WOCC 2020

The 29th Wireless and Optical Communications Conference (WOCC 2020)

May 1-2, 2020, Newark, New Jersey, USA

(Online Conference)

www.wocc.org

Welcome Message

On behalf of the Wireless and Optical Communications Conference (WOCC) Planning Committee, we welcome you to our 29th annual event, the WOCC 2020.

WOCC 2020 features four keynote speeches, highlighting the latest technology advances and potentials on wireless and optical communications, networking, and big data applications: "Sixth-Generation Wireless: The World Will Expect it, But It Will Not Be So Easy to Deliver!" by Prof. Thomas L. Marzetta of New York University; "High-Capacity Free-Space Optical and Millimeter-Wave Communications Using Mode-Division-Multiplexing" by Prof. Alan E. Willner of University of Southern California; "Using Deep Neural Networks in Physical Layer Communication Problems" by Prof. Lizhong Zheng of Massachusetts Institute of Technology; and "Exploring the Power of Pervasive Sensing for IoT Security and Smart Healthcare" by Prof. Yingying Chen of Rutgers University.

The WOCC2020 will present invited and peer reviewed papers on four parallel symposiums: Wireless Communications, Optical Communications and Photonics, Networks, and Big Data and Emerging Technology. Papers presented will be included in WOCC 2020 Conference Proceedings published in IEEE Xplore Digital Library. WOCC Charles K. Gao Best Paper Awards will be given to 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.

Due to COVID-19, WOCC 2020 will be held as a virtual conference. However, the quality and integrity of the research content and conference organization will remain. Thank you for your support of our shared mission to advance technology for humanity. We hope your participation in the WOCC2020 is a productive and rewarding experience. Thank you for your involvement and contribution in making our WOCC 2020 Conference a success.

Xin Jiang, College of Staten Island, CUNY

Conference Co-chair

Meilong Jiang, Qualcomm

Conference Co-chair

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PROGRAM AT A GLANCE

WOCC, Friday, May 1, 2020

10:30–10:35	**Opening Remarks**			
10:35–11:35	K1 **Keynote Session** (*Chair: Xin Jiang*)	**Prof. Thomas L. Marzetta** - New York University, ***"Sixth-Generation Wireless: The World Will Expect it, But It Will Not Be So Easy to Deliver!"***		
11:35–12:35	K2 **Keynote Session** (*Chair: Xin Jiang*)	**Prof. Alan E. Willner -** University of Southern California, ***"High-Capacity Free-Space Optical and Millimeter-Wave Communications Using Mode-Division-Multiplexing"***		
12:35–13:30	Lunch			
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15:10–15:30	Break			
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WOCC, Saturday, May 2, 2020

10:30–10:40	**Best Paper Award ceremony**			
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11:40–12:40	K4 **Keynote Session** (*Chair: Meilong Jiang*)	**Prof. Yingying Chen** - Rutgers University, ***"Exploring the Power of Pervasive Sensing for IoT Security and Smart Healthcare"***		
12:40–13:30	Lunch			
13:30–15:10	W3 **Satellite and Future Wireless Networks** *Chair: Zhangyang Zhang* *College of Staten Island, CUNY*	O3 **Photonic Network and Free Space Communication** *Chair: Zhaoran Rena Huang* *Rensselaer Polytechnic Institute*	B2 **Deep Learning Based Emerging Technology** *Chair: Bin Li* *University of Rhode Island*	
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Parallel Session 1 of 4

WOCC Technical Sessions – Friday, May 01, 2020, 13:30 – 15:10

W1 Antenna, Filter and Modulation

Chair: Guosen Yue
Futurewei Technologies

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Guosen Yue (**Invited**) and Xiao-Feng Qi
Futurewei Technologies, Inc, USA

Automatic Modulation Classification and SNR Estimation Based on CNN in Physical-layer Network Coding
Xuesong Wang,Yuna He, Yang Sun and Yueying Zhan
Chinese Academy of Sciences, China

Non-coherent autocovariance receiver for DPSK-k modulation invariant to channel distortions
Gerardo Ramirez, Fernando Peña, Ramon Parra-Miche, and Valeri Ya Kontorovich
CINVESTAV, Mexico

Joint Hybrid Beamforming and Dynamic Antenna Clustering for Massive MIMO
Ahmad Ghasemi and Seyed (Reza) Zekavat
Worcester Polytechnic Institute (WPI), USA

O1 Fiber Transmission and System

Chair: Ioannis Roudas
Montana State University, Bozeman

Nonlinear GN model for coherent optical communication systems with hybrid fiber spans
I. Roudas (**Invited**), X. Jiang, and J. Kwapisz
Montana State University, Bozeman, Montana, USA

Modern Undersea Cable Systems Evolution
Ruomei Mu **(Invited)**
Subcom, NewJersey, USA

Mitigating the signal distortion in multilevel Manchester-based optical communications systems using optical equalization technique
F. I. Oluwajobi, A.Malekmohammadi , D. Nguyen, and N. Khan
California Polytechnic State University, California, USA

Dual Frame OFDM with Optical Phase Conjugation
Usha Choudhary; Vinjay Janyani, and Muhammad Arif Khan
Malaviya National Institute of Technology Jaipur, India

N1 Computing Systems and Performance

Chair: Hong Zhao
FDU

Decentralized Continuous Game for Task Offloading in UAV Cloud
Ang Gao, Tianli Geng, Yansu Hu, Wei Liang, Weijun Duan
Northwestern Polytechnical University, China

Benchmarking Network Performance in Named Data Networking (NDN)
Yaoqing Liu, Anthony Dowling, and Lauren Huie
Fairleigh Dickinson University, New Jersey, USA

Data Visualization for Wireless Sensor Networks Using ThingsBoard
Matthew Henschke, Xinzhou Wei, and Xiaowen Zhang
College of Staten Island, CUNY, NewYork, USA

B1 Big Data Analytics and Machine Learning Methods

Chair: Zhi Wei
NJIT

Integrating Data-driven Approaches to Improve Performance of Solving SCUC
Xiaoyu Sean Lu **(Invited)**
Stevens Institute of Technology, NJ, USA

Federated Learning meets Wireless Communication
Mingzhe Chen **(Invited)**
Princeton University, Princeton, NJ, USA

Data-driven Surplus Material Prediction in Steel Coil Production
Ziyan Zhao, Xiaoyue Yong, Shixin Liu, and Mengchu Zhou
Northeastern University, Shenyang, China

Research on Hainan Trusted Digital Infrastructure Construction Framework
Kun Zhang, Chong Shen, and Keliu Long
Northeastern University, Shenyang, China

WOCC Technical Sessions – Friday, May 01, 2020, 15:30 – 17:30

W2 Machine Learning and AI for Wireless Communication

Chair: Lingjia Liu
Virginia Tech

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Virginia Tech, Virginia, USA

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Jason Dabin, Justin Mauger, Alexander M. Haimovich and Annan Dong
Naval Information Warfare & New Jersey Institute of Technology, USA

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Mingju He, Shengliang Peng, Huaxia Wang, and Yu-Dong Yao
Stevens Institute of Technology, NJ, USA

MAC Protocol Identification Using Convolutional Neural Networks
Yu Zhou, Shengliang Peng, and Yu-Dong Yao
Stevens Institute of Technology, NJ, USA

LDPC Code Classification using Convolutional Neural Networks
Bradley Comar
Department of Defense, USA

O2 Photonic Device

Chair: Nicholas Madamopoulos
City College of CUNY

Multifunctional Photonic Signal Processing Platforms for Analog and Digital Signal Processing
Nicholas Madamopoulos **(Invited)**
City College, CUNY
New York, USA

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Mario V. Bnyamin, Mark D.Feuer, and Xin Jiang
College of Staten Island, CUNY,
New York, USA

Characteristics of A Frequency-doubled Solid-state Laser with Tunable Pulse Width
Ya-Jiang Li, Jian-Guo Xin and Teng Sun
Beijing Institute of Technology
Beijing, China

N2 Future Internet Architecture and Security

Chair: Yaoqing Liu
FDU

Empowering Named Data Networks for Ad-Hoc Long-Range Communication
Yaoqing Liu,Lauren Njilla, Anthony Dowling, Wan Du
Fairleigh Dickinson University,
New Jersey, USA

DASC: A Privacy-Protected Data Access System with Cache Mechanism for Smartphones
Wenyun Dai, Longbin Chen, Ana Wu, and Md Liakat Ali
Fairleigh Dickinson University,
New Jersey, USA

Detecting host location attacks in SDN-based networks
Sonali Sen Baidya and Rattikorn Hewett
Texas Tech,
Texas, USA

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WOCC Technical Sessions – Saturday, May 02, 2020, 13:30 – 15:10

W3 Satellite and Future Wireless Networks

Chair: Zhangyang Zhang
College of Staten Island, CUNY

Process-Oriented Optimization for Beyond 5G Cognitive Satellite-UAV Networks
Chengxiao Liu, Wei Feng (**Invited**), Yunfei Chen, Cheng-Xiang Wang, Xiangling Li, and Ning Ge
Tsinghua University, China

Dual Splash Plate Parabolic Stacked Antenna for Satellite Communication System Consolidation s
Clive Sugama and V. Chandrasekar
Colorado State University, USA

Optimal UAV Positioning for a Temporary Network Using an Iterative Genetic Algorithm
Nicholas Ceccarelli, Paulo A Regis, Shamik Sengupta, and David Feil-Seifer
SUNY University at Buffalo, NewYork, USA

Hybrid FSO/mmWave based Fronthaul CRAN Optimization for Future Wireless Communications
Nagwa Ibrahim, Ashraf A Eltholth, and Magdy El-Soudani
National Telecommunication Institute Cairo, Egypt

Routing Algorithm with High Credibility and Stability (RACS) in WWSN-based Internet of Medical Things
Kefeng Wei, Lincong Zhang, and Lei Guo
Northeastern University, China

O3 Photonic Network and Free Space Communication

Chair: Zhaoran Rena Huang
Rensselaer Polytechnic Institute

Photonic True Time Delay-Line Reservoir Computer for Time Series of Signals Classification and Prediction
Zhaoran Rena Huang **(Invited)**
Rensselaer Polytechnic Institute,
Troy, New York, USA

Outdoor Optical Wireless Communication: potentials, standardization and challenges for Smart Cities
Véronique Georlette, Véronique Moeyaert, Sébastien Bette,and Nicolas Point
University of Mons, Mons, Belgium

Rain Effects on FSO and mmWave Links: Preliminary Results from an Experimental Study
Elizabeth Verdugo, Roberto Nebuloni, Lorenzo Luini, Carlo Riva, Luiz da Silva Mello, and Giuseppe Roveda
Pontificia Universidade Catolica do Rio de Janeiro
Rio de Janeiro, Brazil

An Adaptive DPPM for Efficient and Robust Visible Light Communication Across the Air-Water Interface
Md Shafiqul Islam and Mohamed Younis
University of Maryland Baltimore County
Baltimore, Maryland, USA

B2 Deep Learning Based Emerging Technology

Chair: Bin Li
University of Rhode Island

Text Representation in Online Abusive Language Detection: An Empirical Study
Fei Tan (**Invited**)
Yahoo! Research,
New York,USA

Towards computationally efficient adversarial training defense against adversarial examples attacks to neural networks classifiers
Abdallah Khreishah (**Invited**)
New Jersey Institute of Technology(NJIT),
New Jersey, USA

A Convolutional Neural Network Approach to Improving Network Visibility
Bruce Hartpence, Andres Kwasinski
Rochester Institute of Technology, Rochester, New York, USA

Deep Learning Methods for Mining Genomic Sequence Patterns
Xin Gao **(Invited)**
Amazon,
California, USA

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WOCC Technical Sessions – Saturday, May 02, 2020, 15:30 – 17:10

W4 Emerging Network Technologies

Chair: Yudong Yao
Stevens Institute of Technology

Classification of QPSK Signals with Different Phase Noise Levels Using Deep Learning
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Stevens Institute of Technology, New Jersey, USA

5G Signal Identification Using Deep Learning
Mohsen H. Alhazmi, Mofadal Alymani, Hatim Alhazmi, Alhussain Almarhabi, Abdullah Samarkandi, and Yu-Dong Yao
Stevens Institute of Technology, New Jersey, USA

Deep Learning in 5G Wireless Networks - Anomaly Detections
Minh Doan and Zhanyang Zhang
College of Staten Island, CUNY, New York, USA

Latency Optimization-based Joint Task Offloading and Scheduling for Multi-user MEC System
Tiantian Yang, Rong Chai, and Liping Zhang
Chongqing University of Posts and Telecommunications, Chongqing, China

Rician K-Factor Estimation Using Deep Learning
Mofadal Alymani, Mohsen H. Alhazmi, Alhussain Almarhabi, Hatim Alhazmi, Abdullah Samarkandi, and Yu-Dong Yao
Stevens Institute of Technology, New Jersey, USA

Network Coding for Integrated Access and Backhaul Wireless Networks
Wei Mao, Murali Narasimha, Meryem Simsek, Hosein Nikopour
Intel Corporation, Santa Clara, California, USA

O4 Visible Light Communication

Chair: Xin Jiang
College of Staten Island, CUNY

A low complexity NOMA scheme in VLC systems using pulse modulations
Jian Song **(Invited)**, Tian Cao, and Hongming Zhang
Tsinghua University, Beijing, China

Spectrally Efficient Cooperative Visible Light Communication with Adaptive Power Sharing for a Generalized System
Umang Garg, Nithin Raha J K, and B. Sainath
Birla Institute of Technology and Science (BITS), Pilani, India

Throughput of Optical WDM with Wide LED Spectra and Imperfect Color-detecting Filters
T. E. Bitencourt Cunha1, Jean-Paul M. G. Linnartz, and Xiong Deng
Eindhoven University of Technology, The Netherlands

Co-Channel Interference Management in Visible Light Communication
Mona Elsayed Hosney, Hossam A. I. Selmy, and Khaled M. F. Elsayed
National Telecommunication Institute,
Cairo, Egypt

K1 – Keynote Session *Friday, May 1st , 2020 10:35-11:35*

Keynote Speaker

Thomas L. Marzetta

Distinguished Industry Professor at NYU Tandon School of Engineering, ECE Department
and
Director of NYU Wireless

New York University

Brooklyn, NY, USA

tlm8@nyu.edu

Sixth-Generation Wireless: The World Will Expect it, But it May Not Be So Easy to Deliver!

ABSTRACT:

The rollout of 5G wireless began in 2018, but in eight or ten years 5G will have run its course. The demands of augmented reality alone - estimated to require a sustained rate of as much as 2 gigabit/second per user - probably cannot be met by 5G technology. Other unanticipated applications will emerge. Another factor-of-ten improvement in performance beyond 5G is required and expected, and, to that end, research and development has already begun. 6G research directions include the extension of mmWave technology to terahertz frequencies, new types of multiple-antenna technology, and applications of AI. However none of these research threads appears quite as promising as mmWave and Massive MIMO did ten years ago when 5G was first envisioned. Notwithstanding, there is still reason for optimism: all existing wireless communication systems are operating far from any fundamental limits imposed by nature!

BIOGRAPHY:

Thomas Marzetta is Distinguished Industry Professor at NYU Tandon School of Engineering, ECE Department, and Director of NYU Wireless. Born in Washington, DC, he received the PhD and SB in Electrical Engineering from Massachusetts Institute of Technology in 1978 and 1972, and the MS in Systems Engineering from University of Pennsylvania in 1973. Prior to joining NYU in 2017, he had three industrial research careers: petroleum exploration (Schlumberger-Doll Research, 1978 – 1987), defense (Nichols Research Corporation, 1987 – 1995), and telecommunications (Bell Labs, 1995 – 2017). At Bell Labs, he directed the Communications and Statistical Sciences Department within the former Mathematical Sciences Research Center, and he was elected a Bell Labs Fellow. He originated Massive MIMO, one of the cornerstones of fifth generation wireless technology. He is lead-author of the book "Fundamentals of Massive MIMO".

Prof. Marzetta was elected a member of National Academy of Engineering in 2020. Additional recognition for his contributions to Massive MIMO include the 2019 Radio Club of America Armstrong Medal, the 2017 IEEE Communications Society Industrial Innovation Award, the 2015 IEEE Stephen O. Rice Prize, and the 2015 IEEE W. R. G. Baker Award. He was elected a Fellow of the IEEE in 2003, and he received an Honorary Doctorate from Linköping University in 2015.

K2 - Keynote Session *Friday, May 1st , 11:35 – 12:35*

Keynote Speaker

Alan E. Willner

Steven and Kathryn Sample Chair in Engineering
and
Professor of Electrical and Computer Engineering

University of Southern California

Los Angeles, CA 90089

willner@usc.edu

High-Capacity Free-Space Optical and Millimeter-Wave Communications Using Mode-Division-Multiplexing

ABSTRACT:

Communications has historically experienced tremendous capacity growth by multiplexing many independent-data-carrying channels and transmitting them simultaneously over the same medium. In this regard, space-division-multiplexing (SDM) is an exciting domain to exploit, and multiple spatially overlapping orthogonal electromagnetic modes can achieve a subset called mode-division-multiplexing (MDM). The ability to efficiently multiplex and co-propagate through a single transmitter/receiver aperture pair arises from the inherent orthogonality among the beams. The ability to multiplex multiple data-carrying beams over the same physical medium represents the potential for increasing system capacity and spectral efficiency.

One type of orthogonal modal basis set for multiplexing is orbital-angular-momentum (OAM), which is a subset of Laguerre-Gaussian modes. Generating different amounts of OAM on different optical or millimeter-wave beams has emerged as a technique for such mode multiplexing in free-space, wireless communications. A beam can carry OAM if its phase front "twists" in a helical fashion as it propagates, and the amount of OAM corresponds to the number of 2*pi phase shifts that occur in the azimuthal direction. Each OAM beam is orthogonal to other beams, and such beams can be efficiently multiplexed, transmitted, and demultiplexed with little inherent crosstalk. Moreover, OAM multiplexing can be compatible with other forms of multiplexing, such as wavelength and polarization multiplexing.

