Curriculum Vitae
Dr. Qiao Xiang

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Education

2014 Ph.D. Wayne State University, Detroit, MI, Computer Science (advisor: Hongwei Zhang)
2011 M.S. Wayne State University, Detroit, MI, Computer Science (advisor: Hongwei Zhang)
2007 B.Eng Nankai University, Tianjin, China, Information Security (advisor: Xiaojie Yuan)
2007 B.Econ Nankai University, Tianjin, China, Economics (advisor: Jie Gao)

Work Experiences

2021 – present Professor, Department of Computer Science, Xiamen University, China
2019 – 2020 Associate Research Scientist (faculty track), Department of Computer Science, Yale University, United States
2016 – 2019 Postdoctoral Fellow, Department of Computer Science, Yale University, United States
2014 – 2015 Postdoctoral Fellow, School of Computer Science, McGill University, Canada

Research Interests

Large-Scale Networking and Systems, Formal Methods in Networking, Interdomain Networking, Cyber-Physical Systems, Data Center Networks,

Projects

2023 – 2025 China Ministry of Science and Technology: Complier for Multimodal Networks, PI, 1700K (CNY)
2022 – 2025 NSF-China: Fast, Efficient Network Verification for Large-Scale Networks, PI, 590K (CNY)
2022 – 2024 Zhejiang Lab: Resource Management for Large-Scale, Multimodal Networks, PI, 500K (CNY)
2022 – 2023 China Ministry of Education: High-Level Programming of Large-Scale SDN, PI, 200K (CNY)
2022 – 2023 Alibaba Innovative Research Award: Application-Defined, Multi-Tenant, Cloud Storage Networks, PI, 500K (CNY)
2019 – 2020 Facebook Research Award: Toward Highly Reliable, Programmable, and Efficient Network Control, Co-PI, 50K (USD)

Awards

2019 IEEE MASS 2019 Best Paper Award
2019 Facebook Networking Research Award
2013 Outstanding Teaching Award, Wayne State University

Invited Talks

2021.12 Toward Flexible, Efficient Smart Cities: A Network-Application Integration Perspective, Future Smart Cities (FCS'21), Malaysia (online)

2021.11 Scaling Network Verification to Large Networks: Progress and Opportunities, Formal Foundations of Software Defined Networks (FoFoSDN'21), Greece (online)

2017.11 Unicorn: Unified Resource Orchestration for Multi-Domain Data Analytics, National University of Singapore, Singapore

2016.11 Simplifying SDN Programming using a Data-Driven Function Store: A Journey Originating from Routing State Abstraction, Wayne State University, US

2016.07 Toward Real-time, Reliable and Efficient Services in Smart City, National University of Singapore, Singapore

2015.08 Emerging Topics in Wireless Networking, Nankai University, Tianjin, China

2015.05 Designing Real-Time, Reliable and Efficient Cyber-Physical Systems for Future Smart City, MIT, Massachusetts, US

2015.04 Towards Real-time, Reliable and Efficient Service in Wireless Cyber-Physical Systems, McDaniel College, Maryland, US

2014.12 In-Network Processing in Wireless Control Systems: Experience and Case Studies, Nankai University, Tianjin, China

Teaching

2022 Fall Instructor: Computer Networks and Network Security, Xiamen University

2021 Fall Instructor: Computer Networks and Network Security, Xiamen University

2018 Fall Teaching Fellow: Object-Oriented Programming, Yale University

2017 Fall Teaching Fellow: Computer Networks, Yale University, rated **"best TF ever"**

2017 Spring Head Teaching Fellow: Introduction to Computer Programming, Yale University

2016 Spring Teaching Fellow: Computer Networks, Yale University

Professional Services

ACM DAC, TPC Member, 2022
IEEE INFOCOM, TPC Member, 2021, 2022, 2023
IEEE ACM/IEEE-CS/AAAI CS2023 Taks Force, Steering Committee Member, 2021, 2022, 2023
IEEE/ACM IWQoS, TPC Member, 2020, 2021
ACM SIGCOMM-NAI Workshop, Publicit Chair/TPC Member, 2020, 2021
IEEE VNC, Publicity Chair, 2019
ACM eEnergy EV-Sys Workshop, TPC member, 2017
ARO SDNA, Web chair, 2016
ACM CoNEXT, Shadow TPC member, 2015
IEEE ICCCN, TPC member, 2015

Miscellaneous

My Erdös number is 3: Qiao Xiang $\rightarrow$ James Aspnes $\rightarrow$ Miklós Ajtai $\rightarrow$ Paul Erdös

List of Publications

Book Chapter

2015 1. **Qiao Xiang**, Hongwei Zhang, In-Network Processing in Wireless Sensor Networks, *Handbook of Sensor Networking: Advanced Technologies and Applications, Chapter 4*, CRC Press

Journals

2022 15. Xi Chen, **Qiao Xiang**, Linghe Kong, Linghe Kong, Huisan Xu, Learning from FM Communications: Toward Accurate, Efficient, All-Terrain Vehicle Localization, in *ACM/IEEE Transactions on Networking (**ToN**)*, co-primary authors.

