The First International Symposium on
Intelligent Computing and Networking

March 18~20, 2024, San Juan, Puerto Rico

ISICN 2024

Final Program

Schedule

	Monday, March 18, 2024	Tuesday, March 19, 2024	Wednesday, March 20, 2024
9:00 AM - 9:30 AM 9:30 AM - 10:30 AM	Opening Speeches Keynote 1: Dr. Rose Qingyang Hu Empowering Federated Learning	Workshop 2: IEEE Blockchain Workshop	Keynote 2: Dr. Hamid Sharif Cyber Resiliency in Operation Technology Networks Award Ceremony (10:00 AM - 10:30 AM)
10:30 AM - 11:00 AM	Coffee Break	Coffee Break	Coffee Break
11:00 AM - 12:30 PM	Session 1: Intelligent Platforms and Systems Poster Session 1	Workshop 2: IEEE Blockchain Workshop	Session 3: Intelligent Security and Privacy Poster Session 3
12:30 PM - 1:30 PM	Lunch	Lunch	Lunch
1:30 PM - 3:00 PM	Workshop 1: Enhanced Open Networked Airborne Computing Platform	Session 2: Advanced Learning Techniques Poster Session 2	Session 4: Intelligent Commun. and Signal Processing Poster Session 4
3:00 PM - 3:30 PM	Coffee Break	Coffee Break	Coffee Break
3:30 PM - 5:00 PM	Workshop 1: Enhanced Open Networked Airborne Computing Platform	Tutorial: Manuel Rodriguez Martinez Large Language Models as Reasoning Engines	Session 5: AI-Enabled IoT and Real-Time Edge Comp.
6:00 PM - 9:00 PM	Welcome Reception	Conference Dinner	

Keynotes

Title: **Empowering Federated Learning: Tackling Challenges for Efficiency, Privacy, and Security in Decentralized and Collaborative Machine Learning**

Rose Qingyang Hu, Ph.D., Fellow IEEE
Associate Dean & Professor
College of Engineering/Electrical and Computer Engineering
Utah State University
Editor-in-Chief, IEEE Communications Magazine

Abstract: Conventional centralized machine learning (ML) demands massive data collection for model training, often raising concerns about privacy and straining communication and computation resources. The rapid advancement of edge devices' computational capacity has paved the way for localized model training, reducing the reliance on remote servers. Federated Learning (FL) is a decentralized ML technique that empowers models to train locally on each client device. In FL, model parameters, not raw data, are shared among clients, thereby protecting user privacy while facilitating distributed collaboration. Nonetheless, FL faces many challenges, including data and computation heterogeneity, a large number of clients and substantial model dimensions, leading to issues on communication costs, model convergence, and security. This keynote talk will present the latest findings in our research aimed at addressing these FL challenges. Approaches to mitigate communication costs in wireless networks, tackle system heterogeneity, and enhance security and privacy will be discussed. Leveraging techniques such as advanced access technologies, model gradient compression, Asynchronous FL scheduling, and approximate communication, ML training can be expedited, and wireless communication costs can be reduced. Furthermore, model update based (MUB) aggregation is exploited to defend against Byzantine attacks, and the individual client model initialization combined with MUB is used to enhance privacy protection in FL.