This presentation will explore the achievements of and challenges to OAM-based optical and millimeter-wave communication systems, including transmission, crosstalk and turbulence mitigation, and link design.

BIOGRAPHY:

Alan Willner received a PhD from Columbia University, and he worked at AT&T Bell Labs and Bellcore. He is currently the Steven & Kathryn Sample Chair in Engineering at the Univ. of Southern California. Prof. Willner has been a Member of the US Army Science Board and the Defense Sciences Research Council. His activities include: Co-Chair of US National Academies' Study on Optics & Photonics; President of the OSA and the IEEE Photonics Society; and Editor-in-Chief of OSA Optics Letters, IEEE/OSA Journal of Lightwave Technology, and IEEE Journal of Selected Topics in Quantum Electronics.

Prof. Willner has received the following honors: Member of US National Academy of Engineering; Int'l Fellow of UK Royal Academy of Engineering; Presidential Faculty Fellows Award from the White House; Ellis Island Medal of Honor; IEEE Sumner Technical Field Award; Fulbright, Guggenheim, and Packard Foundation Fellowships; U.S. Vannevar Bush Faculty Fellowship; Fellow of National Academy of Inventors; IET JJ Thomson Medal; Egleston Medal for Distinguished Eng. Achievement from Columbia Eng. Alumni Association; OSA Forman Engineering Excellence Award; IEEE Photonics Society Eng. Achievement Award; Honorary Doctorate from Yeshiva University; Honorary Professor of Huazhong Univ. of Science & Technology; SPIE President's Award; 2001 Eddy Paper Award from Pennwell Publications for Best Contributed Technical Article; and IEEE Globecom Best Paper Award. He is a Fellow of AAAS, IEEE, IET, OSA and SPIE.

K3 – Keynote Session *Saturday, May 2nd , 2020 10:40 -11:40*

Keynote Speaker

Lizhong Zheng

Professor of Electrical Engineering and Computer Science

Massachusetts Institute of Technology

Cambridge, MA 02139

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Using Deep Neural Networks in Physical Layer Communication Problems

ABSTRACT:

In the current effort to apply machine learning techniques in a wide range of engineering problems, communication networks, in particular, physical layer problems are considered the harder problems. This is mainly because that we traditionally take a model-based approach in communication problems, and often expect strong guarantees on the performance, optimality, robustness, and efficient use of resources, which are all difficult with neural network solutions. The core issue is that unlike image or natural language problems, a communication system is always carefully designed, with structures that are critical in order to achieve the desired performance. However, there is no natural way to use the knowledge about these structures in neural networks, for which part of the design philosophy is to be model agnostic.

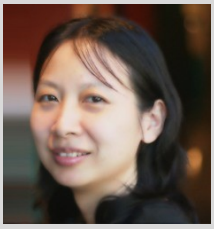
We show in this talk a few examples of how to alter the operations in neural networks to include the structural knowledge in the processing and to solve physical layer communication problems. Our solutions are based on an information theoretic interpretation of neural networks as learning the informative features, where the notion of "informative" can be naturally generalize to include structural information of the problem, such as symmetry, regularity, and specific parameterization like the fading coefficients. We demonstrate that such domain knowledge can be used flexibly to improve the detection accuracy, to reduce the learning cost, or to make the solutions more generalizable. With these examples, we try to make the point that combining structural knowledge in data-driven learning algorithms can indeed provide a powerful alternative to communication problems.

BIOGRAPHY:

Lizhong Zheng received the B.S and M.S. degrees, in 1994 and 1997 respectively, from the Department of Electronic Engineering, Tsinghua University, China, and the Ph.D. degree, in 2002, from the Department of Electrical Engineering and Computer Sciences, University of California, Berkeley. Since 2002, he has been working at MIT, where he is currently a professor of Electrical Engineering. His research interests include information theory, statistical inference, communications, and networks theory. He received Eli Jury award from UC Berkeley in 2002, IEEE Information Theory Society Paper Award in 2003, and NSF CAREER award in 2004, and the AFOSR Young Investigator Award in 2007. He served as an associate editor for IEEE Transactions on Information Theory, and the general co-chair for the IEEE International Symposium on Information Theory in 2012. He is an IEEE fellow.

K4 – Keynote Session *Saturday, May 2nd, 11:40 – 12:40*

Keynote Speaker



Yingying (Jennifer) Chen

Professor of Electrical and Computer Engineering

Associate Director of WINLAB

Rutgers University

New Brunswick, NJ 08854

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Exploring the Power of Pervasive Sensing for IoT Security and Smart Healthcare

ABSTRACT:

With the advancement of mobile sensing and pervasive computing, extensive research is being carried out in various application domains such as Internet of Things (IoT), smart healthcare, connected vehicles, and their security issues. My research work explores the power of pervasive sensing technologies to benefit people's daily lives and make impacts on the society advancement, especially in two emerging areas: IoT security and smart healthcare. Particularly, my group studies how to conduct user authentication on any solid surface for IoT applications and how to perform vital signs monitoring during sleep towards smart healthcare. The first part of my talk introduces the idea of extending user authentication beyond traditional touch screens to any solid surface for smart access systems (e.g., access to apartments, vehicles or smart homes). The system builds upon a touch sensing technique with vibration signals that can operate on surfaces constructed from a broad range of materials. It integrates passcode, behavioral and physiological characteristics, and surface dependency together to provide enhanced security for many IoT applications. The second part of my talk describes how to track human vital signs of breathing and heart rates during sleep, which serve as critical inputs for assessing the general physical health of a person and providing useful clues for diagnosing possible diseases. Different from previous work, our system re-uses existing WiFi network for tracking vital signs of breathing and heart rates concurrently without dedicated/wearable sensors or additional wireless infrastructure (e.g., USRP). The system exploits the fine-grained channel state information of WiFi signals to capture the minute body movements caused by breathing and heartbeats. The proposed system thus has the potential to be widely deployed in home environments and perform continuous long-term monitoring at a low-cost. Finally, I will share with you some new research directions I would like to pursue with the aim of influencing the future of smart homes and smart cities.

BIOGRAPHY:

Yingying (Jennifer) Chen is a Professor of Electrical and Computer Engineering at Rutgers University. She is an IEEE Fellow. She is also the Associate Director of Wireless Information Network Laboratory (WINLAB) and leads the Data Analysis and Information Security (DAISY) Lab. Her research interests include mobile computing and sensing, cyber security and privacy, Internet of Things, and smart healthcare. She has co-authored three books, published over 150 journals and referred conference papers and obtained 8 patents with 3 of them have been licensed to industrial companies. Her background is a combination of Computer Science, Computer Engineering and Physics. Prior to joining Rutgers, she was a tenured professor at Stevens Institute of Technology and had extensive industry experiences at Nokia (previously Alcatel-Lucent). She is the recipient of the NSF CAREER Award and Google Faculty Research Award. She also received NJ Inventors Hall of Fame Innovator Award. She is the recipient of multiple Best Paper Awards from IEEE CNS 2018, IEEE SECON 2017, ACM AsiaCCS 2016, IEEE CNS 2014 and ACM MobiCom 2011. She is the recipient of IEEE Region 1 Technological Innovation in Academic Award 2017; she also received the IEEE Outstanding Contribution Award from IEEE New Jersey Coast Section each year 2005 - 2009. Her research has been reported in numerous media outlets including MIT Technology Review, CNN, Fox News Channel, Wall Street Journal, National Public Radio and IEEE Spectrum. She has been serving/served on the editorial boards of IEEE/ACM Transactions on Networking (IEEE/ACM ToN), ACM Transactions on Privacy and Security, IEEE Transactions on Mobile Computing (IEEE TMC) and IEEE Transactions on Wireless Communications (IEEE TWireless).

Technical Session: Program Chairs

Wireless Program

Meilong Jiang

Qualcomm Flarion Technologies
500 Somerset Corporate Blvd, Bridgewater, NJ 08807

BIOGRAPHY:

Meilong Jiang received his Ph.D. from the University of Hong Kong in electrical engineering in 2006. He was a research staff member with NEC Labs America from 2008 to 2012, where he worked on projects on WiMAX, LTE and 3GPP standardization. He then worked at InterDigital from 2012 to 2015, focusing on technology development and evaluation for 3GPP RAN1 standardizations. From 2015 to 2019, he worked at FutureWei Technologies as a senior staff engineer researching massive MIMO and active antenna system (AAS) related enhancements for 5G. He is currently a senior staff engineer at Qualcomm where his work focuses on mmWave and massive MIMO enhancements. He holds 28 issued US patents with 31 filed patents pending.

Zhanyang Zhang

Computer Science
College of Staten Island, CUNY
Staten Island, NY

BIOGRAPHY:

Dr. Zhanyang Zhang acquired his Ph.D. degree in computer science from the City University of New York. He received a BE degree in computer engineering from Jilin University, Changchun, China. He is currently a full time 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, network modeling and simulations, RFID, underwater sensor networks and parallel computing. He has been awarded several grants from federal and state agencies in wireless and acoustic underwater sensor network research and has numerous peer reviewed publications including book chapters, journal articles and conference papers. Before joining CUNY, he was a member of technical staff (MTS) at Bell Labs, Lucent Technology where he worked on several R&D projects in 3G wireless networks. He also works as a communication network consultant with different companies in New York/New Jersey areas.

Technical Session: Program Chairs

Optical Program

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

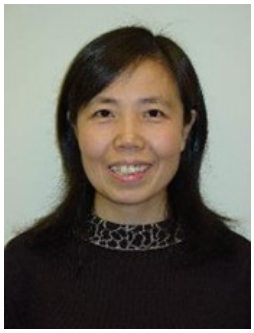
BIOGRAPHY:

Dr. Xin Jiang is an associate professor in Engineering and Environmental Science department at College of Staten Island (CSI), City University of New York (CUNY). She has extensive industrial R&D and academic research experiences in optical fiber communication field. Her research interests include advanced high speed optical transmission technology, optical fiber and optical devices, broadband optical networks, access network and data center interconnection. She is the author or co-author of more than 60 papers in scientific journals and international conferences and holds one patent.

Dr. Jiang received a B.S., M.S., and Ph.D. degree in Electronics Engineering and Opto-electronics from Tsinghua University, Beijing, China. She continued her postdoctoral research work at the University of Southern California on high speed optical systems and networks, and later worked for the Photonic Research and Test Center of Corning Corporate as a senior research scientist, where her research concentrated on linear and nonlinear impairments in high data rate transmission. Prior joining the CSI, Dr. Jiang has worked in multiple R&D and engineering organizations of several high-tech companies, involved in multiple state-of-the-art telecommunication products developments, which covered areas of transoceanic systems, long-haul backbone systems, metro networks, and access networks

Technical Session: Program Chairs

Networks Program

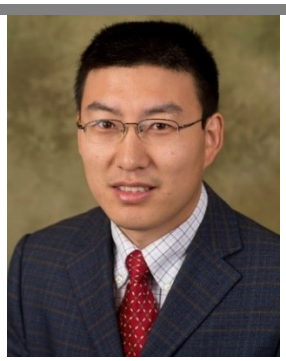


Hong Zhao

Fairleigh Dickinson University

BIOGRAPHY:

Hong Zhao received Ph. D from New Jersey Institute of Technology in Electrical and Computer Engineering. She is an Associate Professor of Electrical and Computer Engineering at Fairleigh Dickinson University, New Jersey, US. Her research focuses on various aspects of broadband communications and computer security including Network Traffic/Performance/Security Analysis and Modeling, and Hardware Trojan detection. She serves as Associate Editor of the Journal on Multidimensional Systems and Signal Processing, and Editor of the Journal of Computing and Information Technology. Professor Zhao also serves as the Chair of the IEEE North Jersey Computer Society Chapter. She has been a TPC member, symposium co-chair, technical paper reviewer and book reviewer for IEEE conferences, journal magazines and book publishers. She received AFRL VFRP award in 2014-2016, Visiting Professor Award from Ministry of Science and Technology in Taiwan, and 2015 IEEE Region 1 award for Outstanding Support for the Mission of the IEEE, MGA, REGION 1 and Section.



Yaoqing Liu

Fairleigh Dickinson University

BIOGRAPHY:

Dr. Yaoqing Liu received his Master's and PhD degrees from the University of Memphis in Computer Science. He is the program coordinator of M.S. in Cybersecurity and Information Assurance program (MSCSIA), and an Assistant Professor in Gildart Haase School of Computer Sciences & Engineering at Fairleigh Dickinson University (FDU). His research interests are cybersecurity and networked systems. His publications appear in highly reputed conference proceedings and journals, such as IEEE INFOCOM, ACM SIGCOMM CCR and ACM/IEEE ANCS. He has been a TPC member and technical paper reviewer for IEEE conferences, journal magazines and transactions. He is the inventor of four patents. His research work has been selected as one of the 2018 TechConnect Defense Innovation Awards recognizing the potential positive impact for the warfighter and national security.

Technical Session: Program Chairs

Big Data and Emerging Technology Program

Zhi Wei

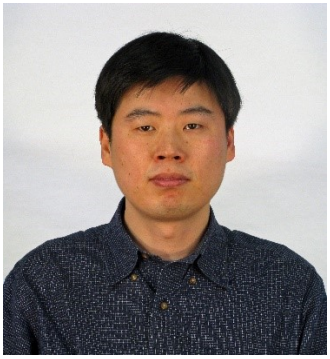
New Jersey Institute of Technology
Newark, NJ 07102

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) with the New Jersey Institute of Technology. He has authored or coauthored more than 150 publications with 8000 citations and 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..

W1 – Technical Session: Antenna, Filter and Modulation (Friday, May 1st , 13:30 -15:10)

Session Chair



Guosen Yue

Radio Algorithms Research, New Jersey Research Center,
Futurewei Technologies, Inc. Bridgewater, NJ 08807

BIOGRAPHY:

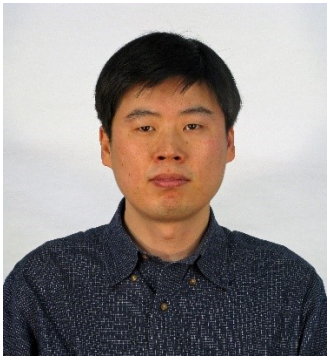
Guosen Yue [S'03-M'04-SM'09] received the B.S. degree in physics and the M.S. degree in electrical engineering from Nanjing University, Nanjing, China, in 1994 and 1997, respectively, and the Ph.D. degree in electrical engineering from Texas A$\&$M University, College Station, TX, USA, in 2004. He was a Senior Research Staff at NEC Laboratories America, Princeton, NJ, USA. From 2013 to 2015, he was with Broadcom Corporation, Matawan, NJ, USA, as a System Design Scientist. He is now a Principal Research Staff at Futurewei Technologies, Bridgewater, NJ, USA. His research interests are in the general areas of wireless communications and signal processing. He has served as an Associate Editor of the IEEE TRANSACTIONS ON WIRELESS COMMUNICATIONS, the Guest Editor of EURASIP Journal of Wireless Communication and Networking special issue on interference management, Elseviers Physical Communication special issue on signal processing and coding. He served as the Symposium Co-chair for IEEE GLOBECOM 2019, IEEE ICC 2010, the Track Co-chair for IEEE ICCCN 2008. He is a senior member of the IEEE.

W1 – Technical Session: Antenna, Filter and Modulation (Friday, May 1st , 13:30 -15:10)

W1.1: Efficient Methods and Architectures for Mean and Variance Estimations of QAM Symbols

Guosen Yue *(invited) and Xiao-Feng Qi

Radio Algorithms Research, New Jersey Research Center,
Futurewei Technologies, Inc. Bridgewater, NJ 08807



Presenter: Guosen Yue

ABSTRACT:

In this paper, we design efficient methods for the mean and variance estimations of QAM symbols with applications to iterative receivers. The proposed methods for optimal estimations enable scalable hardware implementations for any Gray mapped PAM or QAM with less circuitries. For variance estimations, the proposed method reduces the complexity from $O((\log_2 N)^2)$ in the existing method to $O(\log_2 N)$ for an N-QAM. Two suboptimal methods are also proposed to avoid the multiplications in the hardware implementations. The presented approximation approaches provide similar or better performance than the existing methods but with simpler implementation and less logical circuitries. In addition, based on the proposed architecture, we propose novel unit module design with disassembled estimation components and the schematics to virtualize the estimation hardware. With efficient design of unit module and control unit, maximized parallelization can be achieved.

BIOGRAPHY:

Guosen Yue [S'03-M'04-SM'09] received the B.S. degree in physics and the M.S. degree in electrical engineering from Nanjing University, Nanjing, China, in 1994 and 1997, respectively, and the Ph.D. degree in electrical engineering from Texas A$\&$M University, College Station, TX, USA, in 2004. He was a Senior Research Staff at NEC Laboratories America, Princeton, NJ, USA. From 2013 to 2015, he was with Broadcom Corporation, Matawan, NJ, USA, as a System Design Scientist. He is now a Principal Research Staff at Futurewei Technologies, Bridgewater, NJ, USA. His research interests are in the general areas of wireless communications and signal processing. He has served as an Associate Editor of the IEEE TRANSACTIONS ON WIRELESS COMMUNICATIONS, the Guest Editor of EURASIP Journal of Wireless Communication and Networking special issue on interference management, Elseviers Physical Communication special issue on signal processing and coding. He served as the Symposium Co-chair for IEEE GLOBECOM 2019, IEEE ICC 2010, the Track Co-chair for IEEE ICCCN 2008. He is a senior member of the IEEE.

