Wenchao Xu

Department of Computing,
The Hong Kong Polytechnic University
11 Yuk Choi Rd, Hung Hom, Hong Kong

Email: wenchao.xu@polyu.edu.hk
Cell Phone: +852 56006680
https://scholar.google.ca/citations?user=xaTK57QAAAAJ

RESEARCH INTERESTS

Artificial Intelligence based Networking, Internet-of-Things systems, Cloud-edge computing

EMPLOYMENT

- **Research Associate** **Sept. 2018—Present**
  Department of Computing, The Hong Kong Polytechnic University
  Supervisor: Professor Song Guo
- **Software Engineer** **Apr. 2011—Aug. 2014**
  Alcatel-Lucent Shanghai Bell Co., Ltd., Shanghai

EDUCATION

- **Ph.D., Electrical and Computer Engineering** **Sept. 2014—Sept. 2018**
  University of Waterloo, Waterloo, Ontario, Canada
  Supervisor: Professor Xuemin (Sherman) Shen
  GPA: 90/100
  Thesis: Performance Analysis of Drive-thru Internet Access
- **Master of Engineering, Information and Communication Engineering** **Sept. 2008—Mar. 2011**
  Zhejiang University, Hangzhou, P. R. China
  Supervisor: Professor Aiping Huang, Professor Cunqing Hua
  GPA: 83/100
  Thesis: Research of Resource Allocation Algorithms in 802.11 wireless networks
- **Bachelor of Engineering, Communications Engineering** **Sept. 2004—June 2008**
  Zhejiang University, Hangzhou, P. R. China
  Chu Kochen Honors Program
  GPA: 3.81/4.0
  Thesis: Research and Implementation of Auto Configuration in Wireless Sensor Networks

HONORS and AWARDS

- Co-recipient of Best Paper Award, Globecom 2018
- Ontario Research & Development Challenge Fund Bell Scholarship
- University of Waterloo Graduate Scholarship
- University of Waterloo Faculty of Engineers Awards
- International Doctoral Student Award
- Alcatel-Lucent New Employee Award: Quick Learner
- University Scholarship (Level I) of Graduate Student (top 10%) at Zhejiang University
- Excellent Graduate of Zhejiang University (top 10%)

RESEARCH & PROJECT EXPERIENCES

Department of Computing, The Hong Kong Polytechnic University, Hong Kong

Research Associate

- ***Artificial Intelligence based Network Management for Mobile Networks*** **2018—Present**
  - Research on Reinforcement learning based rate adaptation in drive-thru Internet
  - Research on Deep learning based rate sampling for 802.11af TVWS vehicular access
  - Research on NARX prediction based link evaluation for mobile Internet of things
  - Research on AI based joint design for MAC and link adaptation

- ***Proactive and Cooperative Resource Allocation in Wide-scale Edges*** **2018—Present**
  - Proposal compose for General Research Fund (GRF) of Hong Kong. (Fund Granted: 935k HKD, Project number 15222119)
  - Research on game-theoretical analysis for edge cooperation.

Department of Electrical and Computer Engineering, University of Waterloo, Canada

Research Assistant

- ***Exploitation of Opportunistic Spectrum for Vehicular Communication Systems*** **2014—2018**
  - Setup and test of DSRC vehicular system, implementation of network applications
  - Setup and verification of hotspot 2.0 based drive-thru Internet system
  - Setup and measurement of 802.11af TVWS vehicular access system
  - Research of Internet access delay in drive-thru Internet
  - Research of hotspot 2.0 enabled mobile data offloading
  - Throughput analysis of vehicle-to-roadside communication
- ***High Efficiency Wireless LAN MAC Layer Design*** **2015—2017**
  - Performance of drive-thru Internet with variable MAC parameters
  - Implementation of VeMAC on top layer of DSRC
- ***Space-Air-Ground Integrated Vehicular Network for Immersive Driving Experience*** **2017—2018**
  - Setup and simulation in Prescan software for vehicular communication
  - Research of Interworking in heterogeneous vehicular networks
  - Development of multi-interface multi-channel communication protocol in Linux

Department of Information & Telecommunication Engineering, Zhejiang University, China

