Danyang Zhuo

Assistant Professor
Department of Computer Science
Trinity College of Arts and Sciences
Duke University

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Research Interests

I do research broadly in computer systems, including operating systems, distributed systems, and computer networks, with a focus on the design and implementation of data center systems to support today's increasingly data-intensive applications (e.g., deep learning, big data analytics, packet processing). My approaches include software architecture design, programming languages, and machine learning.

Education

- **University of Washington – Seattle** — Seattle, Washington
  Ph.D. in Computer Science and Engineering — *Sep 2013 - Aug 2019*
  - Dissertation: Practical, Efficient, and Reliable Data Center Communication.
  - Advisors: Thomas E. Anderson, Arvind Krishnamurthy
- **University of Illinois – Urbana Champaign** — Urbana, Illinois
  B.S. in Electrical Engineering — *Aug 2009 - May 2013*
  - Advisor: Nitin Vaidya

Professional Experience

- **Duke University** — Durham, North Carolina
  Assistant Professor of Computer Science — *Jul 2020 - now*
- **University of California – Berkeley** — Berkeley, California
  Postdoctoral Researcher — *Sep 2019 - Jun 2020*
  - Advisor: Ion Stoica
- **Microsoft Research** — Redmond, Washington
  Contractor (through Populous Group) — *Oct 2015 - Feb 2017*
- **Microsoft Research** — Redmond, Washington
  Research Intern — *Jun 2015 - Sep 2015*
- **Google** — Mountain View, California
  Software Development Engineering Intern — *Sep 2014 - Mar 2015*
- **Amazon** — Seattle, Washington
  Software Development Engineering Intern — *May 2013 - Sep 2013*
- **Microsoft** — Redmond, Washington
  Software Development Engineering Intern — *May 2012 - Aug 2012*

Awards

Meta Research Award 2021
Amazon Research Award 2021
IBM Academic Award 2021
FAST Best Paper Award 2021
University of Washington Madrona Prize Runner-Up 2018
University of Washington Hacherl Endowed Fellowship . . . . . 2013 - 2014
Rank 146th in the William Lowell Putnam Mathematical Competition 2012

Publications

Conference Papers

1. Xinhao Kong, Yibo Zhu, Huaping Zhou, Zhuo Jiang, Jianxi Ye, Chuanxiong Guo, Danyang Zhuo. *Collie: Finding Performance Anomalies in RDMA Subsystems.* The 19th USENIX Symposium on Networked Systems Design and Implementation (NSDI), 2022.

2. Jingrong Chen, Hong Zhang, Wei Zhang, Liang Luo, Jefferey Chase, Ion Stoica, Danyang Zhuo. *NetHint: White-Box Networking for Multi-Tenant Data Centers.* The 19th USENIX Symposium on Networked Systems Design and Implementation (NSDI), 2022.

3. Shunhua Jiang, Yunze Man, Zhao Song, Zheng Yu, Danyang Zhuo. *Fast Graph Neural Tangent Kernel via Kronecker Sketching.* The 36th AAAI Conference on Artificial Intelligence (AAAI), 2022.

4. Danyang Zhuo, Kaiyuan Zhang, Zhuohan Li, Siyuan Zhuang, Stephanie Wang, Ang Chen, Ion Stoica. *Rearchitecting In-Memory Object Stores for Low Latency.* The 48th International Conference on Very Large Data Bases (VLDB), 2022.

5. Zhuohan Li, Siyuan Zhuang, Shiyuan Guo, Danyang Zhuo, Hao Zhang, Dawn Song, Ion Stoica. *TeraPipe: Token-Level Pipeline Parallelism for Training Large-Scale Language Models.* The 38th International Conference on Machine Learning (ICML), 2021.

6. Siyuan Zhuang, Zhuohan Li, Danyang Zhuo, Stephanie Wang, Eric Liang, Robert Nishihara, Philipp Moritz, Ion Stoica. *Hoplite: Efficient and Fault-Tolerant Collective Communication for Task-Based Distributed Systems.* In Proceedings of the Conference of the ACM Special Interest Group on Data Communication (SIGCOMM), 2021.

7. Shumo Chu, Danyang Zhuo, Elaine Shi, T-H. Hubert Chan. *Differentially Oblivious Database Joins: Overcoming the Worst-Case Curse of Fully Oblivious Algorithms.* The 2nd Information-Theoretic Cryptography conference (ITC), 2021.

8. Sitan Chen, Xiaoxiao Li, Zhao Song, Danyang Zhuo. *On InstaHide, Phase Retrieval, and Sparse Matrix Factorization.* The 9th International Conference on Learning Representations (ICLR), 2021.

9. Samantha Miller, Kaiyuan Zhang, Mengqi Chen, Ryan Jennings, Ang Chen, Danyang Zhuo, Thomas Anderson. *High Velocity Kernel File Systems with Bento.* The 19th USENIX Conference on File and Storage Technologies (FAST), 2021.
   Best Paper Award.

10. Lianmin Zheng, Chengfan Jia, Minmin Sun, Zhao Wu, Cody Hao Yu, Ameer Haj-Ali, Yida Wang, Jun Yang, Danyang Zhuo, Koushik Sen, Joseph E. Gonzalez, Ion Stoica. *Ansor: Generating High-Performance Tensor Programs for Deep Learning.* The 14th USENIX Symposium on Operating Systems Design and Implementation (OSDI), 2020.

11. Kaiyuan Zhang, Danyang Zhuo, Arvind Krishnamurthy. *Gallium: Automated Software Middlebox Offloading to Programmable Switches.* In Proceedings of the Conference of the ACM Special Interest Group on Data Communication (SIGCOMM), 2020.