W1 – Technical Session: Antenna, Filter and Modulation (Friday, May 1st , 13:30 -15:10)

W1.2: Automatic Modulation Classification and SNR Estimation Based on CNN in Physical-layer Network Coding

Xuesong Wang, Yuna He, Yang Sun, Yueying Zhan

Key Laboratory of Space Utilization, Technology and Engineering Center for Space Utilization, Chinese Academy of Sciences

ABSTRACT:

In this paper, we first propose the Automatic Modulation Classification (AMC) problem based on the Physical-layer Network Coding (PNC) system and elaborate in detail. We use Convolutional Neural Networks (CNN) to identify nine cases including three modulation formats with three phase shifts respectively, and estimate the Signal-to-Noise Ratio (SNR) simultaneously. As the result, we correctly identify several modulation formats and typical phase offsets with a 100% recognition rate, and estimate the received signal-to-noise ratio effectively with recognition rate above 98%.

BIOGRAPHY:

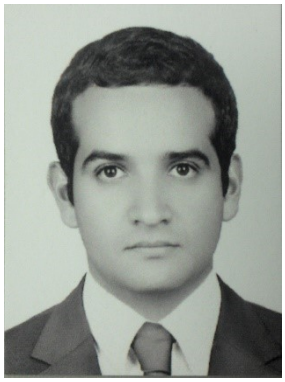
Xuesong Wang received his B.E. from the Beijing Jiaotong University (BJTU) in 2017, and access the outstanding graduates. He is studying for a Ph.D. in Technology and Engineering Center for Space Utilization (CSU), Chinese Academy of Sciences (CAS). He joined the Key Laboratory of Space Utilization in CSU since 2018.
His research interests include wireless communications, free-space optical communications, physical-layer network coding, and neural networks.

W1 – Technical Session: Antenna, Filter and Modulation (Friday, May 1st , 13:30 -15:10)

W1.3: Non-Coherent autocovariance receiver for DPSK-k modulation invariant to channel distortions

Gerardo Ramírez, Fernando Peña, Ramón Parra, Valeri Kontorovich

CINVESTAV, Tecnológico de Monterrey, CINVESTAV, CINVESTAV



ABSTRACT:

Differential phase shift keying (DPSK) is a promising approach for reducing the overhead and computational complexity involved in upcoming multiple input-multiple output links. This technique has some intrinsic benefits, that provide invariance to certain channel distortions depending of the order of modulation used, for example, initial phase introduced by the channel, Doppler Shifts and Carrier Frequency Offset (CFO).

BIOGRAPHY:

Gerardo Ramirez was born in Puruándiro, Michoacán, Mexico, in 1990. He received the B.Sc. degree in electronics from the Universidad Michoacana de San Nicolas de Hidalgo, Michoacán, Mexico, in 2013, and the M.Sc. degree in electrical engineering specializing in communications, from the Centro de Investigación y de Estudios Avanzados (CINVESTAV), Instituto Politécnico Nacional (IPN), Guadalajara, in 2015. He is currently finishing his Ph.D. with CINVESTAV, IPN. His research interests include digital signal processing, modeling, doubly high mobility MIMO channels, and space-time signal modulation techniques.

W1 – Technical Session: Antenna, Filter and Modulation (Friday, May 1st , 13:30 -15:10)

W1.4: Joint Hybrid Beamforming and Dynamic Antenna Clustering for Massive MIMO

Ahmad Ghasemi and Seyed A. (Reza) Zekavat

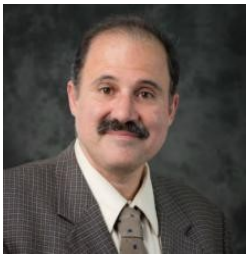
Department of Data Science, Worcester Polytechnic Institute, Worcester, MA, USA

ABSTRACT:

This paper offers a new approach for antenna clustering and hybrid beamforming applicable to massive MIMO systems. Simultaneous clustering and hybrid beamforming across Tx and Rx antennas is an NP-hard problem. To address this issue, first, the paper proposes an antenna clustering that is applied to both Tx and Rx. In this regard, antenna arrays at Tx and Rx are modeled as a Bipartite graph and for the first time, one bi-clustering algorithm, Spectral Co-Clustering algorithm, is applied to achieve simultaneous clustering. Next, singular vectors of subchannels, which are the channels between subantenna arrays of Tx and Rx, are comprised to determine optimal precoders/combiners. Performance evaluations in terms of Tx-Rx data streaming sum-rate demonstrate the effectiveness of the proposed algorithm.

BIOGRAPHY:

Ahmad Ghasemi received the M.Sc. degree in electrical engineering in 2012 from Shiraz University, Shiraz, Iran. He is currently working toward the PhD degree in data science in Worcester Polytechnic Institute, Worcester, USA. His research interests include graph theory, machine learning, and optimization.



Seyed A. (Reza) Zekavat received his PhD from Colorado State University in 2002. He is the Author of the textbook "Electrical Engineering: Concepts and Applications" published by Pearson, and the editor and author of 10 Chapters of the book "Handbook of Position Location: Theory, Practice and Advances," published by Wiley/IEEE. He holds a patent on an active Wireless Remote Positioning System. Zekavat has also co-authored two books "Multi-Carrier Technologies for Wireless Communications," published by Kluwer, and "High Dimensional Data Analysis," published by VDM Verlag; and ten book chapters in the areas of adaptive antennas, localization, and spectrum sharing. Zekavat's research interests are in wireless communications, positioning systems, software defined radio design, dynamic spectrum allocation, Radar theory, blind signal separation, MIMO and beam forming techniques, feature extraction, and neural networking. He is active on the technical program committees for several IEEE international conferences, serving as a committee chair or member. He has founded and chaired several IEEE workshops. He served on the editorial board of many Journals including IET Communications, IET Wireless Sensor System, Springer International Journal on Wireless Networks, and GSTF Journal on Mobile Comm. He has been on the Executive Committee of multiple IEEE conferences.

W2 – Technical Session: Machine Learning and AI for Wireless Communication (Friday, May 1st , 15:30 -17:10)

Session Chair

Lingjia Liu

Bradley Department of Electrical and Computer Engineering, Virginia Tech, Blacksburg, VA, USA

BIOGRAPHY:

Lingjia Liu (SM15) received the B.S. degree in electronic engineering from Shanghai Jiao Tong University and the Ph.D. degree in electrical and computer engineering from Texas A&M University. Currently, he is an Associate Professor in the Bradley Department of ECE at Virginia Tech (VT) and is also the Associate Director of Wireless@VT. Prior to joining VT, he was an Associate Professor in the EECS Department at University of Kansas (KU). He spent more than four years working in the Mitsubishi Electric Research Laboratory (MERL) and the Standards and Mobility Innovation Lab, Samsung Research America (SRA), where he received Global Samsung Best Paper Award in 2008 and 2010. He was leading Samsung's efforts on multiuser MIMO, CoMP, and HetNets in LTE/LTE-Advanced standards. His general research interests mainly lie in emerging technologies for Beyond 5G cellular networks including machine learning for wireless networks, massive MIMO, massive MTC communications, and mmWave communications. Lingjia Liu received the Air Force Summer Faculty Fellow, from 2013 to 2017, Miller Scholar at KU, 2014, Miller Professional Development Award for Distinguished Research at KU, 2015, the 2016 *IEEE* GLOBECOM Best Paper Award, the 2018 *IEEE* ISQED Best Paper Award, the 2018 *IEEE* TAOS Best Paper Award, and 2018 *IEEE* TCGCC Best Conference Paper Award.

W2 – Technical Session: Machine Learning and AI for Wireless Communication (Friday, May 1st , 15:30 -17:10)

W2.1: Reservoir Computing Meets Wi-Fi in Software Radios Neural Network-based Symbol Detection using Training Sequences and Pilots

Lianjun Li[1], Lingjia Liu[1], Jianzhong (Charlie) Zhang[2], Jonathan D. Ashdown[3], and Yang Yi[1]

Lianjun Li[1] , Lingjia Liu[1] , Jianzhong (Charlie) Zhang[2] , Jonathan D. Ashdown[3] , and Yang Yi[1]

[1]Bradley Department of Electrical and Computer Engineering, Virginia Tech, Blacksburg, VA, USA

[2]Standards and Mobility Innovation Lab., Samsung Research America, Plano, TX, USA

[3] Information Directorate, U.S. Air Force Research Lab., Rome, NY, USA

ABSTRACT:

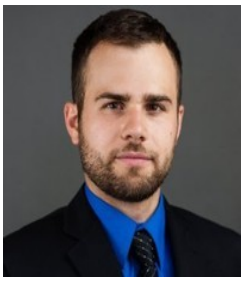
In this paper, we introduce a neural network (NN)-based symbol detection scheme for Wi-Fi systems and its associated hardware implementation in software radios. To be specific, reservoir computing (RC), a special type of recurrent neural network (RNN), is adopted to conduct the task of symbol detection for Wi-Fi receivers. Instead of introducing extra training overhead/set to facilitate the RC-based symbol detection, a new training framework is introduced to take advantage of the signal structure in existing Wi-Fi protocols (e.g., IEEE 802.11 standards), that is, the introduced RC-based symbol detector will utilize the inherent long/short training sequences and structured pilots sent by the Wi-Fi transmitter to conduct online learning of the transmit symbols. In other words, our introduced NN-based symbol detector does not require any additional training sets compared to existing Wi-Fi systems. The introduced RC-based Wi-Fi symbol detector is implemented on the software defined radio (SDR) platform to further provide realistic and meaningful performance comparison against the traditional Wi-Fi receiver. Over the air experiment results show that the introduced RC-based Wi-Fi symbol detector outperforms conventional Wi-Fi symbol detection methods in various environments indicating the significance and the relevance of our work.

BIOGRAPHY:

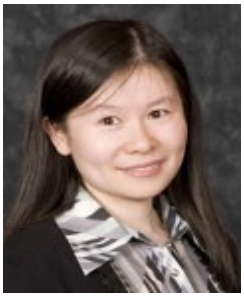
Lingjia Liu (SM15) received the B.S. degree in electronic engineering from Shanghai Jiao Tong University and the Ph.D. degree in electrical and computer engineering from Texas A&M University. Currently, he is an Associate Professor in the Bradley Department of ECE at Virginia Tech (VT) and is also the Associate Director of Wireless@VT. Prior to joining VT, he was an Associate Professor in the EECS Department at University of Kansas (KU). He spent more than four years working in the Mitsubishi Electric Research Laboratory (MERL) and the Standards and Mobility Innovation Lab, Samsung Research America (SRA), where he received Global Samsung Best Paper Award in 2008 and 2010. He was leading Samsung's efforts on multiuser MIMO, CoMP, and HetNets in LTE/LTE-Advanced standards. His general research interests mainly lie in emerging technologies for Beyond 5G cellular networks including machine learning for wireless networks, massive MIMO, massive MTC communications, and mmWave communications. Lingjia Liu received the Air Force Summer Faculty Fellow, from 2013 to 2017, Miller Scholar at KU, 2014, Miller Professional Development Award for Distinguished Research at KU, 2015, the 2016 *IEEE* GLOBECOM Best Paper Award, the 2018 *IEEE* ISQED Best Paper Award, the 2018 *IEEE* TAOS Best Paper Award, and 2018 *IEEE* TCGCC Best Conference Paper Award.

Lianjun Li received the B.S. degree in Telecommunications Engineering from Zhejiang University, Hangzhou, China. After that he joined Ericsson as a wireless network optimization engineer for 7 years. He received the M.S. degree in Electrical Engineering from University of Texas at Dallas (UTD). Now he is pursuing the Ph.D. degree in the Bradley Department of Electrical and Computer Engineering at Virginia Tech. His research interest is applying reinforcement learning and deep learning techniques to wireless communications.

Jianzhong (Charlie) Zhang received the Ph.D. degree from the University of Wisconsin, Madison. He is a SVP and the Head of the Standards and Mobility Innovation Laboratory, Samsung Research America, where he leads research, prototyping, and standards for 5G and future multimedia networks. From 2009 to 2013, he served as the Vice Chairman for the 3GPP RAN1 Working Group and led development of LTE and LTE-Advanced technologies, such as 3-D channel modeling, UL-MIMO, CoMP, and carrier aggregation for TD-LTE.



Jonathan D. Ashdown received the B.S., M.S., and Ph.D. degrees from Rensselaer Polytechnic Institute, Troy, NY, USA, in 2006, 2008, and 2012, respectively, all in electrical engineering. His doctoral dissertation was on a high-rate ultrasonic through-wall communication system using MIMO-OFDM in conjunction with interference mitigation techniques. In 2012, he was a recipient of the Best Unclassified Paper Award at the IEEE Military Communications Conference. Since 2012, he has worked as an Electronics Engineer for the Department of Defense (DoD). Since 2016, he has instructed various communications and networking courses as an Adjunct Professor for the Department of Electrical and Computer Engineering (ECE) at the State University of New York (SUNY) Polytechnic Institute, Utica, NY, USA.



Yang Yi (SM17) is an Associate Professor in the Bradley Department of ECE at Virginia Tech (VT). She received the B.S. and M.S. degrees in electronic engineering at Shanghai Jiao Tong University, and the Ph.D. degree in electrical and computer engineering at Texas A&M University. Her research interests include very large scale integrated (VLSI) circuits and systems, computer aided design (CAD), and neuromorphic computing.

W2 – Technical Session: Machine Learning and AI for Wireless Communication (Friday, May 1st , 15:30 -17:10)

W2.2: Blind Source Separation with L_1 Regularized Sparse Autoencoder

Jason A. Dabin[1,2], Alexander M. Haimovich[2], Justin Mauger[1], Annan Dong[2]

[1]Naval Information Warfare Center Pacific, USA
[2]New Jersey Institute of Technology, USA

ABSTRACT:

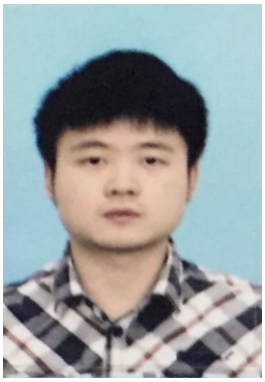
Blind source separation of co-channel communication signals can be performed by structuring the problem with an over-complete dictionary of the channel and solving for the sparse coefficients, which represent the latent transmitted signals. L1 regularized least squares is a common approach to imposing sparsity on the latent signal representation while minimizing the reconstruction error. In this paper we propose an unsupervised learning approach for blind source separation using an L1 regularized sparse autoencoder with a soft-threshold activation function at the hidden layer that is able to separate and fully recover multiple overlapping binary phase shift keying co-channel signals.

BIOGRAPHY:

Since 2011, **Jason Dabin** has been with the Department of the Navy Naval Information Warfare Center Pacific, San Diego, CA, USA. He received the B.Sc. degree in electrical engineering technology and the M.Sc. degree in electrical engineering from the New Jersey Institute of Technology (NJIT), Newark, NJ, USA, in 2001 and 2004, respectively. He is currently pursuing his Ph.D. in Electrical Engineering at NJIT. His research interests include wireless propagation modeling, passive geolocation, array signal processing, blind source separation, machine learning, and neural networks for wireless communications.

W2 – Technical Session: Machine Learning and AI for Wireless Communication (Friday, May 1st , 15:30 -17:10)

W2.3: Identification of ISM Band Signals Using Deep Learning



Mingju He*， Shengliang Peng，Huaxia Wang***，Yu-Dong Yao***

* Department of Electrical and Computer Engineering, Stevens Institute of technology, Hoboken, NJ 07030
** College of Information Science and Engineering, Huaqiao University, Xiamen, P. R. China
*** College of Engineering, Oklahoma State University, Stillwater, OK 74078

ABSTRACT:

Spectrum awareness is now becoming more and more important in recent years, which can be utilized in areas like spectrum resource allocation, spectrum management, inference control, and security protection. Deep learning (DL) models, including convolutional neural network models have been widely used for classification related tasks, such as modulation classification, medium access control protocol (MAC) classification, and spectrum sensing. In this paper, a pre-trained Inception V3 model (CNN-based) is used to classify industrial, scientific, and medical (ISM) radio band signals. Experimentation results demonstrate the effectiveness of deep learning in ISM band signal identification.

BIOGRAPHY:

Mingju He received the B.S. degree in electrical engineering from Xihua University, Chengdu, China, in 2012 and M. Eng. degree in electrical engineering from Stevens Institute of Technology, Hoboken, NJ, USA, in 201. He is currently pursuing his Ph.D. degree in computer engineering at Stevens Institute of Technology. His current research interests include machine learning, deep learning, and wireless communications.

W2 – Technical Session: Machine Learning and AI for Wireless Communication (Friday, May 1st , 15:30 -17:10)

W2.4: MAC Protocol Identification Using Convolutional Neural Networks

Yu Zhou
Department of Electrical and Computer Engineering
Stevens Institute of Technology
Hoboken, NJ, USA
yzhou7@stevens.edu

Shengliang Peng
College of Information Science and Engineering
Huaqiao University
Xiamen, P.R. China
peng.shengliang@gmail.com

Yudong Yao
Department of Electrical and Computer Engineering
Stevens Institute of Technology
Hoboken, NJ, USA
yyao@stevens.edu

ABSTRACT:

Making the network nodes aware of the spectrum parameters can help to improve the spectrum utilization and network efficiency. To achieve such goals, machine learning (ML) and deep learning (DL) have been utilized to identify spectrum parameters, such as modulation formats, power levels, medium access control (MAC) protocols, etc. This paper explores MAC protocol identification using ML and DL in additive white Gaussian noise (AWGN) and Rayleigh fading environments. We transform the received signals into spectrogram and utilize convolutional neural networks (CNN) to recognize the MAC protocols. Experimentation results demonstrate the effectiveness in MAC protocol identification using ML and DL algorithms

BIOGRAPHY:

Yu Zhou received bachelor's degree in Software Engineering from Nanjing University of Posts and Telecommunications, Nanjing, in 2011, master's degree in Financial Engineering from Stevens Institute of Technology, Hoboken, New Jersey, in 2013 and the Ph.D. degree in Computer Engineering from Stevens Institute of Technology in 2018. Her research interests include cognitive radio, machine learning, and deep learning.