Bio: Rose Qingyang Hu is a Professor of Electrical and Computer Engineering Department and Associate Dean for Research of College of Engineering at Utah State University. Besides more than 15 years' academia research experience, Dr. Rose Hu has more than a decade industrial research and development experience with Nortel, Blackberry, and Intel, working on industrial 3G and 4G research, technology development, and 3GPP/IEEE standardization. Dr. Rose Hu's current research interests cover next-generation wireless communications and networks, the Internet of Things, cyber-physical systems, as well as artificial intelligence and machine learning in wireless networks. She has made significant contributions to her field, with a portfolio that includes the publication of 6 books, 4 book chapters, over 320 papers in leading IEEE journals and conferences, and 29 patents. She is an IEEE Fellow, a NIST Communication Technology Laboratory Innovator 2020, an IEEE Communications Society (ComSoc) Distinguished Lecturer, and an IEEE Vehicular Technology Society Distinguished Lecturer. Dr. Hu received 2023 IEEE WICE Outstanding Achievement Award and has co-authored papers that received four IEEE Best Paper Awards from IEEE Globecom 2012, IEEE ICC 2015 and 2016, and IEEE VTC 2016. She has served on the Editorial Boards of 8 journals and guest-edited numerous special issues in the cutting-edge communications and networking areas. She has also been actively involved in organizing numerous IEEE International Conferences, Symposia, and Workshops. This includes her role as TPC Co-Chair for IEEE Globecom 2023 and ICC 2018. Dr. Hu has also served in the ComSoc Board of Governors as Chief Information Officer. Currently, she is the Director for the ComSoc Educational Services Board, Vice Chair for the ComSoc GLOBECOM / ICC Management & Strategy (GIMS) Standing Committee, and a Board of Director member for the American Society of Engineering Education (ASEE) Engineering Research Council.

Keynote 2: Wednesday, 9:00 AM – 10:00 AM, March 20, 2024

Title: **Cyber Resiliency in Operation Technology Networks**

Hamid Sharif, Ph.D., Fellow IEEE
Charles J. Vranek Professor
Department of Electrical and Computer Engineering
University of Nebraska-Lincoln

Abstract: Operational Technology (OT) devices have emerged as prime targets for cyberattacks, a trend amplified by the growing convergence of IT and OT domains. This convergence has led to integrating once-segregated systems into IT and Internet networks, presenting formidable cybersecurity challenges. While OT devices, such as industrial control systems and physical access controls, historically benefited from their isolated nature and limited connectivity, they have increasingly fallen target to extensive intrusion attempts in recent times. This paradigm shift underscores the need for heightened attention and the implementation of novel strategies to fortify cyber resilience in OT environments.

During this presentation, Dr. Sharif will discuss an approach designed to offer a unique cybersecurity framework for OT equipment and the associated control systems. This methodology aims to address the unique challenges posed by securing OT environments, where the consequences of cyber incidents can have far-reaching impacts on critical infrastructure and industrial operations.

Bio: Dr. Hamid Sharif is an IEEE Fellow and the Charles J. Vranek Distinguished Professor in the Department of Electrical and Computer Engineering at the University of Nebraska-Lincoln (UNL). He is also the Director of the Advanced Telecommunications Engineering Laboratory (TEL) at UNL. He has over 37 years of academic and industrial research experience in Mobile Communications, Network Security, Mobile Communication Security, and Intelligent Transportation.

He has published over 400 research papers in national and international journals and conferences and has been serving on many IEEE and other international journal editorial boards. He has been the recipient of a number of research awards and best papers. He was also the recipient of the prestigious Fulbright Fellowship Award in Science, Technology, and Innovation in 2013. He is currently a Distinguished Speaker for the IEEE Vehicular Technology Society.

Workshops

Workshop 1:

Workshop on Enhanced Open Networked Airborne Computing Platform

Monday, 1:30 PM – 5:00 PM, March 18, 2024

1:30 PM – 1:45 PM
Opening remark
Dr. Yan Wan, University of Texas at Arlington

1:45 PM – 2:15 PM
Tutorial part I: Physical UAV platform and communication
Dr. Shengli Fu, University of North Texas
Dr. Kejie Lu, University of Puerto Rico at Mayagüez

2:15 PM – 2:45 PM
Tutorial part II: Computing and controls
Dr. Junfei Xie, San Diego State University
Dr. Yan Wan, University of Texas at Arlington

2:45 PM – 3:00 PM
Demo and hands-on session

3:00 PM – 3:30 PM   Coffee Break

3:30 PM – 3:45 PM
Demo and hands-on session

03:45 p.m. – 5:00 PM
Discussion on use cases, collaboration plan, and technical support