Research Assistant

- ***Key Technology of Wireless Sensor Networks (WSN)*** **2007—2008**
  - Research on self-configuration protocol in WSN
  - Protocol implementation on TinyOS platform
- ***Cross-layer optimization in Wireless Mesh Networks*** **2009—2010**
  - Research on game theoretical approaches of user association in dense mesh networks
  - Research on joint user association and channel allocation in IEEE 802.11 networks

TEACHING AND MENTORING EXPERIENCES

Teaching Experiences

- **Tutorial Lecturer** **2017**
  Department of Electrical and Computer Engineering, University of Waterloo
  Undergraduate course: ECE318 'Analog and Digital Communications'
- **Laboratory Assistant** **2015**
  Department of Electrical and Computer Engineering, University of Waterloo
  Undergraduate course: ECE358 'Computer Networks'
- **Teaching Assistant** **2009**
  Department of Information & Communication Engineering, Zhejiang University
  Undergraduate course: 'Digital Signal Processing'

Mentoring Experience

- Avanish Kumar Pandey, Undergraduate exchange student at University of Waterloo May 2018—Aug. 2018
  Mentoring on safety application based on vehicular communication
- Jerry Zhang, Undergraduate exchange student at University of Waterloo Sept. 2017—Dec. 2017
  Mentoring on TVWS vehicular access system
- Yushi Cao, Undergraduate co-op student at University of Waterloo Sept. 2017—Dec. 2017
  Mentoring on software defined network demo

PUBLICATIONS

Publication Index: 1 Patent, 25 Journal and 13 Conference papers.

Google citation: 679
h-index: 15

Patent

[P1] X. Shen, **W. Xu**, H. Zhou, "System and Method for Automotive Wi-Fi Access and Connection"
Filed in US, Application number: PCT/CA2017/051292
Published in China, NO.: CN110024476A

Refereed Journal Papers

[J1] H. Zhou **W. Xu**, J. Che, W. Wang "Evolutionary V2X Technologies Toward Internet of Vehicles: Challenges and Opportunities", **Proceedings of IEEE**, vol. 108, no. 2 (2020), pp. 308–323.

[J2] **W. Xu**, S. Guo, S. Ma, H. Zhou, M. Wu, W. Zhuang "Augmenting Drive-thru Internet via Reinforcement Learning based Rate Adaptation", IEEE Internet of Things Journal, to appear (DOI 10.1109/JIOT.2020.2965148).

[J3] **W. Xu**, H. Zhou, H. Wu, F. Lyu, N. Cheng, X. Shen "Intelligent Link Adaptation in 802.11 Vehicular Networks: Challenges and Solutions", IEEE Communications Standards Magazine, vol. 3, no. 1, pp. 12–18, 2019

[J4] **W. Xu**, W. Shi, F. Lyu, H. Zhou, N. Cheng, X. Shen "Throughput Analysis of Vehicular Internet Access via Roadside WiFi Hotspot", IEEE Transactions on Vehicular Technology, vol.68, no.4, pp.3980–3991, 2019

[J5] **W. Xu**, H. Zhou, Y. Bi, N. Cheng, X. Shen "Exploiting hotspot-2.0 for traffic offloading in mobile networks", IEEE Network, vol.32, no.5, pp.131–137, 2018

[J6] **W. Xu**, H. Zhou, N. Cheng, F. Lyu, W. Shi, J. Chen, X. Shen "Internet of vehicles in big data era", IEEE/CAA Journal of Automatica Sinica, vol.5, no.1, pp.19–35, 2017 (**Highly cited paper**)

[J7] **W. Xu**, O. Ha, W. Zhuang, X. Shen "Delay analysis of in-vehicle Internet access via on-road WiFi access points", IEEE access, vol.5, pp.2736–2746, 2017

[J8] L. Qian, A. Feng, N, Yu, **W. Xu**, Y. Wu, "Vehicular Networking enabled Vehicle State Prediction via Two-level Quantized Adaptive Kalman Filtering", IEEE Internet of Things Journal, to appear (DOI 10.1109/JIOT.2020.2983332)