W2.5: LDPC Code Classification using Convolutional Neural Networks

Bradley Comar

Department of Defense

Washington, DC
b comar@yahoo.com

ABSTRACT:

This paper discusses the performance of an LDPC code classification system. Three randomly generated binary LDPC codes are created, all having the same codeword size and coderate. Multi-scaled convolutional neural networks are employed to classify codeword streams. High classification accuracies are obtained with relatively small networks..

BIOGRAPHY:

Not available

W3 – Technical Session: Satellite and Future Wireless Networks (Saturday, May 2nd , 13:30 -15:10)

Session Chair

Zhanyang Zhang

Computer Science
College of Staten Island, CUNY
Staten Island, NY

BIOGRAPHY:

Dr. Zhanyang Zhang acquired his Ph.D. degree in computer science from the City University of New York. He received a BE degree in computer engineering from Jilin University, Changchun, China. He is currently a full-time 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, network modeling and simulations, RFID, underwater sensor networks and parallel computing. He has been awarded several grants from federal and state agencies in wireless and acoustic underwater sensor network research and has numerous peer reviewed publications including book chapters, journal articles and conference papers. Before joining CUNY, he was a member of technical staff (MTS) at Bell Labs, Lucent Technology where he worked on several R&D projects in 3G wireless networks. He also works as a communication network consultant with different companies in New York/New Jersey areas.

W3 – Technical Session: Satellite and Future Wireless Networks (Saturday, May 2nd , 13:30 -15:10)

W3.1: Process-Oriented Optimization for Beyond 5G Cognitive Satellite-UAV Networks

Chengxiao Liu[1], Wei Feng (Invited) [1], Yunfei Chen[2], Cheng-Xiang Wang[3, 4], Xiangling Li[1], and Ning Ge[1]

[1]Beijing National Research Center for Information Science and Technology, Tsinghua University, Beijing 100084, China
[2]School of Engineering, University of Warwick, Coventry CV4 7AL, U.K.
[3]National Mobile Communications Research Laboratory, Southeast University, Nanjing 210096, China
[4]Purple Mountain Laboratories, Nanjing 211111, China

ABSTRACT:

The coverage area of terrestrial 4G/5G networks is usually limited, far from satisfying the communication demand in the remote rural, the post disaster and maritime scenarios. Both satellite and unmanned aerial vehicle (UAV) can be adopted to solve this problem in the 6G era. Towards this end, we consider a cognitive satellite-UAV network (CSUN), where satellite and UAVs are managed in a coordinated manner, and opportunistically share spectrum to alleviate the spectrum scarcity problem. Particularly, we use the UAV swarm to mitigate the satellite-UAV interference. Motivated by practical applications, the limited on-board energy and imperfectly acquired channel state information (CSI) are discussed. We propose a process-oriented optimization scheme to maximize the data transmission efficiency, which jointly optimizes the transmit power and hovering time of UAV swarm for the whole flight process. The scheme takes both energy constraints and interference power constraints into account, and performs in an iterative way. Simulation results demonstrate the superiority of the proposed algorithm, which could be an effective solution for extending the coverage performance of terrestrial 4G/5G networks.

BIOGRAPHY:

WEI FENG (S'06, M'10, SM'19) received his B.S. and Ph.D. degrees from the Department of Electronic Engineering, Tsinghua University, Beijing, China, in 2005 and 2010, respectively. He is currently an Associate Professor with the Department of Electronic Engineering, Tsinghua University, Beijing, China. His research interests include maritime communication networks, large-scale distributed antenna systems, and coordinated satellite-UAV-terrestrial networks. He serves as the Assistant to the Editor-in-Chief of *China Communications*, an Editor of *IEEE Transactions on Cognitive Communications and Networking*, and an Associate Editor of *IEEE Access*.

W3 – Technical Session: Satellite and Future Wireless Networks (Saturday, May 2nd , 13:30 -15:10)

W3.2: Dual Splash Plate Parabolic Stacked Antenna for Satellite Communication System Consolidation

Clive Sugama V. Chandrasekar
College of Engineering Colorado State University Fort Collins, CO 80523

ABSTRACT:

Satellite communication system consolidation reduces the amount of shipboard topside and below deck systems required to perform radio frequency capabilities. Parabolic antenna stacking alleviates the need for multiple topside antennas to operate at commercial and military radio frequencies. This paper presents the design and simulated results of a dual splash plate parabolic stacked antenna that has the ability to operate at frequencies of four different Navy antenna variants (NMT Q/Ka, NMT X/Ka, CBSP FLV and CBSP ULV). The dual splash plate parabolic stacked antenna is focused on providing an L, C, K, Ka, Ku, X and Q band capable solution on a single pedestal to save space on the topside of shipboard platforms.

BIOGRAPHY:

Clive Sugama is an Integrated Product Team Lead at the Naval Information Warfare Center Atlantic (NIWC) in Charleston, SC. He joined NIWC in 2009 supporting various Navy and USCG SATCOM projects. He served in the U.S. Air Force as a Network Infrastructure Technician and was honorably discharged in 2006. He holds a B.S. in Electrical Engineering from The University of Alabama as well as a M.S. in Systems Engineering from the Naval-Post Graduate School. He is pursuing his Ph.D. in Systems Engineering from Colorado State University with an emphasis of RF antenna consolidation research.

W3 – Technical Session: Satellite and Future Wireless Networks (Saturday, May 2nd , 13:30 -15:10)

W3.3: Optimal UAV Positioning for a Temporary Network Using an Iterative Genetic Algorithm

Nicholas Ceccarelli, Paulo Alexandre Regis, Shamik Sengupta, David Feil-Seifer

SUNY University at Buffalo

ABSTRACT:

Efficient arrangement of UAVs in a swarm formation is essential to the functioning of the swarm as a temporary communication network. Such a network could assist in search and rescue efforts by providing first responders with a means of communication. We propose a user-friendly and effective system for calculating and visualizing an optimal layout of UAVs. An initial calculation to gather parameter information is followed by the proposed algorithm that generates an optimal solution. A visualization is displayed in an easy-to-comprehend manner after the proposed iterative genetic algorithm finds an optimal solution. The proposed system runs iteratively, adding UAV at each intermediate conclusion, until a solution is found. Information is passed between runs of the iterative genetic algorithm to reduce runtime and complexity. The results from testing show that the proposed algorithm yields optimal solutions more frequently than the k-means clustering algorithm. This system finds an optimal solution 80% of the time while k-means clustering is unable to find a solution when presented with a complex problem..

BIOGRAPHY:

I am a third-year undergraduate student at SUNY University at Buffalo pursing a dual degree in computer science and mathematics. I completed the work for this project in a Research Experience for Undergraduates at the University of Nevada, Reno during the summer of 2019. I have been participating in research since my first year of college. I am currently an undergraduate researcher in the CyberMed laboratory at the University at Buffalo. This laboratory focuses on using computers and computer science to benefit healthcare. The project I am currently working on involves using deep learning to assist in diagnosing illnesses. I am also a teaching assistant for a systems programming class and I am a software engineering intern at CytoCybernetics, Inc. I will be starting an internship for Moog, Inc. this summer in which I will be working with machine learning and data science.

W3 – Technical Session: Satellite and Future Wireless Networks (Saturday, May 2nd , 13:30 -15:10)

W3.4: Hybrid FSO/mmWave based Fronthaul C-RAN Optimization for Future wireless communication

Nagwa Ibrahim, Ashraf A. Eltholth and Magdy S. El-Soudani

Transmission Department, National Telecommunication Institute,
Cairo, Egypt
Faculty of Engineering, Cairo University, Giza, Egypt

ABSTRACT:

Cloud radio access network (C-RAN) architecture is actively considered as a major candidate for future wireless communications. The aerial communication network such as high-altitude balloon (HAB) is used to transport the fronthaul among radio transceivers and processing units. Both free space optic (FSO) and millimeter wave (mmWave) are promising technologies, but each one has its impairments that affect its efficiency under different weather conditions. So, a hybrid channel is considered to match with the requirements of fronthaul networks. This paper aims to optimize the hand over process between FSO and mmWave channels to maximize the sum data rate for the fronthaul in C-RAN architecture. The problem is formulated as an integer linear programming (ILP) problem. The mathematical programming is applied on the hybrid transmission technology FSO/mmWave channel. The obtained numerical results indicate the potential of hybrid FSO/mmWave channel in counteracting the effect of different weather conditions.

BIOGRAPHY:

Research assistant at the Transmission Department, National Telecommunication Institute which affiliated to MCIT, in Egypt. Received the B.S. degree in communication and electronics department from the University of Benha, Egypt, in 2012.

W3 – Technical Session: Satellite and Future Wireless Networks (Saturday, May 2nd , 13:30 -15:10)

W3.5 Routing Algorithm with High Credibility and Stability (RACS) in WWSN-based Internet of Medical Things

Kefeng Wei[1,2], Lincong Zhang[3], Lei Guo[4]

1 School of Computer Science and Engineering, Northeastern University, Shenyang, China
2 Shen Kan Engineering and Technology Corporation, MCC., Shenyang, China
3 School of Information Science and Engineering, Shenyang Ligong University, Shenyang, China
4 School of Communication and Information Engineering, Chongqing University of Posts and Telecommunications, Chongqing, China

ABSTRACT:

Due to the massive development of the wearable technology and widespread use of wearable devices, the Wearable Wireless Sensor Network (WWSN)-based Internet of Medical Things (IoMT) has appeared to become a hot research topic. In WWSN-based IoMT, the users equipped with wearable wireless sensors moving at their will raises a challenge to the routing. Routing algorithms in WWSN proposed by previous works mainly cover the energy consumption of nodes and network delay. However, seldom works pay close attention to the link stability, which is a vital parameter of the network performance. In fact, the mobility of user equipped with wearable sensor nodes can severely influence the link stability. In addition, to ensure the information safety during packet forwarding, the credibility of node is concerned in this paper. We propose a routing algorithm based on credibility and stability (RACS), with taking link maintenance time, the node congestion, the residual energy of node, the credibility of node, and path length into consideration. The routing path with the maximum credibility and stability (CS) is selected as the optimal path. Simulation results show that the proposed RACS algorithm outperforms better in packet forwarding rate, which indicates that the routing path is more stable than others. Meanwhile, the performance of RACS algorithm in terms of energy consumption and delay is close to the other two algorithms. Therefore, the proposed algorithm can provide higher credibility and stability for WWSN-based IoMT.

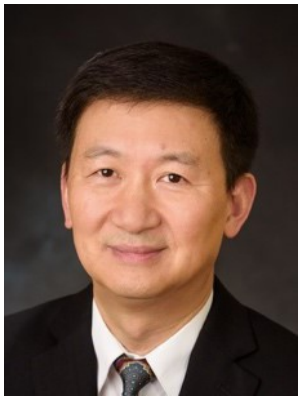
BIOGRAPHY:

Lincong Zhang was born in Shijiazhuang, Hebei, China in 1985. She received the B.S. degree in electronic and information engineering from Shenyang University of Chemical Technology in 2008 and the M.S. and Ph.D. degrees in communication and information system from Northeastern University in 2010 and 2014.

From 2014 to 2019, she was an Assistant Professor with the School of Information Science and Engineering, Shenyang Ligong University. She is the author of more than 30 articles. Her research interests include passive optical access network, 5G network, wireless sensor network, and wearable sensor network.

W4 – Technical Session: Emerging Network Technologies (Saturday, May 2nd , 15:30 -17:10)

Session Chair



Yu-dong Yao

Professor, Dept. of Electrical and Computer Engineering
Stevens Institute of Technology, New Jersey, USA
IEEE Fellow

BIOGRAPHY:

Dr. Yu-Dong Yao has been with Stevens Institute of Technology, Hoboken, New Jersey, since 2000 and served as a Department Chair of Electrical and Computer Engineering from 2007 to 2018. Previously, from 1989 to 2000, Dr. Yao worked for Carleton University, Ottawa, Spar Aerospace Ltd., Montreal, and Qualcomm Inc., San Diego. His research interests include wireless communications, cognitive radio, and machine learning and deep learning. He holds one Chinese patent and thirteen U.S. patents. Dr. Yao was an Associate Editor of IEEE Communications Letters (2000-2008) and IEEE Transactions on Vehicular Technology (2001-2006), and an Editor for IEEE Transactions on Wireless Communications (2001-2005). For his contributions to wireless communications systems, he was elected a Fellow of IEEE (2011), National Academy of Inventors (2015), and Canadian Academy of Engineering (2017). In 2018, he received an honorary degree, Master of Engineering (Honoris Causa), from Stevens Institute of Technology. He received the B.Eng. and M.Eng. degrees from Nanjing University of Posts and Telecommunications, Nanjing, China, in 1982 and 1985, respectively, and the Ph.D. degree from Southeast University, Nanjing, China, in 1988, all in electrical engineering.

W4 – Technical Session: Emerging Network Technologies(Saturday, May 2nd , 15:30 -17:10)

W4.1: Classification of QPSK Signals with Different Phase Noise Levels Using Deep Learning

Hatim Alhazmi, Alhussain Almarhabi, Abdullah Samarkandi,

Mofadal Alymani, Mohsen Alhazmi, Zikang Sheng, and Yu-Dong Yao

Stevens Institute of Technology, Hoboken, NJ 07030

ABSTRACT:

Spectrum awareness allows the understanding of the wireless systems environment and it gives engineers and designers better control in systems design and analysis. Phase noise is one of the characteristics of the channel distortion or device distortion, which causes transmission errors. In this paper, a deep learning network is utilized to study and identify different phase noise levels in quadrature phase shift keying (QPSK) signals. Our experiment results show that the deep learning neural network is capable of classifying a wide range of phase noise levels.

BIOGRAPHY:

Hatim Alhazmi received the B.Sc. degree in computer engineering from Umm Al-Qura University, Makkah, Saudi Arabia, in 2013, and the M.Eng. degree in computer engineering from Stevens Institute of Technology, Hoboken, NJ, USA, in 2018. He is currently pursuing the Ph.D. degree in computer engineering at Stevens Institute of Technology. His current research interests include deep learning and communications systems.

W4 – Technical Session: Emerging Network Technologies (Saturday, May 2nd , 15:30 -17:10)

W4.2: 5G Signal Identification Using Deep Learning

Mohsen H. Alhazmi, Mofadal Alymani, Hatim Alhazmi, Alhussain Almarhabi, Abdullah Samarkandi, and Yu-Dong Yao

Stevens Institute of Technology, Hoboken, NJ 07030

ABSTRACT:
Spectrum awareness, including identifying different types of signals, is very important in a cellular system environment. In this paper, a neural network is utilized to identify 5G signals among different cellular communications signals, including Long-Term Evolution (LTE) and Universal Mobile Telecommunication Service (UMTS). We explore the use of deep learning in wireless communications systems. We consider the effects of training dataset size, features extracted, and channel fading in our study. Experiment results demonstrate the effectiveness of deep learning neural networks in identifying cellular system signals, including UMTS, LTE, and 5G signals.

BIOGRAPHY:

Mohsen H. Alhazmi received the master's degree in computer engineering from Stevens Institute of Technology, Hoboken, New Jersey, in 2017. He is currently pursuing the Ph.D. degree with the Department of Electrical and Computer Engineering at Stevens Institute of Technology. His main research interests include machine learning algorithms for wireless communications networks.

W4 – Technical Session: Emerging Network Technologies (Saturday, May 2nd , 15:30 -17:10)

W4.3: Deep Learning in 5G Wireless Networks:

Anomaly Detections

Minh Doan and Zhanyang Zhang
Computer Science Department, College of Staten Island
City University of New York

ABSTRACT:

The year of 2020 is critical for global implementation of 5G wireless networks. While enjoying a whole new level of user experience in 5G networks, such as high data rate, low latency and virtually everything to everything connections, the ever growing diversity, complexity of network and data traffics impose a set of new challenges for effectively operating and managing 5G networks. As our daily lives are more depended on mobile devices and apps, so does the cyber security risk and venerability increase. Many of the algorithms, protocols and practices used to safeguard 4G networks fall short for 5G networks without degradation the performance expected for 5G networks. In this paper we report our early research results of using deep learning algorithms for anomaly detection in 5G network while minimizing the impacts to network latency. We developed a prototype model using U-Net and conducted a simulation experiment with a well-known botnet dataset to evaluate the suitability and performance.

BIOGRAPHY:

Minh Doan is a Substitute Lecturer of Computer Science at College of Staten Island, CUNY. He received a master's degree in Computer Science (2019) and a bachelor's degree in Computer Science (2017) from College of Staten Island, CUNY. He has passion in teaching and helping students to have better understanding about algorithmic approach to problem solving in Computer Science. Mr. Doan's research interests are data analytics, applied machine learning and deep learning.

W4 – Technical Session: Emerging Network Technologies (Saturday, May 2nd , 15:30 -17:10)

W4.4: Latency Optimization-based Joint Task Offloading and Scheduling for Multi-user MEC System

Tiantian Yang, Rong Chai, Liping Zhang

School of Communications and Information Engineering, Chongqing University of Posts and Telecommunications

ABSTRACT:

Mobile edge computing (MEC) has been recognized as a promising technique which provides mobile devices (MDs) with enhanced computation capability. In this paper, we consider a multi-user, multi-server MEC system which consists of a number of MDs and multiple base stations (BSs) deployed with MEC servers. We assume that computation tasks can be executed locally at the MDs or be offloaded to the MEC servers. Further assume that each MEC server may execute computation tasks for multiple MDs, however, the tasks sharing one MEC server should be scheduled sequentially. We jointly study computation task offloading and scheduling scheme for the MDs and formulate the problem of joint task offloading and scheduling as a task execution latency minimization problem. Since the optimization problem is a mixed integer nonlinear problem which cannot be solved using conventional methods, we transform it into two subproblems, i.e., task partition subproblem and task scheduling subproblem. Under the assumption that task scheduling strategy is given, task partition subproblem is a set of single variable optimization problems, which can be solved easily. To tackle the task scheduling subproblem, we propose a heuristic algorithm, which first determines complete local computing mode for the MDs, then calculates local optimal strategy for the MDs. In the case that multiple MDs may share one MEC server, various priorities are then assigned to the MDs and corresponding computing mode and task scheduling strategy are determined for the MDs with different priorities. Numerical results demonstrate the effectiveness of the proposed scheme.

