Junchen Jiang

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RESEARCH INTERESTS

Computer networks, distributed systems, big data, and cloud computing

During my PhD research, I developed end-to-end systems that leverage data-driven techniques to optimize Quality of Experience of Internet applications, including Internet video streaming and Internet telephony services.

EDUCATION

Carnegie Mellon University   May 2017 (Expected)
Ph.D. in Computer Science
Advisors: Vyas Sekar, Hui Zhang

Tsinghua University   August 2011
B.S. in Computer Science
Advisor: Bin Liu

HONORS & AWARDS

- Best Paper Runner-up, ACM CoNEXT 2012
- Juniper Networks Fellowship, 2015
- Carnegie Mellon University Graduate Fellowship, 2011
- Computer World Scholarship (Awarded by Ministry of Education of China), 2011
- Xuetang Fellowship, Tsinghua University, 2010
- First Prize, National High School Mathematics Competition, China, 2006

PUBLICATIONS

Conference and Workshop Papers

- **J. Jiang**, S. Sun, V. Sekar, H. Zhang. "Pytheas: Enabling Data-Driven Quality of Experience Optimization Using Group-Based Exploration-Exploitation"
  NSDI 2017

- **J. Jiang**, V. Sekar, H. Milner, D. Shepherd, I. Stoica, H. Zhang. "CFA: A Practical Prediction System for Video QoE Optimization"
  NSDI 2016

- **J. Jiang**, R. Das, G. Anathanarayanan, P. A. Chou, V. Padmanabhan, V. Sekar, E. Dominique, M. Goliszewski, D. Kukoleca, R. Vafin, H. Zhang. "VIA: Improving Internet Telephony Call Quality Using Predictive Relay Selection"
  SIGCOMM 2016

- Y. Sun, X. Yin, **J. Jiang**, V. Sekar, F. Lin, N. Wang, T. Liu, B. Sinopoli. "CS2P: Improving Video Bitrate Selection and Adaptation with Data-Driven Throughput Prediction"
  SIGCOMM 2016

- M. Mukerjee, D. Naylor, **J. Jiang**, D. Han, S. Seshan, H. Zhang. "Practical, Real-time Centralized Control for CDN-based Live Video Delivery"
  SIGCOMM 2015

- A. Ganjam, **J. Jiang**, X. Liu, V. Sekar, F. Siddiqui, I. Stoica J. Zhan, H. Zhang. "C3: Internet-Scale Control Plane for Video Quality Optimization"
  NSDI 2015

- **J. Jiang**, V. Sekar, X. Liu, I. Stoica, H. Zhang. "EONA: Experience-Oriented Network Architecture"
  SIGCOMM HotNets 2014

- Y. Sun, **J. Jiang**, V. Sekar, H. Zhang, F. Lin, N. Wang. "Using Video-Based Measurements to Generate a Real-Time Network Traffic Map"
  SIGCOMM HotNets 2014

- **J. Jiang**, V. Sekar, I. Stoica, H. Zhang. "Shedding Light on the Structure of Internet Video Quality Problems in the Wild"
  CoNEXT 2013

- **J. Jiang**, V. Sekar, H. Zhang. "Improving Fairness, Efficiency, and Stability in HTTP-based Adaptive Video Streaming with FESTIVE"
  CoNEXT 2012 (**Best Paper Runner-up, Fast tracked to IEEE/ACM Transaction on Networking**)

- X. Liu, F. Dobrian, H. Milner, **J. Jiang**, V. Sekar, I. Stoica, H. Zhang. "A Case for a Coordinated Internet-Scale Video Control Plane"
  SIGCOMM 2012

- **J. Jiang**, H. Bao, E. Y. Chang, Y. Li. "MOIST: A Scalable and Parallel Moving Object Indexer with School Tracking"
  VLDB 2012

- Y. Wang, K. He, H. Dai, W. Meng, **J. Jiang**, B. Liu Y. Chen. "Scalable Name Lookup in NDN Using Effective Name Component Encoding"
  ICDCS 2012

- J. Fan, C. Hu, K. He, **J. Jiang**, B. Liu. "Reducing Power of Traffic Manager in Routers via Dynamic On/Off-chip Scheduling"
  INFOCOM 2012

