

Xiufeng Xie

Personal Information

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Research Interests

Wireless Networking: Designing efficient and scalable networks for advanced radio communication technologies (MU-MIMO, massive MIMO, phased-array beamforming, full-duplex radio, LTE, mmWave)

Mobile Computing: Using wireless sensing and machine learning to facilitate cutting-edge mobile computing systems like virtual reality and automotive IoT

Education

University of Wisconsin-Madison

08/14/2017

Ph.D. Computer Engineering

Advisor: Prof. Xinyu Zhang

University of Electronic Science and Tech of China

07/01/2011

B.E. Communication Engineering

Rank: 4/339

Work Experiences

Hewlett Packard Enterprise, 1501 Page Mill Road, Palo Alto, CA, 94304

07/23/2018

Research Engineer,

present

Supervisor: Dr. Kyu-Han Kim

Duty: research on next generation wireless networks, mobile VR/AR, and mobile edge computing

University of Michigan, 2260 Hayward St, Ann Arbor, MI 48109

09/13/2017

Research Fellow,

07/11/2018

Advisor: Prof. Kang Shin

Duty: research on using RF wireless signal for vehicular communication & sensing

NEC Labs America, 4 Independence Way, Suite 200, Princeton, NJ 08540

Summer 2015

Summer Research Intern,

Mentor: Dr. Eugene Chai

Duty: research on the coexistence between LTE-Unlicensed and WiFi

NEC Labs America, 4 Independence Way, Suite 200, Princeton, NJ 08540

Summer 2014

Summer Research Intern,

Mentor: Dr. Eugene Chai

Duty: research on analog-digital hybrid beamforming for Massive MIMO (two patents US9537587 and US9413474)

Publications

Xiufeng Xie, Kang Shin, Hamed Yousefi, Suining He, *"Wireless CSI-Based Head Tracking in the Driver Seat"*

International Conference on Emerging Networking Experiments and Technologies (**CoNEXT**), 2018.
Acceptance rate: 17% (32 out of 185 submissions).

Xiufeng Xie, Xinyu Zhang, *"POI360: Panoramic Mobile Video Telephony over LTE Cellular Networks"*

International Conference on Emerging Networking Experiments and Technologies (**CoNEXT**), 2017.
Acceptance rate: 18% (40 out of 222 submissions).

Xiufeng Xie, Xinyu Zhang, Shilin Zhu, *"Accelerating Mobile Web Loading Using Cellular Link Information"*

ACM International Conference on Mobile Systems, Applications, and Services (**MobiSys**), 2017.
Acceptance rate: 18% (34 out of 188 submissions).

Xiufeng Xie, Xinyu Zhang, Swarun Kumar, Li Erran Li, *"piStream: Physical Layer Informed Adaptive Video Streaming Over LTE"*

ACM International Conference on Mobile Computing and Networking (**MobiCom**), 2015.

One of top 4 MobiCom'15 papers highlighted in ACM GetMobile Journal, out of 207 submissions

One of top 9 papers pre-accepted to MobiCom'15 (with unanimous acceptance from all 6 reviewers).

Xiufeng Xie, Eugene Chai, Xinyu Zhang, Karthikeyan Sundaresan, Amir Khojastepour, Sampath Rangarajan, *"Hekaton: Efficient and Practical Large-Scale MIMO"*

ACM International Conference on Mobile Computing and Networking (**MobiCom**), 2015.

One of top 9 papers pre-accepted to MobiCom'15 (with unanimous acceptance from all 6 reviewers) .

Xiufeng Xie, Xinyu Zhang, Eugene Chai, *"Cross-Cell DoF Distribution: Combating Channel Hardening Effect in Multi-Cell MU-MIMO Networks"*

ACM International Symposium on Mobile Ad Hoc Networking and Computing (**MobiHoc**), 2015.

Acceptance rate: 14.8% (37 out of 250 submissions).

Xiufeng Xie, Xinyu Zhang, *"Semi-Synchronous Channel Access for Full-duplex Wireless Networks"*

IEEE International Conference on Network Protocols (**ICNP**), 2014.