Workshop 2:

IEEE Blockchain Workshop @ ISICN 2024 Conference

Tuesday, 9:00 AM – 12:30 PM, March 19, 2024

9:00 AM – 10:30 AM
IEEE Blockchain Keynote Speakers
Dr. Ramesh Ramadoss, Chair, IEEE Blockchain Technical Community
Gora Datta, FHL7 & Vice Chair, IEEE Blockchain Technical Community
Michael Ramalho, Chair, IEEE Florida West Coast Section Blockchain Group
Cristian Melendez, Co-Founder, EvolvingSpace

10:30 AM – 11:00 AM   Coffee Break

11:00 AM – 11:45 AM
Panel on "Blockchain & DLT: Real World Applications"

11:45 AM – 12:30 PM
DAG Tutorial & Demo
Dr. Sergii Grybniak, Co-Chair IEEE Ukraine Blockchain Group

Tutorial

Tutorial: Large Language Models as Reasoning Engines

Tuesday, 3:30 PM – 5:00 PM, March 19, 2024

Dr. Manuel Rodriguez-Martinez
Professor
Department of Computer Science and Engineering
University of Puerto Rico at Mayaguez

Abstract: Large Language Models (LLM) have become a major technological trend in the past few years, mainly because of their ability to understand, manipulate, and generate text in human-like fashion. Recently, image and audio processing capabilities have been added to these systems to further augment their computational abilities. Systems like ChatGPT, Bard, Llama, and Gemini are disrupting many application domains such as search, Q&A systems, information retrieval, chatbots, vision, document translation, and speech to text applications. One important emerging application of LLM is their use as a reasoning engine – they can take external information and combine it with their knowledge to derive new facts and provide insights to users. In this tutorial we will present key techniques for enabling reasoning behavior in an LLM: a) Retrieval Augment Generation (RAG), b) Program-aided language (PAL) models, and c) ReAct prompting. As part of the hands-on aspect of this tutorial, participants will be guided through the implementation of sample reasoning capabilities in an LLM.

Invited Presentation

Invited presentation: A Passive Vibration Signal Processing Device for Wi-Fi Based Vibration Sensing

Tuesday, 1:30 PM – 1:45 PM, March 19, 2024

Dr. Chu Ma
Assistant Professor
Department of Electrical and Computer Engineering
University of Wisconsin-Madison

Abstract: Wi-Fi is one of the most common wireless communication technologies. In the recent past, it is being considered as a potential tool for passive sensing of the surrounding environment due to the ubiquitous presence of Wi-Fi devices. Particularly, Wi-Fi has been explored for its potential in contactless vibration sensing. In Wi-Fi based vibration sensing, a Wi-Fi router emits a signal, which is reflected by a vibration source and captured at the receiver, for example, a cellphone or a Wi-Fi router. The receiver then calculates the Channel State Information (CSI), which captures the frequency response of the wireless channel between the Wi-Fi transmitter and the receiver. The vibration is then calculated based on the principle of the Doppler effect. However, current Wi-Fi vibration sensing methods are not widely used in practice due to their limited sensitivity. First, it lacks sensitivity to small vibration amplitudes because of the limitation posed by the large wavelengths of Wi-Fi signals. Second, it is unable to differentiate between different objects because widely used Wi-Fi antennas in routers and cellphones lack the needed directivity. In this presentation, I will introduce our recently developed device that aims to overcome the limitations of Wi-Fi vibration sensing by amplifying, filtering, and processing the vibration signals using a passive metamaterial-based structure attached to the surface of the vibration source. Our device largely enhances the sensitivity, enriches the functionalities, and broadens the applicability of Wi-Fi vibration sensing in different applications, such as structural health diagnosis, disaster warning, and vital signal monitoring.