- T. Pan, X. Guo, C. Zhang, **J. Jiang**, H. Wu B. Liu. "Tracking Millions of Flows in High Speed Networks for Application Identification"
  INFOCOM 2012

- Z. Li, G. Xia, H. Gao, Y. Tang, Y. Chen, B. Liu, **J. Jiang**, Y. Lv. "NetShield: Massive Semantics-based Vulnerability Signature Matching for High-speed Networks"
  SIGCOMM 2010

- **J. Jiang**, Y. Xu, Y. Tang, B. Liu. "Skip Finite Automaton: A Content Scanning Engine to Secure Enterprise Networks"
  GLOBECOM 2010

- K. He, C. Hu, **J. Jiang**, Y. Zhou, B. Liu. "A2C: Anti-Attack Counters For Traffic Measurement"
  GLOBECOM 2010

- **J. Jiang**, X. Wang, K. He, B. Liu. "Parallel Architecture for High Throughput DFA-Based Deep Packet Inspection"
  ICC 2010

- **J. Jiang**, Y. Xu, T. Pan, Y. Tang, B. Liu. "Pattern-Based DFA for Memory-Efficient Regular Expression Matching"
  ICC 2010

Journal Articles

- **J. Jiang**, V. Sekar, H. Zhang. "Improving Fairness, Efficiency, and Stability in HTTP-based Adaptive Video Streaming with FESTIVE"
  IEEE/ACM Transaction on Networking (ToN), Vol. 22, No. 1, Feb 2014

- Y. Xu, **J. Jiang**, R. Wei, Y. Song, H. J. Chao. "TFA: A Tunable Finite Automaton for Pattern Matching in Network Intrusion Detection Systems"
  IEEE Journal on Selected Areas in Communications (JSAC), Vol. 32, No. 10, Oct 2014

- X. Wang, B. Liu, **J. Jiang**, Y. Xu, Y. Wang, X. Wang. "Kangaroo: Accelerating String Matching by Running Multiple Collaborative Finite State Machines"
  IEEE Journal on Selected Areas in Communications (JSAC), Vol. 32, No. 10, Oct 2014

- Y. Tang, **J. Jiang**, C. Hu, B. Liu. "Managing DFA History with Queue for Deflation DFA"
  Journal of Network and Systems Management archive, Vol. 20, Issue 2, June 2012

- Y. Tang, **J. Jiang**, X. Wang, C. Hu, B. Liu, Z. Chen. "Parallel DFA Architecture for Ultra High Throughput DFA-Based Pattern Matching"
  IEICE Transactions on Information and Systems Vol.E93-D No.12

Invited Paper

- **J. Jiang**, V. Sekar, I. Stoica, H. Zhang. "Unleashing the Potential of Data-Driven Networking"
  COMSNETS 2017

Technical Reports

- **J. Jiang**, V. Sekar, I. Stoica, H. Zhang. "Data-Driven Networking: Harnessing the 'Unreasonable Effectiveness of Data' in Network Design"
  Technical Report CMU-CS-16-102

- **J. Jiang**, V. Sekar, Y. Sun. "DDA: Cross-Session Throughput Prediction with Applications to Video Bitrate Selection"
  arXiv:1505.02056

INDUSTRY IMPACT

- **CFA** has been implemented and deployed by Conviva, a company that provides video quality optimization services for many premium content providers.
- **VIA** has been used in Microsoft internal deployment with real Skype users and is in the process of being fully deployed.
- **MOIST** was deployed in Google datacenters, and used in early backend implementation of Google location-based services.

RESEARCH EXPERIENCE

Carnegie Mellon University

Video Streaming Quality Optimization:
- **CFA [NSDI 2016]** optimizes video streaming quality by accurately predicting video quality using a global and real-time view of network conditions.
- **FESTIVE [CoNEXT 2012]** enables video players to share network resources in a fair, efficient and stable way.
- **CS2P [SIGCOMM 2016]** can accurately predict throughput of an HTTP connection and enable video players to select the highest bitrate without buffering.
- **VDN [SIGCOMM 2015]** optimizes quality of live video streaming by using a centralized control over the internal overlay networks of CDNs.