2021 14. **Qiao Xiang**, Haitao Yu, James Aspnes, Franck Le, Linghe Kong, Yang Richard Yang, Optimizing in the Dark: Learning Optimal Network Resource Reservation Through a Simple Request Interface, in *ACM/IEEE Transactions on Networking (**ToN**)*.

13. Haizhou Du, Keke Zhang, **Qiao Xiang**, Stargazer: Toward efficient data analytics scheduling via task completion time inference, in *Computers & Electrical Engineering*.

2020 12. Yuwei Xu, Shuai Tong, Tiantian Zhang, Wen Sun, Xiaoyan Hu, **Qiao Xiang**, COMPASS: Directing Named Data Transmission in VANETs by Dynamic Directional Interfaces, in IEEE Access.

11. Xingjian Lu, Fanxin Kong, Xue Liu, Jianwei Yin, **Qiao Xiang**, Huiqun Yu, Bulk Savings for Bulk Transfers: Minimizing Energy Cost on Inter-Data-Center Traffic, in *IEEE Transactions on Cloud Computing (**TCC**)*.

2019 10. **Qiao Xiang**, Jingxuan Zhang, Xin Wang, Yang Liu, Chin Guok, Franck Le, John MacAuley, Harvey Newman, Yang Richard Yang, Toward Fine-Grained, Privacy-Preserving, Efficient Multi-Domain Network Resource Discovery, in *IEEE Journal on Selected Areas in Communications (**JSAC**)*.

9. Kai Gao, **Qiao Xiang**, Xin Wang, Yang Richard Yang, Jun Bi, An Objective-Driven On-Demand Network Abstraction for Adaptive Applications, in *ACM/IEEE Transactions on Networking (**ToN**)*.

2018 8. **Qiao Xiang**, Xin Wang, Jingxuan Zhang, Harvey Newman, Yang Liu, Yang Richard Yang, Unicorn: Unified Resource Orchestration for Multi-Domain, Geo-Distributed Data Analytics, in *Future Generation Computer Systems (**FGCS**)*.

2017 7. Linghe Kong, Xi Chen, Xue Liu, **Qiao Xiang**, Yi Gao, Noam Ben Baruch, Guihai Chen AdaSharing: Adaptive Data Sharing in Collaborative Robots, in *IEEE Transactions on Industrial Electronics (**TIE**)*.

2016 6. H. Newman, M. Spiropulu, J. Balcas, J. Bendavid, T. Hendricks, D. Kcira, I. Legrand, A. Mughal, J.R. Vlimant (Caltech/HEP); P. Spentzouris, P. DeMar (Fermilab); I. Monga, C. Guok (ESnet/LBNL); K. Riley, W. Allcock, V. Vishwanath, L. Winkler (Argonne LCF); R.Y. Yang, M. Chen, G. Kai, X. Lin, **Q. Xiang**, J. Zhang (Yale) (alphabetical order except PI), Next Generation Exascale Network Integrated Architecture for HEP and Global Science, Whitepaper for US HPC Leadership.

5. Linghe Kong, Daqiang Zhang, Zongjian He, **Qiao Xiang**, Jiafu Wan, Meixia Tao, Embracing Big Data with Compressive Sensing: A Green Approach in Industrial Wireless Networks, *IEEE Communications Magazine*, 2016.

4. Linghe Kong, **Qiao Xiang**, Xue Liu, Xiao-Yang Liu, Xiaofeng Gao, Guihai Chen, Min-You Wu, ICP: Instantaneous Clustering Protocol for Wireless Sensor Networks, *Computer Networks*, special issue on "Internet of Things", 2016.

2013 3. Xiaohui Liu, Hongwei Zhang, **Qiao Xiang**, Xin Che, Xi Ju, Taming Uncertainties in Real-Time Routing for Wireless Networked Sensing and Control, *IEEE Transactions on Smart Grid (**TSG**)*, special issue on "Smart Grid Communication Systems", 4(1), pp. 288-301, March 2013.