12. Kaiyuan Zhang, Danyang Zhuo, Aditya Akella, Arvind Krishnamurthy, Xi Wang. *Automated Verification of Customizable Middlebox Properties with Gravel.* The 17th USENIX Symposium on Networked Systems Design and Implementation (NSDI), 2020.

13. Danyang Zhuo, Kaiyuan Zhang, Yibo Zhu, Hongqiang Harry Liu, Matthew Rockett, Arvind Krishnamurthy, Thomas Anderson. *Slim: OS Kernel Support for a Low-Overhead Container Overlay Network.* The 16th USENIX Symposium on Networked Systems Design and Implementation (NSDI), 2019.

14. Danyang Zhuo, Monia Ghobadi, Ratul Mahajan, Klaus-Tycho Förster, Arvind Krishnamurthy and Thomas E. Anderson. *Understanding and Mitigating Packet Corruption in Data Center Networks.* In Proceedings of the Conference of the ACM Special Interest Group on Data Communication (SIGCOMM), 2017.

15. Danyang Zhuo, Monia Ghobadi, Ratul Mahajan, Amar Phanishayee, Xuan Kelvin Zou, Hang Guan, Arvind Krishnamurthy and Thomas E. Anderson. *RAIL: A Case for Redundant Arrays of Inexpensive Links in Data Center Networks.* The 14th USENIX Symposium on Networked Systems Design and Implementation (NSDI), 2017.

16. Vincent Liu, Danyang Zhuo, Simon Peter, Arvind Krishnamurthy and Thomas E. Anderson. *Subways: A Case for Redundant, Inexpensive Data Center Edge Links.* The 13th International Conference on emerging Networking EXperiments and Technologies (CoNEXT), 2015.

Workshop Papers

1. John Snyder, Alvin Lebeck, Danyang Zhuo. *RDMA Congestion Control: It's Only for the Compliant.* Cloud@MICRO, 2021.

2. Jialin Li, Samantha Miller, Danyang Zhuo, Ang Chen, Jon Howell, Thomas Anderson. *An Incremental Path Towards a Safe OS Kernel.* The 18th Workshop on Hot Topics in Operating Systems (HotOS), 2021.

3. Samantha Miller, Kaiyuan Zhang, Danyang Zhuo, Shibin Xu, Arvind Krishnamurthy, Thomas Anderson. *Practical Safe Linux Kernel Extensibility.* The 17th Workshop on Hot Topics in Operating Systems (HotOS), 2019.

4. Danyang Zhuo, Qiao Zhang, Xin Yang, Vincent Liu. *Canaries in the Network.* The 15th ACM Workshop on Hot Topics in Networks (HotNets), 2016.

5. Danyang Zhuo, Qiao Zhang, Vincent Liu, Arvind Krishnamurthy, Thomas E. Anderson. *Rack-level Congestion Control.* The 15th ACM Workshop on Hot Topics in Networks (HotNets), 2016.

6. Danyang Zhuo, Qiao Zhang, Dan Ports, Arvind Krishnamurthy, Thomas E. Anderson. *Machine Fault Tolerance for Reliable Datacenter Systems.* The 5th Asia-Pacific Workshop on Systems (APSys), 2014.

Invited Papers

1. Samantha Miller, Kaiyuan Zhang, Mengqi Chen, Ryan Jennings, Ang Chen, Danyang Zhuo, Thomas Anderson. *High Velocity Kernel File Systems with Bento.* USENIX ;login:, 2021.

Patents

1. Monia Ghobadi, Ratul Mahajan, Amar Phanishayee, Danyang Zhuo, Xuan Kelvin Zou. *Data Center Topology Having Multiple Classes of Reliability.* US Patent 20170302565A1. WIPO Patent 2017180450A1.

Students

Current PhD Students: Jingrong Chen, Xinhao Kong, Yongji Wu
Current Master Students: Guozhen She, Zhangzhang Yue, Wei Zhang
Current Interns: Baocheng Sun

Invited Talk

- **Collie: Finding Performance Anomalies in RDMA Subsystems.**
  - Microsoft Azure . . . . . Sep 2021
- **Towards Efficient Cloud Systems for Data-Intensive Applications.**
  - Rice University . . . . . Jun 2021
  - Duke CS+ Undergraduate Summer Resarch Program . . . . . Jun 2021
  - IBM . . . . . Feb 2021
- **Towards Efficient and Reliable Data Center Systems.**
  - Yale University . . . . . Apr 2019
  - Purdue University . . . . . Apr 2019
  - University of Virginia . . . . . Mar 2019
  - Duke University . . . . . Mar 2019
  - Rutgers University . . . . . Mar 2019
  - Microsoft Research . . . . . Mar 2019
  - Pennsylvania State University . . . . . Feb 2019
  - University of Minnesota . . . . . Feb 2019
- **Slim: OS Kernel Support for a Low-Overhead Container Overlay Network.**
  - Princeton University . . . . . Jun 2020
  - University of California - Berkeley . . . . . Nov 2019
  - USENIX NSDI . . . . . Feb 2019
- **Understanding and Mitigating Packet Corruption in Data Center Networks.**
  - ACM SIGCOMM . . . . . Aug 2017

- **RAIL: A Case for Redundant Arrays of Inexpensive Links in Data Center Networks.**
  - USENIX NSDI . . . . . Mar 2017

Teaching

- **Spring 2022: Data Center Systems (CompSci 590.04)**
- **Fall 2021: Introduction to Operating Systems (CompSci 310)**
- **Fall 2020: Advanced Operating Systems (CompSci 510)**

Service

Program Committee

- **2022: APNET, FAST, NSDI, SIGCOMM**
- **2021: CoNEXT**
- **2020: SIGCOMM**