Optimizing QoE of Other Network Applications:
- **VIA [SIGCOMM 2016]** optimizes network performance for Skype calls by selecting the optimal relay clusters in Microsoft cloud service.
- **Pytheas [NSDI 2017]** optimizes quality of Internet-scale applications by running exploration and exploitation over millions of geo-distributed clients in real time and at scale.
- **EONA [HotNets 2014]** is a new network architecture that allow content providers, ISPs, CDNs and cloud providers to optimize application QoE in a coordinated way.

- **ICTM [HotNets 2014]** offers a service that can predict the end-to-end performance of any network path by using video traffic as "carrier signals" of network conditions.

Tsinghua University
Deep Packet Inspection:
- **Kangaroo [JSAC 2014]** accelerates multi-string matching for network intrusion detection systems by using parallel and collaborative finite state machines.
- **TFA [JSAC 2014]** achieves a flexible and tunable space-time tradeoff for the pattern matching process in deep packet inspection.

Location-Based Services:
- **MOIST [VLDB 2012]** is a scalable database built on top of Google BigTable to offer scalable location-based services and support complex location-based queries.

TEACHING EXPERIENCE	I was a teaching assistant for the following courses.

Graduate Computer Networks (CMU CS 15-744) *Spring 2016*
Instructor: Professor Srinivasan Seshan
Gave three full lectures on congestion control, CDN, DNS, and Internet video. Designed all problem sets and exam questions. Helped supervise all student group projects.

Undergraduate Computer Networks (CMU CS 15-441) *Fall 2015*
Instructor: Professor Peter Steenkiste
Taught around 40 students in weekly recitation sections. Designed problem sets, exam questions, and a new class project of implementing congestion control for peer-to-peer systems.

INDUSTRY EXPERIENCE

Research Intern, Microsoft Research Redmond *Summer 2015*
Mentors: Dr. Ganesh Ananthanarayanan, Dr. Venkat Padmanabhan
Worked closely with Skype team to develop new relay selection systems, deployed its prototype with real Skype users, and designed A/B testing plan for its early deployment.

Research Intern, Microsoft Research Silicon Valley *Summer 2013*
Mentors: Dr. Yinglian Xie, Dr. Fang Yu
Performed a large-scale measurement study to discover hidden correlations between fraudulent activities on mobile devices and their network characteristics.

Engineering Intern, Conviva *Summer 2012*
Built the company's first HTTP-based video player based on Adobe OSMF, and helped migrate the company's RTMP-based bitrate adaptation logic to the HTTP-based player.

Intern, Google China *Fall 2010 - Spring 2011*
Mentor: Dr. Edward Y. Chang
Designed and helped develop a prototype backend on top of BigTable to support scalable location-based services and complex queries.

PRESENTATIONS Slides from all talks are available at http://www.cs.cmu.edu/~junchenj/talks/.
- **VIA: Improving Internet Telephony Call Quality Using Predictive Relay Selection**
  Conference talk at SIGCOMM, August 2016

- **CFA: A Practical Prediction System for Video QoE Optimization**
  Conference talk at NSDI, March 2016
  Talk at MSR Student Summit on Mobility, Systems, and Networking, February 2016
  Talk at AT&T Research PhD Summit, April 2016

- **EONA: Experience-Oriented Network Architecture**
  Conference talk at SIGCOMM HotNets, October 2014

- **Shedding Light on the Structure of Internet Video Quality Problems in the Wild**
  Conference talk at CoNEXT, December 2013

- **Improving Fairness, Efficiency, and Stability in HTTP-based Adaptive Video Streaming with FESTIVE**
  Conference talk at CoNEXT, December 2012
  Talk at Conviva, June 2012
  Talk at Cisco Adaptive Media Transport Workshop, June 2012

SERVICE

(External) Reviewer for
IEEE/ACM Transaction on Networking, ACM SIGCOMM Computer Communication Review (CCR), ACM CoNEXT, IEEE INFOCOM, IEEE Internet Computing, IEEE Transactions on Network and Service Management (IEEE TNSM), IEEE Transactions on Parallel and Distributed Systems (IEEE TPDS), Transactions on Mobile Computing, IEEE Network Magazine

REFERENCES

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