2011 2. **Qiao Xiang**, Jinhong Xu, Xiaohui Liu, Hongwei Zhang, Loren J. Rittle, When In-Network Processing Meets Time: Complexity and Effects of Joint Optimization in Wireless Sensor Networks, *IEEE Transaction of Mobile Computing (**TMC**)*, 10(10), pp. 1488-1502, October 2011.

2006 1. Yang Wang, Bo Meng, **Qiao Xiang**, Comparison on Survival Analysis of Traumatic Brain Injury Patients Treated at Normal Temperature and Mild Hypothermia, *Chinese General Practice*, December 2006.

Conferences, Workshops and Posters

2022 37. **Qiao Xiang**, Ridi Wen, Chenyang Huang, Yuxing Wang, Jiwu Shu, Franck Le, Network Can Check Itself: Scaling Data Plane Checking via Distributed, On-Device Verification, **ACM HotNets'22**.

36. Dong Guo, Shenshen Chen, Kai Gao, **Qiao Xiang**, Ying Zhang, Y. Richard Yang, Flash: Fast, Consistent Data Plane Verification for Large-Scale Network Settings, **ACM SIGCOMM'22**.

35. Jinghui Jiang, Zhenpei Huang, **Qiao Xiang**, Lu Tang, Jiwu Shu, P4-DPLL: Accelerating SAT Solving Using Switching ASICs, **FFSPIN-SIGCOMM'22**.

34. Yuxin Wang, Qiao Xiang, Jiwu Shu, Geng Li, Linghe Kong: Toward Low-Latency End-to-End Communication in 5G Using Interdomain Edge Eering, **NAI-SIGCOMM'22**.

33. Yutong Liu, Landu Jiang, Linghe Kong, **Qiao Xiang**, Xue Liu, Guihai Chen, Wi-Fruit: See Through Fruits with Smart Devices, to appear at **ACM UbiComp'22**.

2021 32. Yichao Cheng, Ning Luo, Jingxuan Zhang, Timos Antetomos, Ruzica Piskac, **Qiao Xiang**, Looking for the Maximal Independent Set: A New Perspective of Stable Path Problem, in the 40th Annual IEEE International Conference on Computer Communications (**INFOCOM'21**).

31. **Qiao Xiang**, Franck Le, Jingxuan Zhang, Y. Richard Yang, Toward Stable Interdomain Network-Application Integration, in ACM SIGCOMM 2021 Workshop on Network Application Integration/CoDesign (**NAI'21**).

30. Shuyu Wu, Linghe Kong, **Qiao Xiang**, Zhenzhe Zheng, Luoyi Fu, Guihai Chen, A Lightweight, Privacy-Preserving Tensor Completion Framework for Internet of Things, in IEEE **ISPA'21**.

2020 29. **Qiao Xiang**, Jensen Zhang, Franck Le, Yang Richard Yang, Toward Programmable Interdomain Routing , in *2020 ACM/IRTF Applied Networking Research Workshop 2020 (**ANRW'20**)*.

28. Danny Alex Lachos Perez, Christian Esteve Rothenberg, **Qiao Xiang**, Yang Richard Yang, Börje Ohlman, Sabine Randriamasy, Luis M. Contreras, Kai Gao, Multi-Domain Information Exposure using ALTO: The Good, the Bad and the Solution, in *2020 ACM/IRTF Applied Networking Research Workshop 2020 (**ANRW'20**)*.

27. Danny Alex Lachos Perez, **Qiao Xiang**, Christian Esteve Rothenberg, Sabine Randriamasy, Luis M. Contreras, Börje Ohlman, Towards Deep Network & Application Integration: Possibilities, Challenges, and Research Directions, in *ACM SIGCOMM 2020 Workshop on Network Application Integration/CoDesign (**NAI'20**)*.
26. **Qiao Xiang**, Jensen Zhang, Kai Gao, Yeon-sup Lim, Franck Le, Geng Li, Yang Richard Yang, Toward Optimal Software-Defined Interdomain Routing, in *the 39th Annual IEEE International Conference on Computer Communications (**INFOCOM'20**)*. Acceptance rate: $19.8\% = 268/1354$.

2019 25. Tony Wang, **Qiao Xiang**, Jeremy Tucker, Vinod Mishra, Yang Richard Yang, Dandelion: A Novel, High-Level Programming System for Software Defined Coalitions with Local State Sharing, in *the 38th AFCEA/IEEE Military Communications Conference (**MILCOM'19**)*, one of the highest review scores (5, 5, 5, 3).