Acceptance rate: 19% (15 out of 79 submissions).

Xiufeng Xie, Xinyu Zhang, *"Does Full-duplex Double the Capacity of Wireless Networks?"*

IEEE Conference on Computer Communications (**INFOCOM**), 2014.

Acceptance rate: 19.4% (320 out of 1645 submissions).

Xiufeng Xie, Xinyu Zhang, *"Scalable User Selection for MU-MIMO Networks"*

IEEE Conference on Computer Communications(**INFOCOM**), 2014.

Acceptance rate: 19.4% (320 out of 1645 submissions).

Xiufeng Xie, Xinyu Zhang, Karthikeyan Sundaresan, *"Adaptive Feedback Compression for MIMO Networks"*

ACM International Conference on Mobile Computing and Networking(**MobiCom**), 2013.

Acceptance rate: 13.5%. (28 out of 208 submissions).

Patent

Efficient Large-Scale Multiple Input Multiple Output Communications

Patent Number: *US9537587, US9413474*

Eugene Chai, Xiufeng Xie, Mohammad A. Khojastepour, Karthikeyan Sundaresan, Sampath Rangarajan

Poster Publications

Xiufeng Xie, Xinyu Zhang, “*Accelerating Web Loading over Cellular Networks: A Cross-Layer Approach*”
ACM S3, 2016.

Best Poster Award.

Research Projects

Wireless CSI-Based Head Tracking for In-Vehicle AR System.

- Proposed an in-vehicle driver head tracking system that leverages the CSI of the phone’s WiFi signal to make it a small radar that tracks the driver’s head position to facilitate AR
- Proposed an adaptive headlight system that turns the vehicle’s headlight following the driver’s head orientation
- The proposed system achieves more than 10X sampling rate over existing camera-based solutions thanks to the high WiFi frame rate, thus facilitates predictive head tracking
- The proposed system uses simple CSI-based tracking algorithm that fits the real-time requirement of in-vehicle AR, and outperforms camera-based solutions during the night

Portable Interactive Virtual Reality (VR) Streaming over Cellular Networks.

- Developed an interactive VR system for the emerging VR remote control applications over the cellular networks, e.g., flying a drone over LTE
- Proposed the first adaptive VR stream compression algorithm that balances the system latency and the smoothness of FoV transition by dynamically adjusting the compression strategy based on the network condition
- Proposed a cross-layer rate control algorithm to responsively adapt the video bit-rate and the transport layer bit-rate based on the occupancy of the phone’s LTE uplink firmware buffer and transport block size
- Implemented a real-time prototype of interactive VR based on WebRTC and WebGL. The implementation operates on a vehicle for performance evaluation under different signal quality, background cellular load, and mobility

Cellular-Informed Mobile Web Loading Acceleration.

- Explored the solution to a primary cause of slow Web loading – Sluggish TCP bandwidth exploration fails to converge to available bandwidth within the short Web loading duration
- A closed-form model is proposed to precisely estimate the overall resource usage in the LTE cell based on the energy-based statistics (RSRQ) available on the commodity phones
- Designed a novel TCP variant adapting the congestion window following current LTE resource usage, which reduces the Web loading latency by 30% without hardware modifications

Physical Layer Informed Adaptive Video Streaming Over LTE.

- Identified a vicious cycle in DASH video streaming – a low video bitrate leads to low throughput, which in turn enforces low video bitrate again and causes poor bandwidth utilization
- Scaling up DASH video bit-rate following the LTE PHY-layer resource utilization reported from the USRP software radio sensing the LTE spectrum
- Cross-layer adaptation framework implemented in the open-source GPAC player

Analog & Digital Two-level Hybrid MIMO beamforming.

- Two-level beamforming: combining digital beamforming with phased-array antennas
- Boosting the number of antenna elements (narrower beam) without adding more RF chains
- Using compressive sensing for efficient channel estimation under phased-array antennas

DoF Redistribution for Multi-cell MU-MIMO Networks.

