

# Yang Zhou

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## RESEARCH INTERESTS

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Networked systems, operating systems, distributed systems, networking stacks, and network telemetry.

## EDUCATION

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### Harvard University, Cambridge, MA, USA

Ph.D. in Computer Science

*(Expected) June 2024*

M.S. in Computer Science

*November 2021*

Thesis title: Codesigning Networking Stacks and Datacenter Applications for High Efficiency and Evolvability

Advisors: Minlan Yu and James Mickens

### Peking University, Beijing, China

B.S. in Computer Science

*July 2018*

Thesis title: Towards Faster and More Accurate Data Stream Processing

Advisors: Tong Yang

## WORK EXPERIENCE

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### Harvard University, Research Assistant

*August 2018–Present*

- *Kernel customization*: Designed kernel offloads via eBPF for distributed system protocols including Paxos (Electrode [1]) and serializable transactions (DINT [12]). Implemented and evaluated atop unmodified Linux OSes, and achieved kernel-bypass-like throughput and latency.
- *$\mu$ s-scale RPCs*: Designed an efficient inter-server load balancing scheme for  $\mu$ s-scale RPCs to achieve low tail latency and high goodput (Mew [11]). Implemented and evaluated for both kernel-bypass and kernel-based networking stacks.
- *SmartNIC architecture*: Designed and prototyped SGX-like TEEs (Trusted Execution Environments) for network functions in SmartNICs under multi-tenant cloud environments (S-NIC [13]).

### Google NetInfra Group and System Research Group, Student Researcher

*June 2021–May 2023*

- *Far memory*: Designed an efficient far memory system that leverages erasure-coding, remote memory compaction, one-sided RMAs, and offloadable parity calculations to achieve fast, storage-efficient fault tolerance (Carbink [2]). Implemented and evaluated using production networking stack.
- *Distributed runtime*: Designed an efficient fault-tolerant distributed runtime based on tasks and actors by leveraging the Chandy–Lamport consistent checkpointing algorithm and causal logging mechanism.
- *$\mu$ s-scale RPCs*: Identified and motivated the inter-server scheduling problem for  $\mu$ s-scale RPCs (leading to Mew).

### VMware Research, Research Intern

*July 2020–September 2020*

- *Geo-distributed data analytics*: Applied traffic redundancy elimination (TRE) technique to accelerate geo-distributed data analytics and save WAN traffic cost. Implemented atop Alluxio, an in-memory data cache system for analytics.

### Facebook, Research Collaborator

*November 2019–May 2020*

- *Network telemetry*: Conducted extensive measurement and analysis on Facebook’s network telemetry system. Identified the importance of being evolvable and handling changes. Proposed a change cube abstraction to systematically track changes, and an intent-based layering design to confine and track changes (PCAT [3]).

### SenseTime, Software Engineering Intern

*March 2018–May 2018*

- *Distributed storage*: Worked on Ceph storage setup, testing, maintenance, monitoring, and alerting.

### Peking University, Research Assistant

*April 2016–July 2018*

- *Network telemetry*: Designed and implemented novel probabilistic data structures (e.g., sketches and Bloom filters) to optimize the memory usage, speed, and accuracy of network telemetry tasks (Cold Filter [4], Elastic Sketch [5], Pyramid Sketch [8], and more [6][15][19]).

## PUBLICATIONS

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Total 769 citations till November 2024 based on Google Scholar.