Technical Sessions

Session 1: Intelligent Platforms and Systems

Chair: Shengjie Xu, San Diego State University, CA, USA

Monday, 11:00 AM – 12:30 PM, March 18, 2024

1. Michael Alvarez, Luis Huallparimachi, Sebastian Cruz and Heidy Sierra
   LSTM model for Sepsis Detection and Classification using PPG signals
2. Yongshuo Wan, Kui Wu, Tuo Shi and Jianping Wang
   Fair and Efficient Traffic Light Control with Reinforcement Learning
3. Haomeng Zhang, Junfei Xie, Yan Wan, Shengli Fu and Kejie Lu
   Advancing Networked Airborne Computing with mmWave for Air-to-Air Communications
4. Dalyana Mercado-Perez, Venkataramani Kumar and Feng Ye
   A Software Defined Radio based Tunable Testbed to Analyze the Performance of Channel Estimation in MIMO Systems
5. Ethan Zhu, Haijian Sun and Mingyue Ji
   HawkRover: An Autonomous mmWave Vehicular Communication Testbed with Multi-sensor Fusion and Deep Learning
6. Ming Shi, Shi Lu, Yueping Deng, Qi Guo, Bowei Ge and Ruolan Yuan
   The Right to Personal Data Portability: Practices and Prospects

Poster Session 1:

Chair: Dongfeng Fang, California Polytechnic State University, CA, USA

Monday, 11:00 AM – 12:30 PM, March 18, 2024

1. Xu Liting
   A Quality of Service Optimization Strategy for Aggregated Cloud Storage
2. Jiajia Han, Xin Sun, Yilei Wang and Futai Zou
   Boundary Generation Adversarial Network-based Anomalous Traffic Detection for the Grid Internet of Things
3. Mengjin Sun, Wanbin Qi and Xiaojun Jing
   Delay-phase Hybrid Precoding for Terahertz Massive MIMO Communication
4. Jie Wang, Lei Liu and Weiliang Xie
   Holographic MIMO Communications with Reconfigurable Intelligent Surfaces for 6G Non-Terrestrial Networks
5. Gang Liu and Lei Liu

Machine Learning for Intelligent Resource Allocation in Wireless Networks

6. Hao Zhang and Quan Zhou

   3D-CNN based Feature Acquisition and Action Recognition Algo-rithms for Temporal Data for 5G-TSN Systems

7. Yuze Yao

   RIS-Assisted Energy-Efficient Communication and Key Generation with Reinforcement Learning

8. Hongyu Sun, Wensi Ding, Xia Liu and Qiang Liu

   An Improved Method for Feature Extraction and Classification of Channel Wave Signals Based on Local Mean Decomposition

Session 2: Advanced Learning Techniques and Applications

Chair: Haijian Sun, University of Georgia, GA, USA

Tuesday, 1:30 PM – 3:00 PM, March 19, 2024

1. Chu Ma, University of Wisconsin-Madison (*invited presentation*)

   A Passive Vibration Signal Processing Device for Wi-Fi Based Vibration Sensing

2. Kangkang Sun, Hansong Xu, Xiaojin Zhang and Kun Hua

   Federated Learning with Personalized Privacy Protection for Vehicular Digital Twin Networks

3. Gretchen Bonilla and Manuel Rodriguez

   Deep Learning Methods to Help Predict Properties of Molecules from SMILES

4. Azadeh Khosrotabar and Michel Kadoch

   Anomaly Detection for Internet of Medical Things Using Chameleon Optimization-Based Feature Selection

5. Will Casey, Leigh Metcalf, Heeralal Janwa, Shirshendu Chatterjee and Ernest Battifarano

   A Novel ML Method for Temporal Evolution of Geographic Clusters of Disease Spread Patterns

6. Cesar Bolaños and Dorothy Bollman

   Family of multidimensional periodic arrays based on the direct product for watermarking with optimal low cross-correlation values

Poster Session 2:

Chair: Shengjie Xu, San Diego State University, CA, USA

Tuesday, 1:30 PM – 3:00 PM, March 19, 2024

1. Zhongli Li, Erping Sun and Yijian Liu

   Facile Synthesis of Hollow NiO Nanotubes as Anode for Intelligent Lithium ion Batteries

