

## Education

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- **Ph.D. Student in Computer Science** 2017 – (2022)  
**Northwestern University** Evanston, IL  
- Advisor: Prof. [Yan Chen](#) Area: Network Protocols, Cloud Networking GPA: 3.97/4.00
- **Master's in Computer Science** 2014 – 2017  
**Xi'an Jiaotong University** Shaanxi, China  
- Advisor: Prof. [Chengchen Hu](#) Area: SDN Rank: 1<sup>st</sup>/89 GPA: 3.81/4.00 Average: 91.7
- **B.E. in Software Engineering** 2010 – 2014  
**Xi'an Jiaotong University** Shaanxi, China  
- Rank: 1<sup>st</sup>/78 GPA: 3.94/4.00 Average: 92.4 (in Junior and Senior years)

## Work Experiences

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- **SRI International** Menlo Park, CA  
*Senior Research Intern, at Computer Science Laboratory* Jun. 2021 – Sep. 2021  
- Real-time anomaly detection with P4 switches and reinforcement learning for NextG networks  
*Research Intern, at Computer Science Laboratory* Jun. 2020 – Sep. 2020  
- Enterprise-wide radio situational awareness system with AutoML and nPrint

## Research: Cloud Networks & SDN

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- **Network Optimizing for Serverless Cloud** (work in progress) 2020 – Present  
- Microservices/Serverless architectures bring flexibility but introduce network communication delay  
- Seamlessly integrated **QUIC** into **OpenFaaS/K8s**, improved cloud network performance by 28%  
- Designed systematic benchmarks for the microservices network performance measurement
- **Generic Security Policy Enforcement System for SDN-based Cloud** 2017 – 2018  
- Designed a **policy language** for resource protection and management of SDN-based Cloud  
- Implemented in the **OpenDaylight** controller, and deployed on **OpenStack**
- **Routing Policy for Solving Reactive Model Overhead of SDN** 2016 – 2017  
- SDN control channel bandwidth is the major bottleneck of applying reactive forwarding  
- Proposed a routing policy to reduce the SDN control channel bandwidth consumption up to 80%  
- Implemented in the **Floodlight** controller under **OpenFlow/P4** switch and **Open vSwitch**

## Research: Formal Methods for Network Protocols

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- **Formal Verification and Vulnerability Detection of LTE/5G Protocols** 2019 - 2020  
- Used **TLA+** to formally specify the emergency call systems in **4G/5G** cellular network protocols  
- Built a **complete cellular network testbed** (USRP, OpenAirInterface) for real-world verification  
- Discovered serious availability and security issues in real world, **acknowledged by major carriers**
- **Formal Secure Configuration Search for Network Protocols** 2020 - 2021  
- Traditionally, researchers use secure properties to verify a protocol is safe or find counterexamples  
- We convert this decision problem into a search problem. Given the model and the properties, we search the boundaries of the configuration space where the system is always secure and reliable

## Selected Publications

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- **Kaiyu Hou**, Sen Lin, Yan Chen, Vinod Yegneswaran, *QFaaS: Accelerating and Securing Serverless Cloud Networks with QUIC*, Under Review, USENIX Symposium on Networked Systems Design and Implementation, 2022 (NSDI'21)
- You Li\*, **Kaiyu Hou\***, Yan Chen, Hai Zhou (\*equal contribution), *Property Guided Secure Configuration Space Search*, Under Review, IEEE Int' Conference on Computer Communications, 2022 (INFOCOM'22)
- **Kaiyu Hou\***, You Li\*, Yinbo Yu, Yan Chen, Hai Zhou (\*equal contribution), *Discovering Emergency Call Pitfalls for Cellular Networks with Formal Methods*, ACM International Conference on Mobile Systems, Applications, and Services, 2021 (MobiSys'21)
- You Li\*, **Kaiyu Hou\***, Hai Zhou, Yan Chen (\*equal contribution), *Network Protocol Safe Configuration Search in One Shot*, ACM SIGCOMM, 2020, Poster (SIGCOMM'20)
- Xiaochun Wu, **Kaiyu Hou**, Xue Leng, Xing Li, Yinbo Yu, Bo Wu, Yan Chen, *State of the Art and Research Challenges in the Security Technologies of Network Function Virtualization*, Internet Computing, 2020
- Yinbo Yu, You Li, **Kaiyu Hou**, Yan Chen, Hai Zhou, Jianfeng Yang, *CellScope: Automatically Specifying and Verifying Cellular Network Protocols*, ACM SIGCOMM, 2019, Poster (SIGCOMM'19)
- Xue Leng, **Kaiyu Hou**, Yan Chen, Kai Bu, Libin Song, *SDNKeeper: Lightweight Resource Protection and Management System for SDN-based Cloud*, IEEE/ACM International Symposium on Quality of Service, 2018 (IWQoS'18)
- Chengchen Hu, **Kaiyu Hou** (1<sup>st</sup> student author), Hao Li, Ruilong Wang, Peng Zheng, Peng Zhang, Huan Zhao Wang, *SoftRing: Taming the Reactive Model for Software Defined Networks*, IEEE International Conference on Network Protocols, 2017 (ICNP'17)
- Xiuwen Sun, **Kaiyu Hou**, Hao Li, Chengchen Hu, *Towards A Fast Packet Inspection over Compressed HTTP Traffic*, IEEE/ACM International Symposium on Quality of Service, 2017 (IWQoS'17)

## Awards & Honor

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- **Terminal Year Cabell Fellowship**, Northwestern University 2021
- **Best Teaching Assistant Award**, Northwestern University 2020
- **Outstanding Graduate Award**, Xi'an Jiaotong University 2014, 2017
- **Excellent Student Award**, Xi'an Jiaotong University 2011, 2012, 2013, 2015, 2016
- **Google Excellence Scholarship**, Awarded to 3 students from each of 20 top Chinese universities 2013
- **Meritorious Winner**, Mathematical Contest in Modeling (MCM) 2013
- **Silver Medal**, ACM-ICPC China Province Contest 2012, 2013

## Activities & Experiences

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- **Reviewer/Sub-reviewer** of CCS (18', 19'), ICDCS ('18), IEEE ToN
- **Student President of Computer Science Dept.** (Class 2017), Xi'an Jiaotong University 2014 - 2017
- **Chair, the ACM-ICPC Club**, Xi'an Jiaotong University 2012 - 2013

## Skills

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- Serverless Platforms, Microservices Networks, Cloud Networks, SDN, P4
- TCP/IP Protocols, 3GPP Cellular Network Protocols, 802.11 Protocols, and QUIC Protocol
- Python, Go-lang, Linux | Formal Methods for Network Protocols, TLA+, IC3