24. Xi Chen, **Qiao Xiang** (co-primary author), Linghe Kong, Xue Liu, RadioLoc: Learning Vehicle Locations with FM Signal in All-Terrain Environments, in *2019 IEEE International Conference on Mobile Ad-Hoc and Smart Systems (**MASS'19**)*, **Best Paper Award**, 1 out of 116 submissions.
23. Danny Alex Lachos Perez, Christian Esteve Rothenberg, **Qiao Xiang**, Yang Richard Yang, Börje Ohlman, Sabine Randriamasy, Farni Boten, Luis M. Contreras, Supporting Multi-Domain Use cases with ALTO, in *2019 Applied Networking Research Workshop (**ANRW'19**)*.
22. **Qiao Xiang**, Linghe Kong, Xi Chen, Zhe Wang, Lei Rao, Xue Liu, GreenBroker: Optimal Electric Vehicle Park-and-Charge Control via Vehicle-to-Infrastructure Communication, **Invited Paper**, in *2019 IEEE International Black Sea Conference on Communications and Networking* (**BlackSeaCom'19**).
21. **Qiao Xiang**, Haitao Yu, James Aspnes, Franck Le, Linghe Kong, Yang Richard Yang, Optimizing in the Dark: Learning an Optimal Solution Through a Simple Request Interface, in *2019 AAAI Conference on Artificial Intelligence (**AAAI'19**)*, oral presentation, Acceptance rate: 4.7% (oral) /16.2%.

2018 20. **Qiao Xiang**, Jingxuan Zhang, Xin Wang, Yang Liu, Chin Guok, Franck Le, John MacAuley, Harvey Newman, Yang Richard Yang, Fine-Grained, Multi-Domain Network Resource Abstraction as a Fundamental Primitive to Enable High-Performance, Collaborative Data Sciences, in *2018 ACM/IEEE International Conference for High Performance Computing, Networking, Storage, and Analysis (**Supercomputing'18**)*, Acceptance rate: 20%.

19. **Qiao Xiang**, Franck Le, Yeon-sup Lim, Vinod K. Mishra, Christopher Williams, Yang Richard Yang, Hongwei Zhang, OpenSDC: A Novel, Generic Datapath for Software Defined Coalitions, in *the 37th AFCEA/IEEE Military Communications Conference (**MILCOM'18**)*, the highest review scores (5, 5, 5).
18. **Qiao Xiang**, Chin Guok, Franck Le, John MacAuley, Harvey Newman, Yang Richard Yang, SFP: Toward Interdomain Routing for SDN Networks, in *the 2018 Conference of the ACM Special Interest Group on Data Communication (**SIGCOMM'18**)*, poster.
17. **Qiao Xiang**, Jingxuan Zhang, Xin Wang, Yang Liu, Chin Guok, Franck Le, John MacAuley, Harvey Newman, Yang Richard Yang, Fine-Grained, Multi-Domain Network Resource Abstraction as a Fundamental Primitive to Enable High-Performance, Collaborative Data Sciences, in *the 2018 Conference of the ACM Special Interest Group on Data Communication (**SIGCOMM'18**)*, poster.

2017 16. **Qiao Xiang**, Xin Wang, Jingxuan Zhang, Harvey Newman, Yang Liu, Yang Richard Yang, Unicorn: Unified Resource Orchestration for Multi-Domain, Geo-Distributed Data Analytics, in *2017 INDIS Workshop*. Acceptance rate: 20%.

15. **Qiao Xiang**, Jingxuan Zhang, Kai Gao, Shenshen Chen, Harvey Newman, Justas Balcas, Yang Richard Yang, ExaO: Multi-Resource Orchestration for Multi-Domain Geo-Distributed Data Analytics (position paper), in *ITA Workshop on Distributed Analytics InfraStructure and Algorithms for Multi-Organization Federations (**DAIS'17**)*.

14. Kai Gao, **Qiao Xiang**, Xin Wang, Yang Richard Yang, Jun Bi, NOVA: Towards On-Demand Equivalent Network View Abstraction for Network Optimization, *the 25th IEEE/ACM International Symposium on Quality of Service (**IWQoS'17**)*. Acceptance rate: 19.9%.

2016 13. Fanxin Kong, **Qiao Xiang**, Qinglong Wang, Xue Liu, On-line Event-Driven Scheduling for Electric Vehicle Charging via Park-and-Charge, *the 37th IEEE Real-Time Systems Symposium (**RTSS'16**)*. Acceptance rate: 23%.

12. Kai Gao, Chen Gu, **Qiao Xiang**, Xin Wang, Yang Richard Yang, Jun Bi, RSAP: An On-Demand, Minimal Equivalent Routing State Abstraction Protocol, *the 24th IEEE International Conference on Network Protocols (**ICNP'16**)*, poster, top 30% of all submitted full papers.