2. Jie Wang, Xi Meng and Bingxin Wang

   Millimeter-Wave MIMO Lens Antennas for Non-Terrestrial Networks in 6G

3. Lei Liu

   Machine Learning Empowered Orthogonal Time Frequency Space Modulation for 6G Non-Terrestrial Networks

4. Min Yang, Yang Cheng and Peng Ji

   Traffic Prediction Method of Satellite Communication Network Based on GCN and Attention Mechanism

5. Peiyu Li and Jie Wang

   Multi-Agent Deep Reinforcement Learning for Dynamic Spectrum Access

6. Minghao Gao, Wanbin Qi and Xiaojun Jing

   Research on Vision Aided Beam Prediction Technology Based on Machine Learning

7. Gang Liu and Jie Wang

   Location-Aware Resource Allocation for D2D Communications Underlaying 5G Networks

8. Peiyu Li and Lei Liu

   Distributed Beamforming for Interference Management in Heterogeneous Cellular Networks

Session 3: Intelligent Security and Privacy

Chair: Yili Jiang, University of Mississippi, MS, USA

Wednesday, 11:00 AM – 12:30 PM, March 20, 2024

1. Shi Lu, Ming Shi, Bowei Ge, Yueping Deng and Xiao He

   ML Based Audio Analysis to Detect Fraud Call in 4G-5G Wireless Networks

2. Tjada Nelson, Austin O'Brien, Cherie Noteboom and Shengjie Xu

   WCFG: A weighted control flow graph dataset design for malware classification

3. Bryan Ikei, Hanna Thiry and Shengjie Xu

   Towards Robust IoT Privacy: A Blockchain Design with Attribute-based Encryption

4. Sabrina Perry, Yili Jiang, Fangtian Zhong and Chong Yu

   Detecting Poisoning Attacks with DynaDetect

5. Lee Conway, Kyle Thompson and Dongfeng Fang

   Header Modification Attack Against Intrusion Detection Systems

6. Brian Fehrman, Francis Akowuah and Shengjie Xu
Adversarial Attacks in Problem Space for VBA Code Samples

Poster Session 3:

Chair: Jiaqi Huang, University of Central Missouri, MO, USA

Wednesday, 11:00 AM – 12:30 PM, March 20, 2024

1. Mei Rong and Qian Yu
Revolutionizing Construction Design through the Promise of Large Language Models
2. Ziming Li, Ronghui Zhang and Xiaojun Jing
Cross-Domain Gesture Recognition Algorithm Based on Reinforcement Learning in WiFi Sensing
3. Xing Zhang, Wanbin Qi and Xiaojun Jing
Adaptive Power Allocation for Dual-Function Radar and Communication Systems
4. Lei Liu, Jie Wang and Weiliang Xie
Machine Learning for Dynamic Spectrum Allocation in 6G Non-Terrestrial Networks
5. Ben Wang, Chunfeng Liu and Peng Liu
Adaptive Satellite Network Bandwidth Allocation Method Based on Sequential DDQN Model
6. Xueqi Yuan, Yanfen Li, Fei Qi and Weiliang Xie
Joint User Association and Resource Allocation in Multi-Tier HetNets with Energy Harvesting
7. Fangning Shi, Yiyang Xiong and Haoming Zhang
Over-the-Air Computation With Integrated Sensing and Communication in Connected Vehicles: Challenges and Future Directions
8. Yongjie Li, Jizhao Lu, Huanpeng Hou, Wenge Wang, Xiao Liu and Peng Lin
Delay and Load Aware Service Rerouting Method for Power Communication Networks based on Digital Twins