BIOGRAPHY:

Tiantian Yang received the B.Eng. degree in communication engineering from Sichuan University of Science and Engineering, Sichuan, Zigong, China, in 2018. She is currently pursuing the M.Eng. degree in information and communications engineering in the Chongqing University of Posts and Telecommunications, Chongqing, China. Her current research interests include mobile cloud computing, network computation offlfloading, and resource management.

W4 – Technical Session: Emerging Network Technologies (Saturday, May 2nd , 15:30 -17:10)

W4.5: Rician *K*-Factor Estimation Using Deep Learning

Mofadal Alymani, Mohsen H. Alhazmi, Alhussain Almarhabi, Hatim Alhazmi, Abdullah Samarkandi, and Yu-Dong Yao

Department of Electrical and Computer Engineering,
Stevens Institute of Technology,
Hoboken, NJ 07030, USA

ABSTRACT:

Wireless communications systems design and its performance depend on the wireless fading channels, which are often characterized using a Rician probability function. A Rician K-factor is used to describe the fading severity in a Rician fading channel and is used in the system design and performance evaluation. Therefore, the estimation of the Rician K-factor is important in wireless communications research and development. Traditionally, a Rician K-factor equation, the statistics of the instantaneous frequency of the received signal with a lookup table, or the James-Stein estimator with the maximum likelihood estimation is used for the K-factor estimation. In this paper, we explore the use of deep learning for K-factor estimation. Specifically, we use the convolutional neural network (CNN) to estimate the Rician K-factor from a waveform signal in a Rician channel. Numerical results demonstrate its good performance in estimating the K-factor of the Rician channel.

BIOGRAPHY:

Mofadal Alymani received the B.Eng. degree in computer engineering from Umm Al-Qura University, Makkah, Saudi Arabia, in 2012 and the M.S. degree in computer engineering from Stevens Institute of Technology, New Jersey, USA, in 2017. He is currently pursuing the Ph.D. degree in the Department of Electrical and Computer Engineering at Stevens Institute of Technology. His current research interests include deep learning algorithms for wireless communications networks.

W4 – Technical Session: Emerging Network Technologies (Saturday, May 2nd , 15:30 -17:10)

W4.6: Network Coding for Integrated Access and Backhaul Wireless Networks

Wei Mao, Murali Narasimha, Meryem Simsek, and Hosein Nikopour

Intel Corporation

ABSTRACT:

5G new radio (NR) requires a very dense deployment of cellular infrastructure, which poses a great economical challenge if traditional fiber backhaul links are used. To cope with this problem, 3GPP introduced integrated access and backhaul (IAB), aiming to use wireless backhaul to provide high capacity and great deployment flexibility. The multi-hop and multi-route topology for this new type of access networks challenges the existing retransmission-/repetition-based reliability-enhancing technique, such as ARQ/HARQ and packet duplication. However, it also opens up new opportunities for novel reliability enhancement techniques. In this paper, taking advantage of the more complex network topology of IAB, we propose to use linear network coding as a potentially better solution to improve end-to-end latency and reliability. We discuss its placement in the IAB protocol stack, and propose two novel schemes to improve the performance of network coding in the IAB network: the rate-proportional traffic splitting scheme in the multi-route scenario, and the adaptive coded-forwarding scheme in the multi-hop scenario. Simulation results show that in some typical IAB scenarios our network coding solution has considerable performance gains over the existing repetition-based technology.

BIOGRAPHY:

Wei Mao received his B.E. and M.E. degrees from Tsinghua University, Beijing, China, in 2004 and 2007, respectively, and his Ph.D. degree from California Institute of Technology, in 2015, all in electrical engineering. From 2015 to 2017 he was a Postdoctoral Scholar in the department of electrical engineering, University of California, Los Angeles. In 2017 he joined Intel Corporation, Santa Clara, CA, as a research scientist. His research interests include Communications, Signal processing, Information theory, and Bioinformatics.

O1 – Technical Session: Fiber Transmission and System (Friday, May 1st , 13:30- 15:10)

Session Chair

Ionnis Roudas

Montana State University
Bozeman, MT 59717

BIOGRAPHY:

Ioannis Roudas received his B.S. in Physics and an M.S. in Electronics and Radio-engineering from the University of Athens, Greece in 1988 and 1990, respectively, and an M.S. and a Ph.D. degree in coherent optical communication systems from the Ecole Nationale Supérieure des Télécommunications (currently Télécom ParisTech), Paris, France in 1991 and 1995, respectively.

During 1995-1998, he worked in the Optical Networking Research Department at Bell Communications Research (Bellcore), Red Bank, NJ. At the same time, he taught for two semesters, as an Adjunct Professor, at Columbia University.

He was subsequently with the Photonic Modeling and Process Engineering Department at Corning Inc., Somerset, NJ, from 1999 to 2002.

He spent an eight-year period in Greece, during 2003-2011, working at the Department of Electrical and Computer Engineering at the University of Patras as an Associate Professor of Optical Communications. In addition, he taught, as an Adjunct Professor, at the City University of New York and the Hellenic Open University.

During 2011-2016, he was a Research Associate with the Science and Technology Division of Corning, Inc., Corning, NY.

Since July 2016, he has been with the Department of Electrical and Computer Engineering at Montana State University as the Gilhousen Telecommunications Chair Professor.

He is the author or co-author of more than 100 papers in scientific journals and international conferences and holds five patents. He served as an Associate Editor for the IEEE Photonics Journal during 2013-2020.

O1 – Technical Session: Fiber Transmission and System (Friday, May 1st , 13:30- 15:10)

O1.1: Nonlinear GN model for coherent optical communication systems with hybrid fiber spans

I. Roudas ((Invited)* (1), X. Jiang (2), and J. Kwapisz (1)

(1) Montana State University, Bozeman, MT 59717
(2) College of Staten Island, City University of New York,
Staten Island, NY 10314, USA
*ioannis.roudas@montana.edu

ABSTRACT:

The nonlinear Gaussian-noise (GN) model is a useful analytical tool for the estimation of the impact of distortion due to Kerr nonlinearity on the performance of coherent optical communications systems with no inline dispersion compensation.
The original nonlinear GN model was formulated for coherent optical communications systems with identical single-mode fiber spans. Since its inception, the original GN model has been modified for a variety of link configurations. However, its application to coherent optical communications systems with hybrid fiber spans, each composed of multiple fiber segments with different attributes, has attracted scarcely any attention.
This invited paper is dedicated to the extended nonlinear GN model for coherent optical communications systems with hybrid fiber spans. We review the few publications on the topic and provide a unified formalism for the analytical calculation of the nonlinear noise variance.
To illustrate the usefulness of the extended nonlinear GN model, we apply it to coherent optical communications systems with fiber spans composed of a quasi-single-mode fiber segment and a single-mode fiber segment in tandem. In this configuration, a quasi-single-mode fiber with large effective area is placed at the beginning of each span, to reduce most of the nonlinear distortion, followed by a single-mode fiber segment with smaller effective-area, to limit the multipath interference introduced by the quasi-single-mode fiber to acceptable levels. We show that the optimal fiber splitting ratio per span can be calculated with sufficient accuracy using the extended nonlinear GN model for hybrid fiber spans presented here.

BIOGRAPHY:

Ioannis Roudas received his B.S. in Physics and an M.S. in Electronics and Radio-engineering from the University of Athens, Greece in 1988 and 1990, respectively, and an M.S. and a Ph.D. degree in coherent optical communication systems from the Ecole Nationale Supérieure des Télécommunications (currently Télécom ParisTech), Paris, France in 1991 and 1995, respectively.

He is currently the Gilhousen Telecommunications Chair Professor in the Department of Electrical and Computer Engineering at Montana State University. Prior join the faculty of Montana State University, he worked in R&D department in Corning and Bellcore, and hold faculty position in University of Patras in Greece and adjunct faculty positions in Columbia University, City University of New York, and Hellenic Open University.

He is the author or co-author of more than 100 papers in scientific journals and international conferences and holds five patents. He served as an Associate Editor for the IEEE Photonics Journal during 2013-2020.

O1 – Technical Session: Fiber Transmission and System (Friday, May 1st , 13:30- 15:10)

O1.2: Modern Undersea Cable Systems Evolution

Ruo-Mei Mu

SubCom LLC
250 Industrial way west, Eatontown, NJ 07724

ABSTRACT:

We will overview the evolution of modern submarine cable systems from harvesting ultra-high capacity within available bandwidth of single fiber pair to more power efficient space division multiplexing (SDM) designs employing pump sharing techniques over multiple fiber pairs. The challenging issues including cost vs capacity and connectivity optimization as well as open cable design concept will be discussed.

BIOGRAPHY:

Ruo-Mei Mu received the B.S degree and Ph.D degree in electrical engineering from Beijing University of Posts and Telecommunications, Beijing and the Ph.D degree in Photonics from University of Maryland, Baltimore County, Maryland. In 2001, Dr. Mu joined the Tyco Telecommunications as Senior Member of Technical Staff, worked as a researcher in forward looking group. In 2002, she joined Alphoin Corporation as Photonics Engineer, working on silicon photonics, GPON, fiber to the home. In 2008, she returned to Tyco Telecommunications as Senior Member of Technical Staffs. Now she is a Distinguished Member of Technical Staff in SubCom LLC (former Tyco Telecommunications). Dr. Mu is currently working as wet system design in Customer Solution department. She has been designed and implemented many ultra high capacity optical systems for undersea system over the past decade
.

O1.3: Mitigating the signal distortion in multilevel Manchester-based optical communications systems using optical equalization technique

Festus Idowu Oluwajobi (1), Dong-Nhat Nguyen(2), Nafizah Khan(1), and Amin Malekmohammadi*(3)

(1) The University of Nottingham, Malaysia Campus, Semeniyh, Selangor, Malaysia
(2) Czech Technical University in Prague Prague, Czech Republic
(3) California Polytechnic State University, CA, USA
*aminmalek_m@ieee.org

ABSTRACT:

The performance of the Four-level Manchester coding (4-MC) and Four-level Modified Manchester (4-MM) technique were assessed at 20 Gb/s and 40 Gb/s bitrates using the first-order and second-order optical equalizers. The results indicate that applying the second-order optical equalizer, at 20 Gb/s, the transmission distance of 4-MC and 4-MM increases by 25 km and 27 km of standard single-mode fiber (SSMF), respectively, whereas at the bitrate of 40 Gb/s, the 4-MC and 4-MM transmission distance were extended by 6.5 km and 7.5 km of SSMF, respectively. Thus, with second-order optical equalizer, the fiber dispersion can be adequately compensated and subsequently improved the overall BER performance. Hence, the proposed technique could serve as a substitute for the next-generation short-reach optical transmission links..

BIOGRAPHY:

Not available
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O1 – Technical Session: Fiber Transmission and System (Friday, May 1st , 13:30- 15:10)

O1.4: Dual Frame OFDM with Optical Phase Conjugation

Usha Choudhary [(1)], Vijay Janyani [(1)], and Muhammad Arif Khan [* (2)]

(1) Malaiya National Institute of Technology,Jaipur, India
(2) Charles Sturt University Australia
*mkhan@csu.edu.au

ABSTRACT:

This paper presents a modification in conventional asymmetrically clipped optical OFDM (ACO-OFDM) frame for direct detection intensity modulation (DD-IM) system. Proposed dual frame OFDM consists of two similar frames and transmitted with optical phase conjugation for dispersion and non-linearity mitigation in optical fiber. Proposed system is compared with another scheme- phase conjugated sub-carrier coding (PCSC) in OFDM. Authors have compared the proposed system performance with PCSC for single mode fiber (SMF) with length 10 km and multi-mode fiber (MMF) with length 100 meters. Simulation results show that PCSC scheme performs better for SMF but in case of MMF, performance of proposed system is better..

BIOGRAPHY:

Not available

O2 –Photonic Device (Friday, May 1st , 15:30- 17:10)

Session Chair

Nicholas Madamopoulos

Department of Electrical Engineering, The City College of New York
And
Department of Aeronautical Sciences, Hellenic Air Force Academy

BIOGRAPHY:

Nicholas Madamopoulos received the B.S. degree in Physics (with honors) from the University of Patra, Greece, in 1993 and the M.S. and Ph.D. degrees in Optical Science and Engineering from CREOL/College of Optics and Photonics, University of Central Florida, Orlando, USA in 1996 and 1998, respectively. His Ph.D. specialization was in photonic information processing systems, where he introduced novel photonic delay lines for phased array antenna applications, as well as photonic processing modules for fiber-optic communications.

He is an Associate Professor at the Department of Electrical Engineering, the City College of the City University of New York (CUNY), since 2007. He has held positions as a Research Associate at the Department of Electrical and Computer Engineering, University of California-Santa Barbara; Sr. Research Engineer for Calient Networks, Inc. (Santa Barbara, CA); Member of Technical Staff for Lucent-Bell Labs, and Sr. Research Scientist for Corning, Inc. He was a visiting faculty at NASA-AMES in the summer of 2009.

Dr. Madamopoulos is a Senior Member of IEEE Photonics Society. He was one of the founding members of the first IEEE-Photonics Society Student chapter (Orlando Chapter) and he served as treasurer and president for several years. He has served as the vice-Chair and Chair of the IEEE-Photonics Society Princeton-Central New Jersey Section. He is a reviewer for IEEE, OSA, Elsevier publications and he has served as General Conference Chair, Technical Program Chair, Technical Program Committee of several conferences. He received a New Focus Student Essay Prize in 1996, the SPIE Educational Scholarship in Optical Engineering in 1997, the UCF Graduate Merit Fellowship Award in 1998 and the New Focus/Optical Society of America (OSA) Student Award in 1998.

O2 –Photonic Device (Friday, May 1st , 15:30- 17:10)

O2.1: Multifunctional Photonic Signal Processing Platforms for Analog and Digital Signal Processing

Nicholas Madamopoulos

Department of Electrical Engineering, The City College of New York
And Department of Aeronautical Sciences, Hellenic Air Force Academy

ABSTRACT:

Photonics has been recognized to offer several advantages compared to electronics in signal processing. However, most photonic devices have been focused to provide single functionality. From an engineering and application point of view, reconfigurable and/or programmable platforms, that can provide multiple functionality, can lead to dynamic transformable features, lower cost, scalable manufacturing, and enhanced fabrication reliability. In the recent years, research efforts have been focusing into multifunctional photonic modules. Often, an important device requirement is improved linearity of the photonic device. Recently, linearization techniques of the optical electric field, rather than the optical intensity, have received attention for both analog and digital communication systems, as these systems evolve towards faster speed, higher spectral efficiency, and wider bandwidth environments. Under the context of multifunctional devices, the lecture will first introduce the current trends in PIC technology and the important PIC building blocks (e.g., waveguides, couplers, Mach-Zehnder Interferometer-MZI) in order to aid the audience in the understanding of the field. Then, MZI-based multifunctional platforms will be presented for analog and digital signal processing applications.

BIOGRAPHY:

Nicholas Madamopoulos received the B.S. degree in Physics (with honors) from the University of Patra, Greece, in 1993 and the M.S. and Ph.D. degrees in Optical Science and Engineering from CREOL/College of Optics and Photonics, University of Central Florida, Orlando, USA in 1996 and 1998, respectively. His Ph.D. specialization was in photonic information processing systems, where he introduced novel photonic delay lines for phased array antenna applications, as well as photonic processing modules for fiber-optic communications.

He is an Associate Professor at the Department of Electrical Engineering, the City College of the City University of New York (CUNY), since 2007. He has held positions as a Research Associate at the Department of Electrical and Computer Engineering, University of California-Santa Barbara; Sr. Research Engineer for Calient Networks, Inc. (Santa Barbara, CA); Member of Technical Staff for Lucent-Bell Labs, and Sr. Research Scientist for Corning, Inc. He was a visiting faculty at NASA-AMES in the summer of 2009.

Dr. Madamopoulos is a Senior Member of IEEE Photonics Society. He was one of the founding members of the first IEEE-Photonics Society Student chapter (Orlando Chapter) and he served as treasurer and president for several years. He has served as the vice-Chair and Chair of the IEEE-Photonics Society Princeton-Central New Jersey Section. He is a reviewer for IEEE, OSA, Elsevier publications and he has served as General Conference Chair, Technical Program Chair, Technical Program Committee of several conferences. He received a New Focus Student Essay Prize in 1996, the SPIE Educational Scholarship in Optical Engineering in 1997, the UCF Graduate Merit Fellowship Award in 1998 and the New Focus/Optical Society of America (OSA) Student Award in 1998.

O2 –Photonic Device (Friday, May 1st , 15:30- 17:10)

O2.2: Symbol Error Rate Analysis of 8-state Stokes Vector Modulation for Large Capacity Data Centers

Mario V. Bnyamin*(1), Mark D.Feuer(2), and Xin Jiang(2)

(1) Department of Physics ,CUNY-Graduate Center, New York, USA
(2) Department of Engineering College of Staten Island, CUNY, NY, USA
*Mario.Bnyamin@csi.cuny.edu

ABSTRACT:

Polarization-shift keying (PolSK) and Stokes vector modulation (SVM) offer multi-dimensional signaling for high-throughput data links in terabit-class data center networks, using low-cost, direct detection (DD) receivers. In this paper, we develop and characterize a system based on a cubic constellation for 8-SVM, using an off-the-shelf integrated modulator driven with simple bias points and data waveforms. Symbol error rates (SER) and bit error rates (BER) are measured up to 7.5 Gb/s, and analysis of the symbol errors reveals a significant effect of intersymbol interference.

BIOGRAPHY:

Not available.