[J9] H. Zhou, X. Peng, B. Qian, F. Lyu, **W. Xu**, "Enabling Security-Aware D2D Spectrum Resource Sharing for Connected Autonomous Vehicles", IEEE Internet of Things Journal, to appear (DOI 10.1109/JIOT.2020.2975754)

[J10] C. Hua, **W. Xu**, P. Gu, "Optimal Power Allocation for Non-orthogonal Multiple Access in Wireless Backhaul Networks", IET Communications, 2020

[J11] P. Gu, C. Hua, **W. Xu**, R. Khatoun, Y. Wu, A. Serhrouchni, " Control Channel Anti-Jamming in Vehicular Networks via Cooperative Relay Beamforming", IEEE Internet of Things Journal, to appear (DOI 10.1109/JIOT.2020.2973753)

[J12] H. Wu, J. Chen, **W. Xu**, N. Cheng, W. Shi, L. Wang, X. Shen "Delay-Minimized Edge Caching in Heterogeneous Vehicular Networks: A Matching-Based Approach", IEEE Transactions on Wireless Communication, accepted

[J13] F. Lyu, N. Cheng, H. Zhu, H. Zhou, **W. Xu**, M. Li, X. Shen "Towards Rear-End Collision Avoidance: Adaptive Beaconing for Connected Vehicles", IEEE Transactions on Intelligent Transportation Systems, accepted

[J14] F. Lyu, H. Zhu, N. Cheng, H. Zhou, **W. Xu**, M. Li, X. Shen "Characterizing Urban Vehicle-to-Vehicle Communications for Reliable Safety Applications", IEEE Transactions on Intelligent Transportation Systems, early access (DOI 10.1109/TITS.2019.2920813)

[J15] N. Cheng, **W. Xu**, W. Shi, Y. Zhou, N. Lu, H. Zhou, X. Shen "Air-ground integrated mobile edge networks: Architecture, challenges, and opportunities", IEEE Communications Magazine, vol.56, no.8, pp.26–32, 2018

[J16] W. Shi, J. Li, **W. Xu**, H. Zhou, N. Zhang, S. Zhang, X. Shen "Multiple drone-cell deployment analyses and optimization in drone assisted radio access networks", IEEE Access, vol.6, pp.12518–12529, 2018

[J17] W. Shi, H. Zhou, J. Li, **W. Xu**, N. Zhang X. Shen "Drone assisted vehicular networks: Architecture, challenges and opportunities", IEEE Network, vol.32, no.3, pp.130–137, 2018

[J18] F. Lyu, N. Cheng, H. Zhou, **W. Xu**, W. Shi, J. Chen, M. Li, X. Shen "DBCC: Leveraging Link Perception for Distributed Beacon Congestion Control in VANETs", IEEE Internet of Things Journal, vol.5, no.6, pp.4237–4249, 2018

[J19] N. Cheng, F. Lyu, J. Chen, **W. Xu**, H. Zhou, S. Zhang, X. Shen "Big data driven vehicular networks", IEEE Network, vol.32, no.6, pp.160–167, 2018 (**Highly cited paper**)

[J20] F. Lyu, N. Cheng, H. Zhu, H. Zhou, **W. Xu**, M. Li, X. Shen "Intelligent context-aware communication paradigm design for IOVs based on data analytics", IEEE Network, vol.32, no.6, pp.74–82, 2018

[J21] F. Lyu, H. Zhu, H. Zhou, L. Qian, **W. Xu**, M. Li, X. Shen "MoMAC: mobility-aware and collision-avoidance MAC for safety applications in VANETs", IEEE Transactions on Vehicular Technology, vol.67, no.11, pp.10590–10602, 2018

[J22] H. Zhou, **W. Xu**, Y. Bi, J. Chen, Y. Quan, X. Shen "Toward 5G spectrum sharing for immersive-experience-driven vehicular communications", IEEE Wireless Communications, vol.24, no.6, pp.30–37, 2017

[J23] F. Lyu, H. Zhu, H. Zhou, **W. Xu**, N. Zhang, M. Li, X. Shen "SS-MAC: A novel time slot-sharing MAC for safety messages broadcasting in VANETs", IEEE Transactions on Vehicular Technology, vol.67, no.4, pp.3586–3597, 2017

