Kaiyu Hou

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Objective

- **Intern**: Networked Systems; Cloud Networks; Container and Serverless Network Optimization

Education

- **Ph.D. Student** in **Computer Science**   **Northwestern University**   2017 – (2022)
  Prof. Yan Chen   Area: Networked System, Cloud Networking
  (Research Intern   SRI International, Advisor: Dr. Vinod Yegneswaran)   Summer, 2020

- **Master's** in **Computer Science**   **Xi'an Jiaotong University**   2014 – 2017
  Prof. Chengchen Hu   Area: Software Defined Networking (SDN)
  Rank: 1st/89   **GPA**: 3.81/4.0   **Average**: 91.7

- **B.E.** in **Software Engineering**   **Xi'an Jiaotong University**   2010 – 2014
  Rank: 1st/78   **GPA**: 3.94/4.0   **Average**: 92.4   (in Junior and Senior year)

Research: Cloud Networks & SDN

- Optimizing Network Performance for **Microservices based Cloud** (work in progress)   2020 – Present
  - Microservice architecture brings flexibility but introduces network communication delay
  - Aim to integrate the **QUIC protocol** into microservice architecture to replace the slow https service calls
  - Aim to design systematic metrics to provide a benchmark for the microservice network performance
  - For microservice, working on integrating QUIC into GRPC to improve **Kubernetes** performance
  - For serverless, working on integrating QUIC into **OpenFaaS** to solve the function chain delay

- 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**

  Publication: *SDNKeeper: Lightweight Resource Protection and Management System for SDN-based Cloud*
  Xue Leng, **Kaiyu Hou**, Yan Chen, Kai Bu, Libin Song
  IEEE/ACM 26th International Symposium on Quality of Service (IWQoS), 2018

- Routing Policy for Solving Reactive Model Overhead of **Software Defined Networks**   2016 – 2017
  - Proposed a fine-grained **routing policy** to reduce the control channel bandwidth consumption up to 80%
  - Implemented in the **Floodlight** controller under the **OpenFlow** protocol with **Open vSwitch**
  - Deployed on the **ONetSwitch**, an OpenFlow white-box switch with Xilinx FPGA

  Publication: *SoftRing: Taming the reactive model for software defined networks*
  Chengchen Hu, **Kaiyu Hou** (1st student author), Hao Li, Ruilong Wang, Peng Zheng, Peng Zhang, Huanzhao Wang
  IEEE 25th International Conference on Network Protocols (ICNP), 2017

Research: Formal Methods for Network Protocols

- The Vulnerabilities of **Emergency Call Systems** in Cellular Network 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) and verified these issues
  - Discovered serious availability and security issues in real-world, **acknowledged by major carriers**

  Publication: *Discovering Emergency Call Pitfalls for Cellular Networks with Formal Methods*
  Kaiyu Hou, You Li, Yinbo Yu, Yan Chen, Hai Zhou
  Under Reviewing

- Formal **Safe Configuration Search** for Network Protocols (work in progress)   2020 - Present
  - Traditionally, researchers use correctness 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 aim to generate the safe configurations space for the system.
  - Devised algorithms by leveraging the recent breakthroughs of symbolic model checker: IC3 and FAIR

  Publication: *Network Protocol Safe Configuration Search in One Shot*
  You Li, **Kaiyu Hou**, Hai Zhou, Yan Chen
  ACM Special Interest Group on Data Communication (SIGCOMM, Poster), 2020

Experiences

- **Reviewer/Sub-reviewer** of CCS ('18, '19), ICDCS ('18), ToN ('18)
- **Teaching Assistant** of
  - CS 212: Discrete Mathematics (2020); CS 214: Data Structures (2019, 2020); CS 343 Operating Systems (2019)
  - CS 340: Introduction to Networking (2018, 2019, 2020); IT 458: Information Security and Assurance (2018)
- **Activities**
  - **Student President** of Dept., Computer Science and Technology, Xi'an Jiaotong University   2014 – 2017
  - **Chair**, the ACM-ICPC Club of Xi'an Jiaotong University   2013

Awards

●	**Bronze Medal**	ACM-ICPC Asia Regional Contest	2012, 2013, 2014
●	**Silver Medal**	ACM-ICPC China Province Contest, Chengdu	2013
●	**Meritorious Winner**	Mathematical Contest In Model	2013

Honor

●	**Best Teaching Assistant**	Northwestern University	2020
●	**Graduate with Honor**	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 top 20 Chinese universities	2013

Skills

- L2/L3/L4 Protocols, Microservice Networks, Serverless Platforms, SDN; Formal Verification; Python