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O2 –Photonic Device (Friday, May 1st , 15:30- 17:10)

O2.3: Characteristics of A Frequency-doubled Solid-state Laser with Tunable Pulse Width

Ya-Jiang Li, Jian-Guo Xin and Teng Sun

School of Information and Electronics, Beijing Institute of Technology

ABSTRACT:

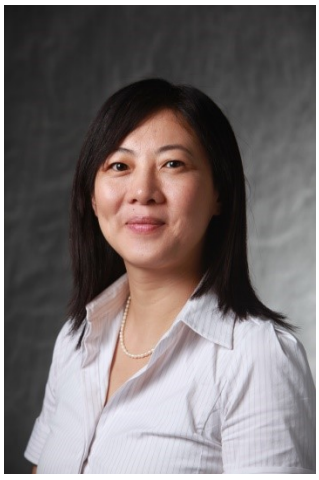
Green light pulse lasers have many applications in various fields, the tunable pulse width of the laser will provide additional parameters for optimizing the effect of the applications. Therefore, in this paper, the characteristics of a frequency-doubled 532 nm solid-state laser with a tunable pulse width were examined in an experiment in which a proposed four-pass optical laser amplifier was employed. The results showed that, for a 1064 nm wavelength laser with pulse widths ranging from 0.55 ns to 1.4 ns, the frequency-doubled 532 nm wavelength laser pulse width was compressed in the ratio of 1.39 to 1.05. The rising and falling edges of the frequency-doubled pulse became steeper.

BIOGRAPHY:

Ya-jiang Li is a student at Beijing Institute of Technology. He received the B.Sc. degree in optical information science and technology, then studied in Beijing Institute of Technology for Master degree in electronic science and technology. His research interests focus on laser diode pumped solid-state laser..

O3 –Photonic Network and Free Space Communication (Saturday, May 2nd , 13:30- 15:10)

Session Chair



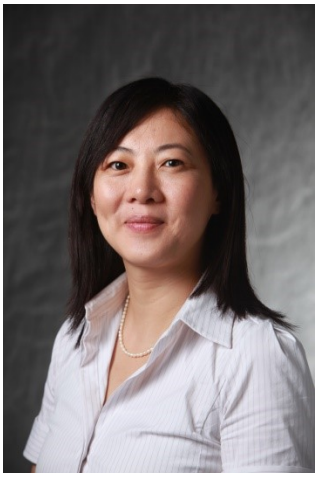
Zhaoran Rena Huang

Department of Electrical, Computer and System Engineering
Rensselaer Polytechnic Institute
Troy, New York 12180

BIOGRAPHY:

Dr. Huang received her B.Sc. from Beijing Institute of Technology and her Ph.D. in Electrical Engineering from Georgia Institute of Technology. Prior to joining RPI, she worked as a postdoctoral fellow at the NSF Microsystem Packaging Center at Georgia Tech where she led the effort of end-to-end optical interconnects on printed circuit boards. Dr. Huang now is an Associate Professor at the Electrical, Computer, and System Engineering Department at RPI. She has co-authored more than 60 journal articles and conference proceedings. She received the Best Poster PRC Award (2nd place) in 1999, Outstanding Poster Paper Award of 53th ECTC in 2003, Commendable Paper Award of IEEE Transaction in Advanced Packaging in 2004, and NSF RampUp Award in 2010.

O3 –Photonic Network and Free Space Communication (Saturday, May 2nd , 13:30- 15:10)



O3.1: Photonic True Time Delay-Line Reservoir Computer for Time Series of Signals Classification and Prediction

Zhaoran Rena Huang

Department of Electrical, Computer and System Engineering
Rensselaer Polytechnic Institute
Troy, New York 12180

ABSTRACT:

Reservoir computing (RC) is a type of recurrent neural network (RNN) that has attracted much attention lately in the artificial intelligence (AI) and machine learning communities. RNNs make predictions that are influenced by the past which makes RNNs a very powerful tool for handling dynamical systems such as time series of data. However, training an RNN is extremely difficult and time consuming due to its recurrent connections. Photonic true time delay-line reservoir (TDR) is one class of RNN with random but fixed neural connections in the hidden layer while the "virtual nodes" are stored in the reservoir layer. In TDR network architecture, only the weighted connections at the output layer are trained and updated. This simplified network topology makes photonic TDR is extremely efficient for processing temporally correlated signals at very high speed. In this talk, we will introduce delay-line based RC and present its use in sine/square wave classification, nonlinear channel equalization classification, respiratory induced motion prediction tasks..

BIOGRAPHY:

Dr. Huang received her B.Sc. from Beijing Institute of Technology and her Ph.D. in Electrical Engineering from Georgia Institute of Technology. Prior to joining RPI, she worked as a postdoctoral fellow at the NSF Microsystem Packaging Center at Georgia Tech where she led the effort of end-to-end optical interconnects on printed circuit boards. Dr. Huang now is an Associate Professor at the Electrical, Computer, and System Engineering Department at RPI. She has co-authored more than 60 journal articles and conference proceedings. She received the Best Poster PRC Award (2nd place) in 1999, Outstanding Poster Paper Award of 53th ECTC in 2003, Commendable Paper Award of IEEE Transaction in Advanced Packaging in 2004, and NSF RampUp Award in 2010

O3 –Photonic Network and Free Space Communication (Saturday, May 2nd , 13:30- 15:10)

O3.2: Outdoor Optical Wireless Communication: potentials, standardization and challenges for Smart Cities

Véronique Georlette, Véronique Moeyaert, Sébastien Bette and Nicolas Point

Mons University and Multitel

ABSTRACT:

With the growth in number and diversity of devices using RF (Radio Frequency) technologies, e.g. in the frame of IoT (Internet of Things), the available RF spectrum is getting overcrowded with these newcomers. As it is a limited and regulated resource, alternative solutions need to be found to avoid a possible shortage of wireless frequencies. Among the new potential technologies, Optical Wireless Communication (OWC), the family of communication techniques that uses visible, infrared or UV spectra to transmit data, is gaining popularity. Applications of OWC technologies are, for now, related to indoor communications. Nevertheless, outdoor OWC applications are also promising, particularly in the context of smart cities with applications such as outdoor urban Li-Fi (Light Fidelity) or IoT optical interconnections with urban furniture. The aim of this paper is to review the current status of outdoor OWC systems and their standardization, as well as identify their potential and the challenges they face with regard to the deployment of Smart Cities.

BIOGRAPHY:

Véronique Georlette is a Telecommunication Engineer who graduated in 2018 from the University of Mons in Belgium. She is currently working on the European project "Wal-e-Cities" which aims to introduce smart technology in Wallonia, Belgium. Within this project, a Ph.D. dissertation is being conducted, focusing on Optical Wireless Communication systems and more specifically Visible Light Communication systems in the scope of Smart Cities.

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O3 –Photonic Network and Free Space Communication (Saturday, May 2nd , 13:30- 15:10)

O3.3: Rain Effects on FSO and mmWave Links: Preliminary Results from an Experimental Study

Elizabeth Verdugo[1], Roberto Nebuloni[2], Lorenzo Luini[3], Carlo Riva[3], Luiz da Silva Mello[1], Giuseppe Roveda4

[1]CETUC, Pontifícia Universidade Católica do Rio de Janeiro, Brazil.
[2]IEIIT, Consiglio Nazionale delle Ricerche, Milan, Italy.
[3]DEIB, Politecnico di Milano, Milan, Italy.
4Huawei Microwave Center, Milan, Italy.

ABSTRACT:

Optical and mmWave terrestrial links are somewhat considered complementary as they have a different sensitivity to fog and rain, i.e. the most frequent atmospheric impairments at mid-latitude. Hence, hybrid optical-mmWave systems that back-up each other according to weather conditions, have been proposed as they put together extremely large-bandwidth and high availability. However, in order to assess whether optical and mmWave systems can be considered complementary rather than competitors, the propagation effects should be quantified, possibly on a statistical basis. This paper presents preliminary results of the effects of rain on a commercial optical link at 1550 nm and a co-located dual-band mmWave link. It is shown that the degradation of the optical signal is not always well correlated with the microphysical properties of rain, Signal attenuation can be substantially underestimated if predicted by the electromagnetic theory, due to the concurrent action of other factors..

BIOGRAPHY:

Elizabeth Verdugo was born in Colombia, in 1992. She received the bachelor degree of Electronic Engineer in 2015 from Universidad de Nariño, Colombia. She obtained the master degree in Electric Engineering in 2017 from Pontificia Universidade Católica do Rio de Janeiro, Rio de Janeiro, Brazil. She is a doctoral student from the same university, currently she is a visiting student at Politecnico di Milano.
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O3 –Photonic Network and Free Space Communication (Saturday, May 2nd , 13:30- 15:10)

O3.4: An Adaptive DPPM for Efficient and Robust Visible Light Communication Across the Air-Water Interface

Md Shafiqul Islam and Mohamed Younis

Department of Computer Science and Electrical Engineering,
University of Maryland Baltimore County
Baltimore, Maryland, USA

Md Shafiqul Islam

ABSTRACT:
The scarcity of the optical power is the main challenge for underwater visible light communication. It becomes worst for communication across the air-water interface because of the reflection of light from the air-water interface. Differential pulse position modulation (DPPM) is one of the power efficient modulation techniques. In L-DPPM a block of M= 〖log〗_2 L input data is mapped into one of the L distinct waveforms containing only one 'on' chip. The size of the DPPM packet is variable and depends on the value of input data and L, which makes error detection quite challenging. In this paper, we propose a frame structure that efficiently enables error detection within a packet for various symbol length, L, of DPPM. We also propose an algorithm using such a frame structure to enable effective detection of packet errors and for adaptively changing the value of L for optimal power efficiency while meeting a certain bound on the packet error rate (PER). We have named our proposed protocol as adaptive differential pulse position modulation (ADPPM). The Bit rate and PER have been studied for different signal-to-noise ratio (SNR) through simulation. A comparison between ADPPM and OOK, DPPM with fixed L is provided.

BIOGRAPHY:

Md Shafiqul Islam was born in Manikganj, Bangladesh, in 1990. He received his B.Sc. and M.Sc. degree in Applied Physics, Electronics and Communication Engineering from the University of Dhaka. He also received MS degree in Computer Engineering from University of Maryland Baltimore County and is currently enrolled in the Ph.D. program of the same university.

In 2015, he was a lecturer in the Electrical and Electronics Eng. Dept. of Hamdard University, Bangladesh. Since 2015, he has been a teaching assistant with the Computer Science and Electrical Engineering Department, University of Maryland Baltimore County (UMBC). He is also a research assistant at Embedded Systems and Networks lab in UMBC. His research interest includes underwater optical communication, visible light communication, wireless sensor networks, and RF communication.

Biography of Mohamed Younis

Mohamed F. Younis is currently a professor in the department of computer science and electrical engineering at the university of Maryland Baltimore County (UMBC). He received his Ph.D. degree in computer science from New Jersey Institute of Technology, USA. Before joining UMBC, he was with the Advanced Systems Technology Group, an Aerospace Electronic Systems R&D organization of Honeywell International Inc. While at Honeywell he led multiple projects for building integrated fault tolerant avionics and dependable computing infrastructure. He also participated in the development of the Redundancy Management System, which is a key component of the Vehicle and Mission Computer for NASA's X-33 space launch vehicle.

Dr. Younis' technical interest includes network architectures and protocols, wireless sensor networks, embedded systems, fault tolerant computing, secure communication and distributed real-time systems. He has published over 260 technical papers in refereed conferences and journals. Dr. Younis has seven granted and three pending patents. In addition, he serves/served on the editorial board of multiple journals and the organizing and technical program committees of numerous conferences. Dr. Younis is a senior member of the IEEE and the IEEE communications society.

O4 –Visible Light Communication (Saturday, May 2nd , 15:30- 17:10)

Session Chair

Xin Jiang

Engineering and Environmental Science
College of Staten Island, CUNY
Staten Island, NY
10314

BIOGRAPHY:

Dr. Xin Jiang is an associate professor in Engineering and Environmental Science department at College of Staten Island (CSI), City University of New York (CUNY). She has extensive industrial R&D and academic research experiences in optical fiber communication field. Her research interests include advanced high speed optical transmission technology, optical fiber and optical devices, broadband optical networks, access network and data center interconnection. She is the author or co-author of more than 60 papers in scientific journals and international conferences and holds one patent.

Dr. Jiang received a B.S., M.S., and Ph.D. degree in Electronics Engineering and Opto-electronics from Tsinghua University, Beijing, China. She continued her postdoctoral research work at the University of Southern California on high speed optical systems and networks, and later worked for the Photonic Research and Test Center of Corning Corporate as a senior research scientist, where her research concentrated on linear and nonlinear impairments in high data rate transmission. Prior joining the CSI, Dr. Jiang has worked in multiple R&D and engineering organizations of several high-tech companies, involved in multiple state-of-the-art telecommunication products developments, which covered areas of transoceanic systems, long-haul backbone systems, metro networks, and access networks

O4 –Visible Light Communication (Saturday, May 2nd , 15:30- 17:10)

O4.1: A low complexity NOMA scheme in VLC systems using pulse modulations

Jian Song[1,2], Tian Cao[1], Hongming Zhang[1,2]

1. Beijing National Research Center for Information Science and Technology (BNRist), Department of Electronic Engineering, Tsinghua University, Beijing, China.
2. Key Laboratory of Digital TV System of Guangdong Province and Shenzhen City, Research Institute of Tsinghua University in Shenzhen, Shenzhen, China.

ABSTRACT:

Successive interference cancellation (SIC) decoding scheme is commonly utilized in nonorthogonal multiple access (NOMA) scheme to obtain the data of each user under different channel conditions at acceptable complexity. However, the imperfect SIC would lead to error propagation (EP) problem, deteriorating the error performance of the NOMA scheme. In this work, a SIC-free NOMA scheme is proposed in the pulse modulation-based visible light communication (VLC) systems with two users. The user under worse channel condition adopts on-off keying (OOK) and the other employs multiple pulse position modulation (MPPM). Here, we employ the soft decision decoding (SDD) scheme to decode the MPPM signal of the user under the better channel condition, which could fundamentally alleviate the adverse impact of EP on symbol error rate (SER) performance and is easier and faster to implement than the traditional SIC decoding scheme. The expressions of SER for two users are derived and the Monte Carlo (MC) simulation results are further provided to validate analytical results.

BIOGRAPHY:

Dr. Jian Song received B. Eng and PhD degrees from Electronic Engineering Department, Tsinghua University, China in 1990 and 1995, respectively with high honor, and was the Post-doctor at The Chinese University of Hong Kong and University of Waterloo in 1996 and 1997, respectively. He then worked in USA before joining Tsinghua faculty team in 2005. He is now Director of DTV Technology R&D Center which is one of the major technical contributors to Chinese DTV standard.

Dr. Song's research interests include digital broadcasting and the network convergence, wireless communications, powerline communications and the visible light communications. He is Associate Editor of IEEE Transaction on Broadcasting and Access for BTS, the founding Editor-in-Chief of two ITU academic Journals, ICT Discoveries and the Intelligent and Converged Networks. He also served as general chair or TPC chair for several IEEE flagship conferences in the related areas.

Dr. Song has published over 280 peer-reviewed papers, holds two US and more than seventy Chinese patents. He is the author or co-author of several book or book chapters**.**

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O4 –Visible Light Communication (Saturday, May 2nd , 15:30- 17:10)

O4.2: Spectrally Efficient Cooperative Visible Light Communication with Adaptive Power Sharing for a Generalized System

Nithin Rahav J K,Umang Garg,B.Sainath

Biirla Insitite if Technology and Science,Pilani,India

ABSTRACT:

Visible Light Communication (VLC) is among oneof- the top emerging next-generation technology and a key-enabler for the future networks, utilizing the visible light spectrum to achieve nominal data rates of Gbps. The compatibility of VLC with the existing infrastructure proves to be a major thrust in this domain, but suffers from signal fading and considerable interference provided by the nearby illuminants. Thus, a cooperative gain stage becomes essential to boost the signal present in the Non-line-of-sight (NLOS) with minimum power overheads. This paper proposes an optimal solution for the spectral efficiency of the VLC link: by introducing relay-based adaptive powersharing schemes for improvement in signal strength, under the constraints of LED linear radiation region and threshold power consumption. DCO-OFDM modulation technique has been used to achieve minimum inter-symbol interference owing to its circular convolution properties. The Analytic analysis, as well as simulation results, are presented to show the effect of the scheme over an uncontrolled relay link. Later, a generalized model is proposed, and analytic methodology is adopted to determine optimal power-sharing coefficients. As a figure of merit, we observe 18.29 % improvement in spectral efficiency at 13 dB of signal to noise ratio (SNR) when compared to an unoptimized collaborative link..

BIOGRAPHY:

Nithin Rahav received B.E(Hons.) in Electrical and Electronics Engineering from Birla Institute of Technology and Science,Pilani, India in 2020. I'm currently working as Research Assistant in "Vodafone Chair for Mobile Communications Systems" at TU Dresden, Germany exploring the Deep Learning techniques for channel estimation and signal detection for improving the performance of V2X systems. .My current research interests include mmWave communication, Deep Learning based Channel Estimation and Signal detection and optical wireless communication..