### Conference Publications

- [1] **Yang Zhou**, Zezhou Wang, Sowmya Dharanipragada, and Minlan Yu.  
Electrode: Accelerating Distributed Protocols with eBPF. [\[link\]](#)  
*USENIX NSDI 2023*.
- [2] **Yang Zhou**, Hassan Wassel, Sihang Liu, Jiaqi Gao, James Mickens, Minlan Yu, Chris Kennelly, Paul Turner, David Culler, Hank Levy, and Amin Vahdat.  
Carbink: Fault-Tolerant Far Memory. [\[link\]](#)  
*USENIX OSDI 2022*.
- [3] **Yang Zhou**, Ying Zhang, Minlan Yu, Guangyu Wang, Dexter Cao, Eric Sung, and Starsky Wong.  
Evolvable Network Telemetry at Facebook. [\[link\]](#)  
*USENIX NSDI 2022*.
- [4] **Yang Zhou**, Tong Yang, Jie Jiang, Bin Cui, Minlan Yu, Xiaoming Li, and Steve Uhlig.  
Cold Filter: A Meta-Framework for Faster and More Accurate Stream. Processing [\[link\]](#)  
*ACM SIGMOD 2018*.
- [5] Tong Yang, Jie Jiang, Peng Liu, Qun Huang, Junzhi Gong, **Yang Zhou**, Rui Miao, Xiaoming Li, and Steve Uhlig.  
Elastic Sketch: Adaptive and Fast Network-Wide Measurements. [\[link\]](#)  
*ACM SIGCOMM 2018*.
- [6] Omid Alipourfard, Masoud Moshref, **Yang Zhou**, Tong Yang, and Minlan Yu.  
A Comparison of Performance and Accuracy of Measurement Algorithms in Software. [\[link\]](#)  
*ACM Symposium on SDN Research (SOSR) 2018*.
- [7] Xiangyang Gou, Chenxingyu Zhao, Tong Yang, Lei Zou, **Yang Zhou**, Yibo Yan, Xiaoming Li, and Bin Cui.  
Single Hash: Use One Hash Function to Build Faster Hash Based Data Structures. [\[link\]](#)  
*IEEE International Conference on Big Data and Smart Computing (BigComp) 2018*.
- [8] Tong Yang, **Yang Zhou**, Hao Jin, Shigang Chen, and Xiaoming Li.  
Pyramid Sketch: A Sketch Framework for Frequency Estimation of Data Streams. [\[link\]](#)  
*VLDB 2017*.
- [9] **Yang Zhou**, Peng Liu, Hao Jin, Tong Yang, Shoujiang Dang, and Xiaoming Li.  
One Memory Access Sketch: A More Accurate and Faster Sketch for Per-Flow Measurement. [\[link\]](#)  
*IEEE Global Communications Conference (Globecom) 2017*.
- [10] Junzhi Gong, Tong Yang, **Yang Zhou**, Dongsheng Yang, Shigang Chen, Bin Cui, and Xiaoming Li.  
ABC: A Practicable Sketch Framework for Non-Uniform Multisets. [\[link\]](#)  
*IEEE International Conference on Big Data (BigData) 2017*.

### Papers Under Reviews

- [11] **Yang Zhou**, Hassan Wassel, James Mickens, Minlan Yu, and Amin Vahdat.  
Mew: Efficient Inter-Server Load Balancing for Microsecond-Scale RPCs. [\[link\]](#)  
September 2023.
- [12] **Yang Zhou**, Xingyu Xiang, Matthew Kiley, Sowmya Dharanipragada, and Minlan Yu.  
DINT: Fast In-Kernel Distributed Transactions with eBPF. [\[link\]](#)  
September 2023.
- [13] **Yang Zhou**, Mark Wilkening, James Mickens, and Minlan Yu.  
SmartNIC Security Isolation in the Cloud with S-NIC. [\[link\]](#)  
October 2023.