- Investigated the solution to prevent the wireless channel correlation from deteriorating MU-MIMO capacity under increasing number of users
- Redistributing Tx DoFs from the overcrowded cell to multiple neighboring cells, thus improving the channel orthogonality without reducing the number of concurrent transmissions
- Joint AP & user selection algorithm for performance optimization

Light-weight PHY Implementation for Full-duplex Radio.

- A beamforming-based full-duplex radio PHY implementation built on 802.11ac-styled MU-MIMO beamforming system
- Proposed a full-duplex transceiver design that uses zero-forcing beamforming to steer the null point of the outgoing signal over its own receiving antenna
- A prototype implementation over WARP software radio platform

Orthogonality Probing Based MU-MIMO User Selection.

- Analysis for the relation between channel orthogonality and MU-MIMO performance
- Novel probing mechanism to identify the user most orthogonal to already selected users
- Low-overhead user selection running in parallel with the CSI collection procedure of 802.11ac

BrainKey: Zero Footprint Mobile Authentication Via Brainwaves.

- An authentication system using human brainwave as the unique signature.
- Based on the Emotiv EEG headset and used to unlock music player on an Android phone.
- Sponsored by the Qualcomm Innovation Competition 2013.

Adaptive Feedback Compression of MIMO Networks.

- Proposed an efficient CSI feedback compression scheme for closed-loop MIMO
- An implementation over WARP platform that is compatible with 802.11ac MU-MIMO system

MAC Protocol Design for Full-duplex Radio Networks.

- Discovered that full-duplex radio breaks the rule that collision detection is infeasible for wireless networks: the transceiver can detect the interfering packet even when it is transmitting
- Leveraging full-duplex radio to explore the packet collision intensity around the wireless node and use that to control its CSMA transmission aggressiveness

Capacity Analysis for Full-Duplex Radio Networks.

- Deriving the asymptotic network-level capacity gain of full-duplex WLAN over half-duplex
- The typical network capacity gain over half-duplex networks is proved to be below 2, the theoretical PHY-layer capacity gain.

Teaching Experiences

Mobile Computing Laboratory, ECE 454.
Android Application Development.

Fall 2013

Services

Conference/Workshop Program Committee:

TPC (IEEE ICCCN'18).

TPC (ACM S3'17).

Web Chair (IEEE SECON'17).

Web Chair (ACM Hotwireless'16).

Reviewer:

IEEE INFOCOM 2019.

5 in 2018

ACM MobiCom 2019.

3 in 2018

IEEE ICCCN 2018.

3 in 2018

Sensors.

1 in 2018

IEEE Access.

1 in 2018

ACM Transactions on Sensor Networks (ACM TOSN).

2 in 2018

IEEE Globecom 17.

1 in 2017

IEEE/ACM International Symposium on Quality of Service (IEEE/ACM IWQoS).

1 in 2017

IEEE Wireless Communications and Networking Conference (IEEE WCNC 2017).

1 in 2016

IEEE JSAC Special Issue on Human-In-The-Loop Mobile Networks (IEEE JSAC).

1 in 2016

IEEE Transactions on Mobile Computing (IEEE TMC).

11 in 2015-18

IEEE/ACM Transactions on Networking (IEEE ToN).

7 in 2016-18

Wireless Networks (WINE).

3 in 2015-16

International Journal of Communication Systems (IJCS).

1 in 2015

IEEE Transactions on Vehicular Technology (IEEE TVT).

3 in 2015

IEEE Transactions on Wireless Communications (IEEE TWireless).

2 in 2014-15

IEEE Communications Letters (IEEE CL).

4 in 2015

Awards

Best Poster Award, ACM S3'16.

2016

Patent Award (US9537587 & US9413474), NEC Labs America.

2015

Travel Grant Award, ICNP'14.

2014

Outstanding Graduate, University of Electronic Science and Tech of China.

2011

Outstanding Bachelor Thesis, University of Electronic Science and Tech of China.

2011

National Scholarship, Ministry of Education, China.

2007-2010