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O4 –Visible Light Communication (Saturday, May 2nd , 15:30- 17:10)

O4.3: Throughput of Optical WDM with Wide LED Spectra and Imperfect Color-detecting Filters

T. E. Bitencourt Cunha [(1)], Jean-Paul M. G. Linnartz [(1,2)] and Xiong Deng [(2)]

(1) Department of Electrical Engineering, Eindhoven University of Technology, 5600 MB Eindhoven, The Netherlands
(2) Signify (Philips Lighting) Research, 5656 AE Eindhoven, The Netherlands
{t.e.bitencourt.cunha, j.p.linnartz, x.dengg}@tue.nl,
j.p.linnartz@signify.com

ABSTRACT:

Plastic optical fiber (POF) is considered as an attractive candidate for next-generation networks, for fiber-to-the-home or for fronthaul of wireless access points in offices. Inside such spaces, visible light communication (VLC) can be an attractive interference-free communication approach. Such system can offer high data rates with potential cost reduction compared to existing techniques. Wavelength division multiplexing (WDM) can not only increase the link capacity, but also offers the ability to share the POF media with multiple services. In VLC systems, WDM can increase capacity. However, the use of narrow emitters and narrow bandpass filters to demultiplex the WDM signals are relative costly components in such systems. This work focuses on inexpensive light emitting diodes (LEDs), to accelerate mass-market applications, and we explore the potential for relaxing the wavelength filters at the detector. In these scenarios, multiple-input multiple-output (MIMO) technology can efficiently suppress interference or automatically fall back to common signalling if the crosstalk is so large that parallel channels would be insufficiently independent. We calculate the MIMO crosstalk channel coefficients due to relatively wide LED spectra. We derive analytical expressions for the maximum achievable rate of the system and we conclude that relatively large amount of crosstalk can be tolerated without jeopardizing performance, provided that dedicated signal processing is used. We show that without such signal processing, the choice of optical filters is very critical..

BIOGRAPHY:

T. E. Bitencourt Cunha received the B.Sc. degree in telecommunications engineering from the Fluminense Federeal University (UFF) in 2017, and the M.Sc. degree in electrical engineering from the Pontifical Catholic University of Rio de Janeiro (PUC-Rio) in 2019. He is currently pursuing the Ph.D. degree in electrical engineering with the Signal Processing Systems Group at the Eindhoven University of Technology (TU/e). His Ph.D. research project is a part of the H2020 project Enhance Lighting for the Internet of Things (ELIoT). ELIoT is an innovation action project with strong industrial and academic partners, and aims to introduce Visible Light Communication (VLC) for the realization of dense reliable low-power high-bandwidth wireless connectivity which should enable and bring new features for Internet of Things (IoT) applications

O4 –Visible Light Communication (Saturday, May 2nd , 15:30- 17:10)

O4.4: Co-Channel Interference Management in Visible Light Communication

Mona Elsayed Hosney[(1)], I Hossam A. I. Selmy[(2)], Khaled M. F. Elsayed[(3)]

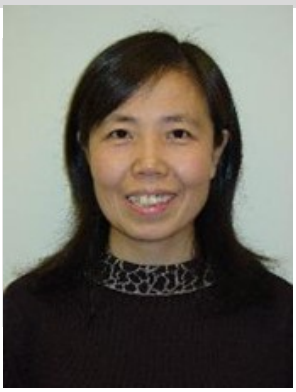
(1) National Telecommunication Institute Transmission Department, Cairo, Egypt
(2)National Institute of Laser Enhanced Science,Cairo University,Cairo, Egypt
(3) Faculty of Engineering, Cairo University,Cairo, Egypt

ABSTRACT:
Visible Light Communication (VLC) is the hope for keeping up the rapid increase of user's data demands. VLC provides high-speed data connections. However; it suffers from limited optical bandwidth, and performance decline due to either inter-symbol interference (ISI) or co-channel interference (CCI). In this paper, CCI is managed by using Angular Diversity Receiver (ADR) with a limited field of view to reduce the number of interfered signals. After that least-square (LS) channel estimation with maximum-likelihood (ML) equalizer is used to resolve the interfered signals. The bit-error-rate (BER) is calculated at different room positions and receiver's heights. The simulation results appear that the proposed scheme BER performance has been enhanced at all positions of the ADR.

BIOGRAPHY:
Not available**.**

N1: Computing System and Performance (Friday May 1st , 13:30- 15:10)

Session Chair



Hong Zhao

Fairleigh Dickinson University

BIOGRAPHY:

Hong Zhao received Ph. D from New Jersey Institute of Technology in Electrical and Computer Engineering. She is a Professor of Electrical and Computer Engineering at Fairleigh Dickinson University, New Jersey, US. Her research focuses on various aspects of broadband communications and computer security including Network Traffic/Performance/Security Analysis and Modeling, and Hardware Trojan detection. She serves as Associate Editor of the Journal on *Multidimensional Systems and Signal Processing*, and Editor of the *Journal of Computing and Information Technology*. Professor Zhao also serves as a Vice Chair of IEEE North Jersey Section. She has been a TPC member, symposium co-chair, technical paper reviewer and book reviewer for IEEE conferences, journal magazines and book publishers. Dr. Zhao served as a board Chair of the Wireless and Optical Communication Conference (WOCC) (2017-2018). She received VFRP (Visiting Faculty Research Program) award from AFRL (Air Force Research Laboratory) in 2014-2016, and SFFP (Summer Faculty Fellowship Program) award from ASOFR (Air Force Office of Scientific Research) in 2017-2019, Visiting Professor Award from Ministry of Science and Technology Taiwan in 2015, and 2015 IEEE Region 1 award for Outstanding Support for the Mission of the IEEE, MGA, REGION 1 and Section.

N1: Computing System and Performance (Friday May 1st , 13:30- 15:10)

N1.1: Decentralized Continuous Game for Task Offloading in UAV Cloud

Ang Gao*†, Tianli Geng*, Yansu Hu‡, Wei Liang*, Weijun Duan*†

*School of Electronics and Information Northwestern Polytechnical University, Xi'an 710072, China
†Yangtze River Delta Research Institute of NPU, Taicang 215400, China
‡School of Electronics and Control, Chang'an University, Xian 710064, China

ABSTRACT:

UAV cloud which integrates the flexibility and resilience of mobile cloud computing (MCC) with multiple UAV system provides drones the ability of processing compute-intensive application by offloading task to cloud. However, such task with heterogeneous quality of experience (QoE) requirement generated by massive drones becomes a troublesome burden for cloud resource allocation. Especially the endurance issue related to the energy efficiency makes the problem more complicated. This paper proposes a game theory based decentralized continuous offloading algorithm. Each drone in the UAV cloud optimizes the percentage of offloading task executed at cloud, while minimizes its overhead composed by QoE requirement and energy consumption. This algorithm can be proved to a potential game that can reach a bilateral satisfaction Nash Equilibrium (NE) by finite iteration. Numerical results under various scenarios corroborate not only the effectiveness and stability of the proposed continuous offloading game, but also the superiority of computation complexity and communication overhead.

BIOGRAPHY:

Ang Gao received his Ph.D. degree in Control Theory and Control Rngineering from the School of Automation, Northwestern Polytechnical University, Xi'an, China, in 2011. He currently serves as an Associate Professor at the School of Electronics and Information, Northwestern Polytechnical University. His research interests include QoS control, resource management and allocation in wireless communication and cloud.

N1: Computing System and Performance (Friday, May 1, 13:30-15:10)

N1.2: Benchmarking Network Performance in Named Data Networking (NDN)

Yaoqing Liu[1], Anthony Dowling,[2] Lauren Huie[3]

1. Fairleigh Dickinson University
2. Clarkson University
3. Air Force Research Laboratory, Rome

ABSTRACT:

Named Data Networking is one of the most promising future Internet architectures with many advanced characteristics that are lacking in the existing TCP/IP-based Internet architecture. NDN features named content, built-in security, in-network caching, adaptive traffic routing, and multi-path forwarding. NDN can be used to mitigate traffic congestion and prioritize critical messages in both wired and wireless networks. It has particular advantages to deliver traffic over a disrupted and highly dynamic network environment because of its delay-tolerant and content-centric features. However, very few works have shown the real-world capacity of NDN over different types of network links. In this work, we benchmark the performance of NDN in various real network settings and make side-by-side comparisons with TCP/IP based approaches. We also demonstrate the strong capabilities of flexible forwarding strategies through prioritizing critical traffic over the network.

BIOGRAPHY:

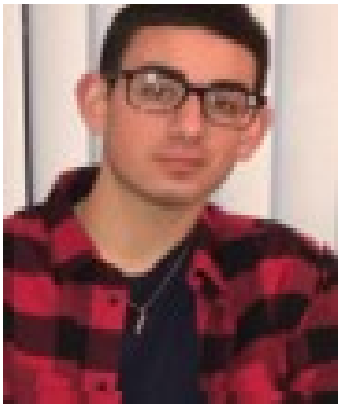
Anthony Dowling is a Graduate Student at Clarkson University. Anthony received his Bachelor's degree in Computer Science from Clarkson University in the Spring of 2019. He has worked with the Air Force Research Lab in Rome, NY in the summers of two years: 2018 and 2019, via the Visiting Faculty Research Program. His work focuses on Named-Data Networking (NDN) and its uses in various applications, along with the evaluation of NDN's performance over a variety of network environments. He enjoys discussing research problems with his parakeets, Turing and Galileo.

N1: Computing System and Performance (Friday May 1st , 13:30- 15:10)

N1.3: Data Visualization for Wireless Sensor Networks Using ThingsBoard

[1] Matthew Henschke, [2] Xinzhou Wei, and [1] Xiaowen Zhang

[1] CUNY College of Staten Island
[2] CUNY New York City College of Technology



ABSTRACT:

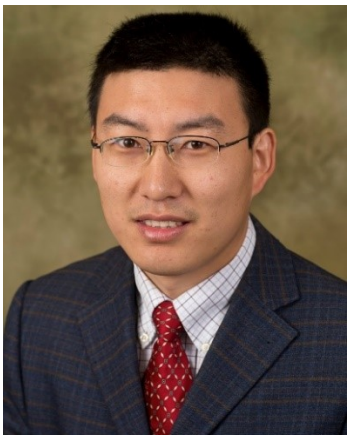
A data visualization proposition for wireless sensor networks (WSNs) is presented in this paper. WSNs play a pivotal role in the composition of Internet of Things (IoT) systems. In an IoT system, the data accumulated by nodes with distinct sensors can be used to monitor environmental conditions such as temperature and humidity. With this data, efforts can be taken to improve the comfort of people in these environments. There exist circumstances where directly connecting the data collected in the WSNs to the Internet may not always be economic efficient. Moreover, we propose a scheme that utilizes both open source hardware and software for data collection at the nodes of a WSN where it is visualized using an online IoT platform known as ThingsBoard.

BIOGRAPHY:

Matthew Henschke is a fourth-year undergraduate Verrazano Honors student at the College of Staten Island studying Computer Science. He is expected to graduate with a Bachelor of Science in Computer Science in May 2020. He enjoys programming full-stack web applications and different types of hardware. After graduation, he aspires to become a software engineer/developer.

N2: Future Internet Architecture and Security (Friday, May 1st , 15:30 -17:10)

Session Chair



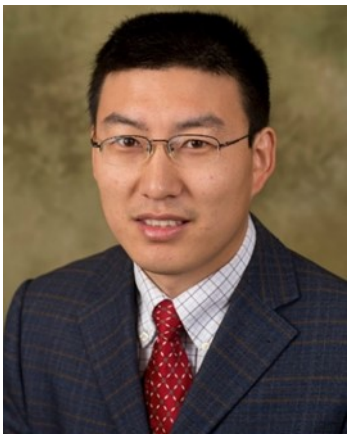
Yaoqing Liu

Fairleigh Dickinson University (FDU)

BIOGRAPHY:

Dr. Yaoqing Liu received his Master's and PhD degrees from the University of Memphis in Computer Science. He is the program coordinator of M.S. in Cybersecurity and Information Assurance program (MSCSIA), and an Assistant Professor in Gildart Haase School of Computer Sciences & Engineering at Fairleigh Dickinson University (FDU). His research interests are cybersecurity and networked systems. His publications appear in highly reputed conference proceedings and journals, such as IEEE INFOCOM, ACM SIGCOMM CCR and ACM/IEEE ANCS. He has been a TPC member and technical paper reviewer for IEEE conferences, journal magazines and transactions. He is the inventor of four patents. His research work has been selected as one of the 2018 TechConnect Defense Innovation Awards recognizing the potential positive impact for the warfighter and national security.

N2: Future Internet Architecture and Security (Friday, May 1st , 15:30 -17:10)



N2.1: Empowering Named Data Networks for Ad-Hoc Long-Range Communication

Yaoqing Liu[1], Laurent Njilla[2], Anthony Dowling[3], Wan Du[4]

1. Fairleigh Dickinson University
2. Air Force Research Laboratory, Rome
3. Clarkson University
4. University of California, Merced

ABSTRACT:

This work leverages Named Data Networks (NDN), an emerging information-centric network architecture, to interconnect diverse wireless links at the network layer and implements flexible routing and forwarding strategies for efficient information dissemination. The system focuses on implementing the interface between NDN and LoRaWAN, and interconnecting LoRaWAN and WiFi via the NDN Forwarding Daemon (NFD) into a ubiquitous ad hoc network, which bears very long-range and multi-hop capabilities for Device-to-Device (D2D) communication. Field experimental results show that the newly built ad hoc network can easily cover a radius of several kilometers and make full use of NDN features to maximize utilization of heterogeneous wireless links and efficiency of information dissemination.

BIOGRAPHY:

Dr. Yaoqing Liu received his Master's and PhD degrees from the University of Memphis in Computer Science. He is the program coordinator of M.S. in Cybersecurity and Information Assurance program (MSCSIA), and an Assistant Professor in Gildart Haase School of Computer Sciences & Engineering at Fairleigh Dickinson University (FDU). His research interests are cybersecurity and networked systems. His publications appear in highly reputed conference proceedings and journals, such as IEEE INFOCOM, ACM SIGCOMM CCR and ACM/IEEE ANCS. He has been a TPC member and technical paper reviewer for IEEE conferences, journal magazines and transactions. He is the inventor of four patents. His research work has been selected as one of the 2018 TechConnect Defense Innovation Awards recognizing the potential positive impact for the warfighter and national security.

N2: Future Internet Architecture and Security (Friday, May 1st , 15:30 -17:10)

N2.2: DASC: A Privacy-Protected Data Access System with Cache Mechanism for Smartphones

Wenyun Dai, Longbin Chen, Ana Wu, Md Liakat Ali

Fairleigh Dickinson University

ABSTRACT:

Mobile apps in smartphones are over-collect users' data, that harms users' privacy. To overcome the coarse-grained access control offered by current mobile operating systems, we propose DASC to protect mobile users' privacy by placing private data into the cloud storage. The cloud storage provides thorough and fine-grained access control, but it decreases the performance due to the extra network communication. DASC offers a cache mechanism to improve the access performance by remaining frequently used ordinary mobile data within the smartphones. We treat the storage of smartphones as the cache and the cloud storage as the memory. We design the Pref-LRU algorithm based on the classic LRU algorithm but adding users' preference about data type into consideration. The user preference vector is dynamically changing referring to the data access requests. We analyze the performance of DASC with different sets of workload. Evaluations on real smartphones show the performance improvements resulting from DASC.

BIOGRAPHY:

Wenyun Dai is an Assistant Professor of Computer Science at Gildart Haase School of Computer Sciences and Engineering, Fairleigh Dickinson University, Metropolitan Campus. He received his Ph.D. in Computer Science from Pace University in 2018. He received the Master's degree from Shanghai Jiao Tong University in 2014 and the Bachelor's degree from Xiamen University in 2010. His research interests include distributed systems, Cloud Computing, mobile computing, privacy protection, and optimization.

N2: Future Internet Architecture and Security (Friday, May 1st , 15:30 -17:10)

N2.3: Detecting host location attacks in SDN-based networks

Sonali Sen Baidya and Rattikorn Hewett
Department of Computer Science
Texas Tech University
Lubbock, USA

ABSTRACT:

Software Defined Networking (SDN) is an emerging technology that has increasingly become popular for implementing modern infrastructures. SDN offers advantages of programmable and flexible network management over the traditional practice. As more and more SDN-based networks are being implemented, it is necessary to consider security issues especially those that are inherent from SDN. This paper addresses an important SDN specific security issue, namely a host location (tracking) attack, where an attacker compromises a host and captures its location information to manipulate the packets and trick the controller. Such an attack can potentially lead to many harmful effects including disruption of network traffic and denial of services. In particular, we introduce a new host location attack that exploits unused ports, along with its countermeasure for the controller to detect and take appropriate actions. We illustrate and evaluate the proposed detection mechanism by network simulations. The results obtained from our experiments are effective and promising.

BIOGRAPHY:

Sonali Sen Baidya received the B.Eng. degree in Computer Science from Utkal University, India and the M.Tech degree from IIEST, India. She is currently pursuing the Ph.D. degree in the department of Computer Science of Texas Tech University, USA. Her research area is Cybersecurity in Software-Defined Networks.

B1 – Technical Session: Big Data Analytics and Machine Learning Methods (Friday May 1st , 13:30- 15:10)

Session Chair

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) with the New Jersey Institute of Technology. He has authored or coauthored more than 150 publications with 8000 citations and 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.

B1 – Technical Session: Big Data Analytics and Machine Learning Methods (Friday May 1st , 13:30- 15:10)

B1.1: Integrating Data-driven Approaches to Improve Performance of Solving SCUC

Xiaoyu Sean Lu

Stevens Institute of Technology, Hoboken, NJ

ABSTRACT:

This talk presents an approach that integrates a data-driven approach into a solution procedure for a security constrained unit commitment model (SCUC). SCUC is one of the fundamental models in power systems. Solving it provides a key operating strategy in power systems. Nowadays, there are many methods proposed to solve SCUC. However, every method has its advantages and disadvantages when solving different cases of SCUC. A data-driven approach learns from a huge amount of historical data and is helpful to select a proper solution method for specific cases of SCUC. In our study, for any specific case, a data-driven approach chooses one from two solution methods: a conventional method and an aggregation one. At last, we implement our idea in the IEEE 118-bus system with real load curves and obtain a desired performance.

