical knowledge with her extensive experience in modeling and analyzing physical layer communication systems, developing innovative transceiver prototypes and baseband algorithms.



### Dr. Sneha Sudhakaran

**Assistant Professor** ■ Florida Institute of Technology

#### BIOGRAPHY

Dr. Sneha Sudhakaran has been serving as an Assistant Professor in a tenure-track position at Florida Institute of Technology (FIT), Melbourne, Florida, since Fall 2022. She completed her Ph.D. at Louisiana State University (LSU), where she gained experience as a Research Assistant in Cyber Security at the Center for Computation and Technology. Dr. Sudhakaran holds certifications including CEH and CHFI and has contributed as an Item Writer for EC-Council exams. During her Ph.D., she was actively engaged in research at LSU and previously held a research role at the University of New Orleans. Currently, she is a faculty advisor and founder of the Women in Cybersecurity (WiCyS) chapter at FIT. As an active researcher at FIT, her interests encompass Android Security, Application Security, Host Security, Cyber Forensics, Memory analysis and Blockchain. Dr. Sudhakaran has published her work in prominent cybersecurity conferences and serves as a reviewer and program committee member for various esteemed journals and conferences.



### Dr. Fang-Jing Wu

**Associate Professor** ■ National Taiwan University

#### BIOGRAPHY

Dr. Fang-Jing Wu is an associate professor at National Taiwan University. Dr. Wu was an assistant professor at TU Dortmund in Germany from 2018 to 2023. Before TU Dortmund, she was a research scientist at Cloud Service and Smart Things Group, NEC Laboratories Europe from 2016 to 2017. Before NEC Labs, she was a scientist at the Institute of Infocomm Research (I2R), Agency for Science, Technology and Research (A\*STAR), Singapore from 2013 to 2015. Before joining A\*STAR, she was a research fellow at Nanyang Technological University in 2012. She was awarded a Ph.D. degree in Computer Science from the National Chiao Tung University in 2011. She was a visiting researcher at Imperial College London from 2010 to 2011. Her current research interests are primarily in pervasive computing, wireless sensor networks, wireless communications and networks, cyber-physical systems, mobile crowdsourcing, mobile computing, wearable sensing, and Internet of Things.



# IPCCC 2024: KEYNOTE SPEAKER I: FRIDAY

## Riding the Waves of Research Hypes: Staying Relevant in IoT and Beyond

### Dr. Kemal Akkaya

Eminent Scholar Chaired Professor, Knight Foundation School of Computing and Information Sciences -  
Florida International University

▪ Friday, November 22<sup>ND</sup> ▪ 13:15-14:30 EST | Lake I & 2 ▪

#### ABSTRACT

Researchers may face challenges in sustaining momentum and securing resources as the fields they target mature and evolve over time. The challenges are compounded for certain fields that come with major hypes and opportunities but in the end, they may lose the initial momentum and become saturated with redundant studies. In such cases, researchers need to adapt wisely to still stay relevant and impactful. This talk will explore strategies for continued innovation in such fields by using IoT and IoT security as a case study. We will examine the initial surge of IoT as a hot research topic starting from early 2000s and then point out how the field needed to evolve to keep up its initial impact on our lives. Specifically, we will discuss new challenges arising within the IoT domain as the IoT devices are deployed in many emerging applications. For instance, with the rise of blockchain and cryptocurrencies, there are many efforts to enable cryptocurrencies that may be accommodated by IoT devices with limited computational and communication capabilities. Similarly, as generative AI technologies become more sophisticated and prevalent, it is getting easier to deceive sensor defense systems for IoT devices such as drones that rely on machine learning. We will present our current projects pursued at Advanced Wireless and Security (ADWISE) Lab at Florida International University (FIU) that touches these emerging IoT research areas along with some future directions.

#### BIOGRAPHY

Dr. Kemal Akkaya is an Eminent Scholar Chaired Professor in the Knight Foundation School of Computer and Information Sciences (KFSCIS) at Florida International University (FIU). He received his PhD in Computer Science from University of Maryland Baltimore County in 2005. Dr. Akkaya was a visiting professor at The George Washington University in

2013, a Faculty Fellow at Airforce Research Lab in Summer 2020 and a visiting faculty at the University of Florida Nelms Institute of Connected World in 2021. He is the Co-Director of Center for Security, Privacy and Trustworthy AI (CIERTA) and leads the Advanced Wireless and Security Lab (ADWISE) at FIU. His current research interests include security and privacy, internet-of-things, and cyber-physical systems. Dr. Akkaya is a Fellow of IEEE and senior member of ACM. He is the area editor for IEEE Transactions on Forensics and Security, Elsevier Ad Hoc Network Journal, and Computer Networks Journal. Dr. Akkaya was the editor-in-chief of Springer Nature Computer Science journal (2022-2023), the General Chair of IEEE LCN 2018, General Co-Chair of IEEE NOMS 2023, and TPC Chair for IEEE ICC Smart Grid Communications in 2019. He has published over 300 papers in peer-reviewed journals and conferences, 1 book along with 9 patents. These publications received more than 20,000 citations with a Google h-index of 58. He was listed among the top 2% scientists in the world according to a Stanford University study in 2020-24. Dr. Akkaya received FIU Faculty Senate Excellence in Research Award, FIU College of Engineering and Computing Research Award both in 2020 and FIU Top Scholar Award in 2023. He has also received "Top Cited" article award from Elsevier in 2010.



# IPCCC 2024: KEYNOTE SPEAKER II: SATURDAY

## Heterogeneity-aware Distributed Learning for Collaborative Sensing over Wireless Networks

### Professor Zhi Tian

Professor at the Electrical and Computer Engineering Department of George Mason University

▪ Saturday, November 23<sup>RD</sup> ▪ 09:00-10:15 EST | Lake I & 2 ▪

#### ABSTRACT

Multi-agent collaborative sensing is essential for wireless sensor networks and IoT applications, which faces various practical challenges. For example, there is an increasing need for spectrum monitoring and management to support the growing demands of data-intensive applications across wireless networks. Networks of spectrum sensors are deployed to gain spectrum awareness across time, frequency, and space, performing collaborative tasks like multi-channel spectrum sensing and large-scale radio map estimation. While federated learning enables collaborative learning, its reliance on a shared homogeneous model limits performance in heterogeneous networks. Distributed sensing nodes, constrained by hardware and sensing capabilities, capture only partial views of the network environment, leading to data heterogeneity that traditional federated learning struggles to handle. This talk introduces a distributed multi-task learning architecture designed for heterogeneous networks, such as for wideband spectrum occupancy detection and radio map estimation under partial sensory observations. Through task-aware model decoupling, this approach supports heterogeneous feature extraction, improving spectrum learning across distributed sensors. The heterogeneity-aware approach enhances communication-efficient distributed learning for broad network applications.

#### BIOGRAPHY

Zhi Tian is a Professor at the Electrical and Computer Engineering Department of George Mason University. Previously she was on the faculty of Michigan Technological University, and served a 3-year term as Program Director at the US National Science Foundation. Her research interests lie in distributed machine learning, wireless communications, and statistical signal processing. She is an IEEE Fellow. She was a Member-at-Large of the Signal Processing Society Board of Governors (2019-2021). She was General Co-Chair of the IEEE GlobalSIP Conference in 2016 and the IEEE SPAWC Workshop in 2023. She served as an IEEE Distinguished Lecturer for both the IEEE Communications Society and the IEEE Vehicular Technology Society. She is the Editor-in-Chief for the IEEE Transactions on Signal Processing. She received the IEEE Communications Society TCCN Publication Award in 2018.





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