11. Kai Gao, Chen Gu, **Qiao Xiang**, Yang Richard Yang, Jun Bi, FAST: Enabling Simplified Programming Abstraction for Complex State-Dependent SDN Programming, *the 2016 Conference of the ACM Special Interest Group on Data Communication (**SIGCOMM'16**)*, poster.

10. Xi Chen, Lei Rao, **Qiao Xiang**, Xue Liu, Fan Bai, DRIVING: Distributed Scheduling for Video Streaming in Vehicular Wi-Fi Systems, to appear in *the 24th ACM Multimedia Conference (**MM'16**)*. Acceptance rate: $20\% = 52/260$.

9. **Qiao Xiang**, Linghe Kong, Xue Liu, Jingdong Xu, Wei Wang, Auc2Reserve: A Differentially Private Auction for Electric Vehicle Fast Charging Reservation, **Invited Paper**, *the 22th IEEE International Conference on Embedded and Real-Time Computing Systems and Applications (**RTCSA'16**)*.

8. Xi Chen, Linghe Kong, Xue Liu, Lei Rao, Fan Bai, **Qiao Xiang**, How Cars Talk Louder, Clearer and Fairer: Optimizing the Communication Performance of Connected Vehicles via Online Synchronous Control, *the 35th Annual IEEE International Conference on Computer Communications (**INFOCOM'16**)*. Acceptance rate: $18.25\% = 300/1644$.

2015 7. **Qiao Xiang**, Fanxin Kong, Xue Liu, Xi Chen, Linghe Kong, Lei Rao, Auc2Charge: An Online Auction Framework for Electric Vehicle Park-and-Charge, *the sixth International Conference on Future Energy Systems (**ACM eEnergy'15**)*. Acceptance rate: $22.8\% = 16/70$.

6. **Qiao Xiang**, Hongwei Zhang, Jianping Wang, Guoliang Xing, Shan Lin, Xue Liu, On Optimal Diversity in Network-Coding-Based Routing in Wireless Networks, *the 34th Annual IEEE International Conference on Computer Communications (**INFOCOM'15**)*. Acceptance rate: $19\% = 316/1640$.

5. **Qiao Xiang**, Xi Chen, Linghe Kong, Lei Rao, Xue Liu, Data Preference Matters: A New Perspective of Safety Data Dissemination in Vehicular Ad Hoc Networks, *the 34th Annual IEEE International Conference on Computer Communications (**INFOCOM'15**)*. Acceptance rate: $19\% = 316/1640$.

2012 4. **Qiao Xiang**, Hongwei Zhang, QoS-Aware In-Network Processing for Mission-Critical Wireless Cyber-Physical Systems, *Doctoral Colloquium on the 10th ACM Conference on Embedded Networked Sensor Systems (DC SenSys'12)*.

3. Xiaohui Liu, Hongwei Zhang, **Qiao Xiang**, Xin Che, Xi Ju, Taming Uncertainties in Real-Time Routing for Wireless Networked Sensing and Control, *the 13th ACM International Symposium on Mobile Ad Hoc Networking and Computing (**MobiHoc'12**)*. Acceptance rate: $20\% = 24/120$.

2011 2. Xiaohui Liu, Hongwei Zhang, **Qiao Xiang**, Towards Predictable Real-Time Routing for Wireless Networked Sensing and Control, *the Cyber-Physical-Systems (CPS) Week Workshop on Real-Time Wireless for Industrial Applications (RealWin'11)*.

2009 1. **Qiao Xiang**, Jinhong Xu, Xiaohui Liu, Hongwei Zhang, Loren J. Rittle, When In-Network Processing Meets Time: Complexity and Effects of Joint Optimization in Wireless Sensor Networks, *the 30th IEEE Real-Time Systems Symposium (**RTSS'09**)*. Acceptance Rate: $< 20\%$.

Dissertation, Thesis and Technical Report

2014 3. In-Network Processing for Mission-Critical Wireless Networked Sensing and Control: A Real-Time, Efficiency, and Resiliency Perspective *PhD Dissertation*, Wayne State University

2011 2. When In-Network Processing Meets Time: Complexity and Effects of Joint Optimization in Wireless Sensor Networks, *Master Thesis*, Wayne State University

2009 1. **Qiao Xiang**, QoS-Assured In-Network Processing in Wireless Cyber-Physical Systems: A Survey, *Technical Report, Dependable Networking and Computing Group*, Wayne State University