[J24] J. Chen, H. Zhou, N. Zhang, **W. Xu**, Q. Yu, L. Gui, X. Shen "Service-oriented dynamic connection management for software-defined internet of vehicles", IEEE Transactions on Intelligent Transportation Systems, vol.18, no.10, pp.2826–2837, 2017

[J25] Y. Bi, H. Zhou, **W. Xu**, X. Shen, H. Zhao, "An efficient PMIPv6-based handoff scheme for urban vehicular networks", IEEE transactions on intelligent transportation systems, vol.17, no.12, pp.3613–3628, 2016

Refereed Conference Papers

[C1] **W. Xu**, H. Zhou, T. Yang, H. Wu, S. Guo, "Proactive Link Adaptation for Marine Internet of Things in TV White Space", accepted, ICC 2020

[C2] **W. Xu**, S. Guo, H. Zhou, S. Ma, M. Wu, "A Queueing Analysis of the Opportunistic Vehicle-to-Vehicle Communication', in Proc. Globecom 2019

[C3] **W. Xu**, C. Ma, S. Guo, H. Zhou "Efficient Rate Adaptation for 802.11af TVWS Vehicular Access via Deep Learning', in Proc. Globecom 2019

[C4] H. Cai, C. Hua, **W. Xu** "Design of Active Learning Framework for Collaborative Anomaly Detection", in Proc. WCSP 2019

[C5] **W. Xu**, H. Wu, J. Chen, H. Zhou, N. Cheng, X. Shen, "ViFi: Vehicle-to-Vehicle Assisted Traffic Offloading via Roadside WiFi Networks", in Proc. Globecom 2018, pp.1–6

[C6] H. Wu, **W. Xu**, J. Chen, L. Wang, X. Shen, "Matching-Based Content Caching in Heterogeneous Vehicular Networks", in Proc. Globecom 2018, pp.1–6, **Best Paper Award**

[C7] J. Chen, **W. Xu**, N. Cheng, H. Wu, S. Zhang, X. Shen, "Reinforcement Learning Policy for Adaptive Edge Caching in Heterogeneous Vehicular Network", in Proc. Globecom 2018, pp.1–6

[C8] W. Shi, J. Li, **W. Xu**, H. Zhou, N. Zhang X. Shen, "3D drone-cell deployment optimization for drone assisted radio access networks", in Proc. ICCC 2017, pp.1–6

[C9] **W. Xu**, H. Zhou, W. Shi, F. Lyu, X. Shen, "Throughput analysis of in-vehicle internet access via on-road wifi access points", in Proc. VTC-Fall 2017, , pp.1–5

[C10] **W. Xu**, Y. Wu, H. Zhou, Y. Bi, N. Cheng, X. Shen, "Ti-Fi: Terminal-to-terminal communication incorporated Wi-Fi offloading", in Proc. WCSP 2016, pp.1–5

[C11] **W. Xu**, C. Hua, A. Huang, "Channel assignment and user association game in dense 802.11 wireless networks", in Proc. ICC 2011, pp.1–5

[C12] **W. Xu**, C. Hua, A. Huang, "A game theoretical approach for load balancing user association in 802.11 wireless networks", in Proc. Globecom 2010, pp.1–5

[C13] X. Ding, C. Hua, **W. Xu**, A. Huang, "A measurement study of channel dynamics in wireless mesh networks", in Proc. WCSP 2009

PROFESSIONAL SERVICES & ACTIVITY

Journal Administrative Assistant

– IET Communications, 2016-2018
– IEEE Internet of Things Journal, 2017-2018

Delegate Associate Editor

– Springer Nature Computer Science, 2019

Technical Program Committee

– ICNC, 2019
– WCSP, 2019

Session Chair
– Vehicular Communications, Networks, and Telematics sessions, IEEE VTC-Fall, Toronto, Canada, 2017

Volunteer
– IEEE Globecom 2016, Washington D.C., USA, December 2016

Presenter
– TU-Automotive Detroit, USA, June 2016

Department Graduate Research Seminar (GRS) Organizing Team **2015—2017**
– Research seminar organizer at ECE department, University of Waterloo

BBCR VANET Group Coordinator **2016—2018**
– Responsible for group meeting, research progress and funding applications