Session 4: Intelligent Communications and Signal Processing

Chair: Sohan Gyawali, East Carolina University, NC, USA

Wednesday, 1:30 PM – 3:00 PM, March 20, 2024

1. Niloofar Mozafarian and Michel Kadoch
   A Two-Stage AP Selection Approach for Scalable User-Centric Cell-Free Massive MIMO Systems
2. Guga Esitashvili, Krishna Murthy Kattiyan Ramamoorthy, Wei Wang and Yanxiao Zhao
   Study of Reconfigurable Intelligent Surface Deployment For Non-Orthogonal Multiple Access Wireless Communication Networks
3. Gandhimathi Velusamy and Ricardo Lent
   Modulation Classification Using Convolution Spiking Neural Networks with Data Fusion
4. Venkataramani Kumar and Feng Ye
   Analysis of Reciprocity based Downlink Channel Estimation with Uneven Uplink Channel
5. Daidong Ying and Feng Ye
   Analysis of Path Prediction Error for a High-Mobility Massive MIMO-OTFS System
6. Andrea Gomez and Emmanuel Arzuaga
   Real Time American Sign Language Recognition Using Yolov6 Model

Poster Session 4:

Chair: Jielun Zhang, University of North Dakota, ND, USA

Wednesday, 1:30 PM – 3:00 PM, March 20, 2024

1. Yong Zhang, Lei Sheng, Ningning Zhang, Huifang Liu and Peng Lin
   Network Resource Scheduling Mechanism with Controllable Delay in Service Function Chain
2. Yanfen Li
   Age-of-Information Aware Radio Resource Management in URLLC Networks
3. Huanpeng Hou, Jizhao Lu, Yongjie Li, Wenge Wang, Shilong Zhao and Peng Lin
   Digital Twin Driven Traffic Prediction for Power Communication Network Based on GraphLSTM
4. Chunying Wang, Fajia Ji, Yan Liu, Yizhan Quan and Peng Lin
   Network Slicing Delay Constrained Resource Allocation Algorithm Based on TOPSIS
5. Chao Chen, Ronghui Zhang and Xiaojun Jing
   Unsupervised Text Semantic Matching Based on Contrastive Learning
6. Jiatai Wang, Jiaen Zhou, Ronghui Zhang and Yunfeng Zhang
   Edge Dynamic Service Offloading Based on Multi-Agent Deep Q Learning

7. Yonghu Cao, Quan Zhou, Zhaotao Qin and Yuqi Wang
   NOMA-based Minimum Transmit Power of Static UAV
8. Pingping Lin
   Federated Learning for Interference Management in Ultra-Dense mmWave Network
9. Haoran Jing, Haowei Wu, Haoyun Liu, Ronghui Zhang and Xiaojun Jing
   Dynamic Beam Hopping Resource Allocation based on Deep Reinforcement Learning in LEO Multi-Beam Satellite Communication Systems

Session 5: AI-Enabled IoT and Real-Time Edge Computing

Chair: Dongfeng Fang, California Polytechnic State University, CA, USA

Wednesday, 3:30 PM – 5:00 PM, March 20, 2024

1. Maryam Safaei, Michel Kadoch and David Bensoussan
   Real-Time Traffic Flow Prediction and Management via Vehicular Fog Computing and Edge Intelligence
2. Josué A. Rodríguez-Cordero, Gabriel A. Santiago-Plaza, Luke Meyers, Fanfan Noel, Eduardo J Figueroa-Santiago, Rémi Mégret, Carlos Corrada Bravo, José L. Agosto-Rivera and Tugrul Giray
   A Real-Time Edge System for Honeybee Flower Patch Assays
3. Jingxiao Tian, Patrick Mercier and Christopher Paolini
   Fall Detection through Inferencing at the Edge
4. Fuhao Li, Mohammad Ali and Jielun Zhang
   Cyber Attack Detection in IoT Using Enhanced Stream Classification Algorithm
5. Mohammad Ali and Jielun Zhang
   Explainable Artificial Intelligence Enabled Intrusion Detection in the Internet of Things
6. Dong Wang, Kejie Lu and Edwin Florez Gomez
   A Survey on Digital Twin Networks: Use Cases and Enabling Technologies