BIOGRAPHY:

XIAOYU SEAN LU (Member, IEEE) received the B.S. degree from the Nanjing University of Technology, Nanjing, China, in 2011, and the M.S. and Ph.D. degrees from the New Jersey Institute of Technology, Newark, NJ, USA, in 2015 and 2019, respectively. He is a Research Scholar with the Department of Electrical and Computer Engineering, Stevens Institute of Technology, Hoboken, NJ, USA. He has published more than 10 articles in journals and conference proceedings, including the IEEE TRANSACTIONS ON SYSTEM, MAN AND CYBERNETICS: SYSTEMS, the IEEE/CAA JOURNAL OF AUTOMATICA SINICA, and the IEEE TRANSACTIONS ON COMPUTATIONAL SOCIAL SYSTEMS. His current research interests include deep learning, data processing, data mining, social media data analysis, and their applications in smart grids and healthcare.

B1 – Technical Session: Big Data Analytics and Machine Learning Methods (Friday May 1st , 13:30- 15:10)

B1.2: Federated Learning meets Wireless Communication

Mingzhe Chen

Princeton University, Princeton, NJ

ABSTRACT:
For decades, artificial intelligence solutions have relied on conventional machine learning approaches that require centralizing the training data and inference processes at a single data center. However, due to privacy constraints and limited communication resources for data transmission, it is impractical and/or undesirable for all devices that are engaged in learning to transmit all their data to a data center for centralized learning. To address this problem, there is a need for distributed machine learning techniques that can operate at a network's edge and using which edge devices can collaboratively train a shared learning model using real-time generated mobile data. In this talk, we will present new frameworks to address some of the fundamental challenges of federated learning (FL) and present new wireless FL framework for optimization of wireless network performance. First, we will show how a joint learning and communication co-design is necessary to truly deploy federated learning over wireless networks. Then, we will present our recent results on analyzing the impact of wireless factors such as packet error rate, resource allocation, computational capacity, and transmit power on the performance of the federated learning. We then will present new approaches to optimize the performance of FL over realistic wireless networks. Finally, we will introduce the use of wireless FL to determine user association so as to minimize the energy efficiency in mobile edge computing based networks.

BIOGRAPHY:

Mingzhe Chen (S'15-M'19) is currently a Post-Doctoral Researcher at the Electrical Engineering Department, Princeton University and at the Chinese University of Hong Kong, Shenzhen, China. He received the Ph.D. degree from the Beijing University of Posts and Telecommunications, Beijing, China, in 2019. From 2016 to 2019, he was a Visiting Researcher at the Department of Electrical and Computer Engineering, Virginia Tech. His research interests include machine learning, virtual reality, unmanned aerial vehicles, wireless networks, and caching. He was an exemplary reviewer for IEEE Transactions on Wireless Communications and IEEE Transactions on Communications in 2018. He served as a Co-Chair for 2020 IEEE International Conference on Communications (ICC) Workshop on Edge Machine Learning for 5G Mobile Networks and Beyond.

B1 – Technical Session: Big Data Analytics and Machine Learning Methods (Friday May 1st , 13:30- 15:10)

B1.3: Data-driven Surplus Material Prediction in Steel Coil Production

Ziyan Zhao[1,2] (presenter), Xiaoyue Yong[3], Shixin Liu[1], Mengchu Zhou[2]

1. State Key Laboratory of Synthetical Automation for Process Industries, College of Information Science and Engineering, Northeastern University, Shenyang, 110819, China
2. Department of Electrical and Computer Engineering New Jersey Institute of Technology Newark, NJ, 07102, USA
3. Shanghai Baosight Software Co., Ltd, Shanghai, 201900, China

ABSTRACT:

A steel enterprise is currently trying to avoid the presence of surplus materials since they can greatly increase its operational cost. The complicated production process of steel products makes it difficult to find the causes of surplus materials. In this work, we propose a surplus material prediction problem and solve it based on statistical analysis and machine learning methods. In the concerned problem, we predict whether there are surplus materials under a given group of production parameters. The dataset used in this work is from a real-world three-month steel coil production process. First, data cleaning is conducted to standardize the industrial dataset. Then, the production parameters highly correlated with surplus material prediction results are selected by a series of feature selection methods. Finally, two prediction models based on extreme gradient boosting and logistic regression are presented according to the selected features. The experimental results reveal that the proposed prediction models have similar effectiveness. A visible regression function makes the logistic regression method more suitable for practical application.

BIOGRAPHY:

Ziyan Zhao received his B.S. and M.S. degrees from Northeastern University, Shenyang, China, in 2015 and 2017, respectively. He is currently working toward his Ph. D. degree with the Department of Information Science and Engineering, Northeastern University, Shenyang, China. He is supported by a scholarship from the China Scholarship Council. From 2018, he works as a joint Ph. D. Student with the Department of Electrical and Computer Engineering, New Jersey Institute of Technology, Newark, NJ, USA. His research focuses on operations research, production planning and scheduling and intelligent optimization algorithm.

B1 – Technical Session: Big Data Analytics and Machine Learning Methods (Friday May 1st , 13:30- 15:10)

B1.4: Research on Hainan Trusted Digital Infrastructure Construction Framework

1st Chong Shen
State Key Laboratory of Marine Resource Utilization in South China Sea
Hainan University
Haikou, China
chongshen@hainanu.edu.cn

2nd Kun Zhang *
Education Center of MTA
Hainan Tropical Ocean University
Sanya, China
Corresponding author:
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3rd Keliu Long
State Key Laboratory of Marine Resource Utilization in South China Sea
Hainan University
Haikou, China
keliulong@hainanu.edu.cn

ABSTRACT:

The trusted infrastructure based on blockchain technology can be intelligently integrated with emerging technologies such as cloud computing, big data, the Internet of Things, artificial intelligence, etc., and achieve the realization of machine trust, data trust, and autonomous trust in a trusted digital infrastructure environment. Use blockchain technology to build a trusted infrastructure and promote the development and application of the integration of diverse high-tech. Together, we will enhance the capabilities of information acquisition, realtime feedback, and intelligent service anywhere, anytime for this complex adaptive system in cities. Then the decision-making ability of intelligent convergence emerges quickly. With the continuous development of blockchain technology, it is possible to build a set of credible infrastructure environment based on blockchain technology. The article conducts in-depth research in the areas of performance, scalability, privacy and security, with a view to helping to build a trusted infrastructure environment,

BIOGRAPHY:

Not available

B2 – Technical Session: Deep Learning Based Emerging Technology (Saturday, May 2nd , 13:30- 15:10)

Session Chair

Bin Li

Department of Electrical, Computer and Biomedical Engineering
University of Rhode Island
Kingston, RI 02881, USA

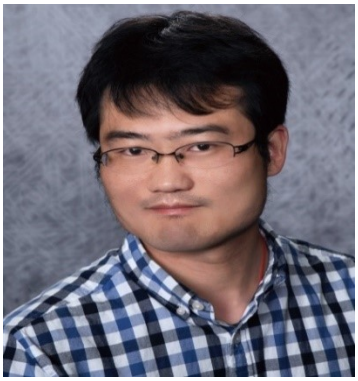
BIOGRAPHY:

Bin Li received his B.S. degree in Electronic and Information Engineering in 2005, M.S. degree in Communication and Information Engineering in 2008, both from Xiamen University, and Ph.D. degree in Electrical and Computer Engineering from The Ohio State University (OSU)in May 2014. Between June 2014 and August 2016, he was a Postdoctoral Researcher in the Coordinated Science Lab at the University of Illinois at Urbana-Champaign (UIUC). In August 2016, he joined the University of Rhode Island (URI) as an assistant professor in the Department of Electrical, Computer and Biomedical Engineering and was also affiliated with URI's Big Data Collaborative.His research spans communication networks, virtual and augmented reality, fog computing, and data centers. In particular, his research utilizes mathematical tools from stochastic processes, optimization, control, and algorithms to understand fundamental performance limits of complex network systems, and develop efficient, adaptable, and scable algorithms for diverse applications. He has served on the technical committees of several major conferences in networking such as ACM MobiHoc, IEEE INFOCOM, and WiOpt. He received both National Science Foundation (NSF) CAREER Award and Google Faculty Research Award in 2020, and ACM MobiHoc 2018 Best Poster Award. Here are his demos on wireless virtual reality networking.

B2.1: Text Representation in Online Abusive Language Detection: An Empirical Study

Fei Tan

Yahoo! Research, New York



ABSTRACT:

Abusive language has profound negative impacts on the integrity of online communities. Unlike normal text, more varieties and manipulations are often used in abusive text to circumvent the moderation. Processing this kind of user generated text is important but challenging. In this work, we describe our efforts in fighting against abusive language and present insights gained. Specifically, we comprehensively analyze how different text representations (word, subword, character, byte) impact typical models including a linear model, CNN, bidirectional LSTM (BiLSTM) and recently popular BERT. Regarding the linear model, we introduce Naive Bayes count ratio to scale n-gram based features. For CNN and BiLSTM, a byte-level quantization scheme is proposed to target multi-byte characters. A customized BERT model is further introduced with bi-gram whole-word masking and word based positional embedding. We then perform systematic experiments with different combinations of text decomposition and algorithms on Yahoo! Finance, Yahoo! News, Wikipedia and Twitter abusive datasets to our best efforts.

It's found that fine-grained textual units enable CNN to capture subtle signals and present a superior performance. This superiority is somewhat degraded on BiLSTM. For BERT models, subword works well on context understanding but performs poorly on intentional obfuscations, which can be rescued by byte and character to some extent. In addition, the linear model with proper feature engineering outperforms CNN and BiLSTM but is inferior to BERT models. Finally, the customized BERT models achieve better performance than the original BERT pre-trained on standard text corpora.

BIOGRAPHY:

Fei Tan is currently a Research Scientist at Yahoo! Research (New York) of Verizon Media Group. His current research interests include Data Mining, Applied Machine Learning and Natural Language Processing. He obtained the Ph.D. degree in Computer Science from New Jersey Institute of Technology in May 2019. His Doctoral Dissertation won Joseph Leung Award. Fei is a main author of multiple papers in premier conference proceedings and journals including IEEE TNNLS, IEEE ICDM, SIAM SDM, AAAI, IJCAI, Data Mining and Knowledge Discovery, Physical Review E, Europhysics Letters, etc.

Prior to joining Yahoo! Research, he worked at Adobe and Yahoo Research as an intern and Hong Kong Polytechnic University as a Research Assistant.

B2.2: Towards computationally efficient adversarial training defence against adversarial examples attacks to neural networks classifiers

Abdallah Khreishah

Electrical & Computer Engineering, New Jersey Institute of Technology

ABSTRACT:

Due to their descent performance in approximating different latent distributions from data, Neural Network (NN) classifiers gain wide adoption in different complex tasks, including natural language processing, computer vision and cyber security. However, the underlying assumption of attack free operating environment has been defied by the introduction of adversarial examples – carefully perturbed samples of input that are usually misclassified.

Recently, considerable efforts have been made to develop defenses against adversarial examples, however, existing approaches are still far from providing effective defenses to mitigate this continuously evolving problem. Some of the existing defense approaches rely on training with existing adversarial examples, and hence are inefficient in training and in mitigating new types of adversarial examples. While, many others utilize randomness to defend adversarial examples but are shown to be impractical or inefficient.

In this talk, we introduce the concept of adversarial examples and review several state-of-the-art approaches to generate these attacks and defend against them. We show that these methods lack the ability to dynamically control the trade-off between classifying original and adversarial examples and also require too much computation to generate iterative adversarial examples during training. After that we present our recent adversarial training methods in making the defense more practical.

In the first method we propose a GAN based defense against adversarial examples, dubbed GanDef. GanDef is designed based on adversarial training combined with feature learning. As a GAN model, GanDef is realized based on a classifier and a discriminator which form a minimax game that can dynamically change the sensitivity of adversarial examples by modifying a threshold on the fly to achieve a dynamic trade-off between classifying original and adversarial examples. In the second method, we propose a GAN based zero knowledge adversarial training defense, dubbed ZK-GanDef. Compared to the state-of-the-art zero knowledge defenses, ZK-GanDef applies a more flexible regularization on prediction logits by using the discriminator. This results in the highest test accuracy in classifying different white-box adversarial examples when compared to state-of-the-art zero knowledge defenses. To further reduce the computation, our third approach is a single-step adversarial training method that can efficiently mitigate adversarial examples with low training overhead. This new approach flattens iterative adversarial examples into single-step adversarial examples in multiple consecutive training epochs. At the end of the talk we will also discuss several future directions and research opportunities in this emerging field of research.

BIOGRAPHY:

Abdallah Khreishah received his Ph.D and M.S. degrees in Electrical and Computer Engineering from Purdue University in 2010 and 2006, respectively. Prior to that, he received his B.S. degree with honors from Jordan University of Science & Technology in 2004. During the last year of his Ph.D, he worked with NEESCOM. In Fall 2012, he joined the Electrical and Computer Engineering department of NJIT as an Assistant Professor and promoted to Associate Professor in 2017. His research spans the areas of network security, machine learning, wireless networks, visible-light communication, vehicular networks, and cloud & edge computing. His research projects are funded by the National Science Foundation of USA, New Jersey Department of Transportation, and the UAE Research Foundation. He is currently serving as an associate editor for several International Journals including IEEE/ACM Transactions on Networking. He served as the TPC chair for WASA 2017, IEEE SNAMS 2014, IEEE SDS -2014, BDSN-2015, BSDN 2015, IOTSMS-2105. He has also served on the TPC committee of several international conferences such as IEEE Infocom. He is a senior member of IEEE and the chair of the IEEE EMBS North Jersey chapter.

B2 – Technical Session: Deep Learning Based Emerging Technology (Saturday, May 2nd , 13:30- 15:10)

B2.3: A Convolutional Neural Network Approach to Improving Network Visibility

Bruce Hartpence and Andres Kwasinski

Rochester Institute of Technology

ABSTRACT:
Increasingly researchers are turning to machine learning techniques such as artificial neural networks to address communication network research questions. At the heart of each challenge is the need to classify packets and improve visibility. To date, multi-layer perceptron neural networks have been used to successfully identify individual packets. This work utilizes convolutional neural networks to classify packets after their conversion to an image matrix. To help address network challenges and aid in visualization, packets are combined into larger images to provide greater insight into a particular time span. Applications of this research can use the surrounding temporal area to gain insight into conversations, exchanges, losses and threats. We demonstrate the use of this technique to identify potential latency problems. This approach of using contemporary network traffic and convolutional neural networks has success rate for individual packets exceeding 99%. Larger images achieve the same high level of accuracy.

BIOGRAPHY:

Bruce Hartpence has been a faculty member at Rochester Institute of Technology since 1998. Previously he served in the Unites States Navy. His research and teaching areas include wired and wireless networking, software defined networks and machine learning for communication. In addition to his research writing, Bruce is the author of the Packet Guide series for O'Reilly. He is the creator of the O'Reilly video series on networking. Bruce also runs an active youtube channel focused on these areas. Most recently his works include:

Hartpence, Bruce, and Andres Kwasinski. "Combating TCP Port Scan Attacks Using Sequential Neural Networks." 2020 International Conference on Computing, Networking and Communications (ICNC). IEEE, 2020.

Hartpence, Bruce, and Andres Kwasinski. "Considering the Blackbox: An Investigation of Optimization Techniques with Completely Balanced Datasets of Packet Traffic." 2019 IEEE International Conference on Big Data (Big Data). IEEE, 2019.

Hartpence, Bruce, Kwasinski, A., "Fast Internet Packet and Flow Classification Based on Artificial Neural Networks", IEEE Southeastcon, 2019.

B2 – Technical Session: Deep Learning Based Emerging Technology (Saturday, May 2nd , 13:30- 15:10)

B2.4: Deep Learning Methods for Mining Genomic Sequence Patterns

Xin Gao

Applied Scientist, Amazon
California, USA

ABSTRACT:

Nowadays, with the growing availability of large-scale genomic datasets and advanced computational techniques, more and more data-driven computational methods have been developed to analyze genomic data and help to solve incompletely understood biological problems. Among them, deep learning methods, have been proposed to automatically learn and recognize the functional activity of DNA sequences from genomics data. Techniques for efficient mining genomic sequence pattern will help to improve our understanding of gene regulation, and thus accelerate our progress toward using personal genomes in medicine.

This talk focuses on the development of deep learning methods for mining genomic sequences. We demonstrate that an appropriate deep learning model can be generally made for successfully recognizing various genomic sequence patterns. We also develop deep learning methods to help solve two specific biological problems, (1) inference of polyadenylation code and (2) tRNA gene detection and functional prediction. Polyadenylation is a pervasive mechanism that has been used by Eukaryotes for regulating mRNA transcription, localization, and translation efficiency. Polyadenylation signals in the plant are particularly noisy and challenging to decipher. A deep convolutional neural network approach DeepPolyA is proposed to predict poly(A) site from the plant Arabidopsis thaliana genomic sequences. Transfer RNAs (tRNAs) represent a highly complex class of genes and play a central role in protein translation. There remains a de facto tool, tRNAscan-SE, for identifying tRNA genes encoded in genomes. Despite its popularity and success, tRNAscan-SE is still not powerful enough to separate tRNAs from pseudo-tRNAs, and a significant number of false positives can be output as a result. To address this issue, tRNA-DL, a hybrid combination of convolutional neural network and recurrent neural network approach is proposed. It is shown that the proposed method can help to reduce the false positive rate of the state-of-art tRNA prediction tool tRNAscan-SE substantially. Coupled with tRNAscan-SE, tRNA-DL can serve as a useful complementary tool for tRNA annotation. Taken together, the experiments and applications demonstrate the superiority of deep learning in automatic feature generation for characterizing genomic sequence patterns.

BIOGRAPHY:

Xin Gao is currently an Applied Scientist at Amazon. Before she joined Amazon, she was a Machine Learning Engineer in Human Machine Intelligence Department at SAIC Innovation Center, helping build the AI system for autonomous driving vehicles.

She received a Ph.D. in Computer Science from New Jersey Institute of Technology in 2018, working under the supervision of Prof. Zhi Wei. Her general research area is deep learning, bioinformatics, natural language processing and intelligent transportation. Prior to her Ph.D., she received a B.E. in Computer Engineering and a LL.B. in Civil Law both from Nankai University in 2012.

Notes