### Workshop and Demo Publications

- [14] **Yang Zhou**, Hao Jin, Peng Liu, Haowei Zhang, Tong Yang, and Xiaoming Li.  
Accurate Per-Flow Measurement with Bloom Sketch. [\[link\]](#)

## Journal Publications

- [15] Zhuochen Fan, Gang Wen, Zhipeng Huang, **Yang Zhou**, Qiaobin Fu, Tong Yang, Alex X Liu, and Bin Cui.  
On the Evolutionary of Bloom Filter False Positives - An Information Theoretical Approach to Optimizing Bloom Filter Parameters. [\[link\]](#)  
*IEEE Transactions on Knowledge & Data Engineering* 2022.
- [16] Yuanpeng Li, Xiang Yu, Yilong Yang, **Yang Zhou**, Tong Yang, Zhuo Ma, and Shigang Chen.  
Pyramid Family: Generic Frameworks for Accurate and Fast Flow Size Measurement. [\[link\]](#)  
*IEEE/ACM Transactions on Networking* 2021.
- [17] Tong Yang, Jie Jiang, **Yang Zhou**, Long He, Jinyang Li, Bin Cui, Steve Uhlig, and Xiaoming Li.  
Fast and Accurate Stream Processing by Filtering the Cold. [\[link\]](#)  
*The VLDB Journal* 2019.
- [18] Tong Yang, Jie Jiang, Peng Liu, Qun Huang, Junzhi Gong, **Yang Zhou**, Rui Miao, Xiaoming Li, and Steve Uhlig.  
Adaptive Measurements Using One Elastic Sketch. [\[link\]](#)  
*IEEE/ACM Transactions on Networking* 2019.
- [19] **Yang Zhou**, Omid Alipourfard, Minlan Yu, and Tong Yang.  
Accelerating Network Measurement in Software. [\[link\]](#)  
*ACM SIGCOMM Computer Communication Review* 2018.

## TALKS

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- Electrode: Accelerating Distributed Protocols with eBPF  
Duke University, ACE Center for Evolvable Computing, Google, USENIX NSDI  
Columbia University  
April 2023  
March 2023
  - Carbink: Fault-Tolerant Far Memory  
Cornell University  
WORDS workshop  
Microsoft Research Redmond, USENIX OSDI  
Google  
November 2023  
November 2022  
July 2022  
March & June 2022
  - Evolvable Network Telemetry at Facebook  
USENIX NSDI  
Boston University, Meta  
April 2022  
March 2022
  - Cold Filter: A Meta-Framework for Faster and More Accurate Stream Processing  
Harvard University  
October 2018

## MENTORING EXPERIENCE

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- Matt Kiley, Harvard College undergraduate  
Accelerating distributed transactions using eBPF and AF\_XDP-based RPC systems. 2023
  - Yunxi Shen, Tsinghua University undergraduate  
Resource-efficient job scheduling in data centers. 2023
  - Xingyu Xiang, Peking University undergraduate  
Accelerating distributed transactions using eBPF. 2023
  - Zezhou Wang, Peking University undergraduate → University of Washington PhD  
Accelerating Paxos using eBPF (NSDI 2023, [\[1\]](#)). 2022

## TEACHING EXPERIENCE

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- **Guest Lecture** on far memory, CS294-252: Architectures and Systems for Warehouse-Scale Computers, UC Berkeley  
Nov 2023

- **Teaching Assistant** for Prof. Minlan Yu, CS145: Networking at Scale, Harvard University *Spring 2021*
- **Teaching Assistant** for Prof. Tong Yang, Algorithm Design and Analysis, Peking University *Fall 2018*

## PATENTS

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- **Yang Zhou**, Hassan Wassel, Minlan Yu, Hank Levy, David Culler, and Amin Vahdat. “Fault Tolerant Disaggregated Memory”. Pending (US20230185666A1), filed by Google in December 2022.

## ACADEMIC HONORS

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- Google Ph.D. Fellowship in Systems and Networking *2022*
- Finalist, Meta Ph.D. Fellowship in Networking *2022*
- Graduate Fellowship, Harvard University *2018*
- Excellent Bachelor Thesis (10/327), School of EECS, Peking University *2018*
- New Academic Star Award (1/193), School of EECS, Peking University *2018*
- Arawana Scholarship (2/193), Peking University *2017*
- Pinyou Hudong Scholarship, School of EECS, Peking University *2016*
- May Fourth Scholarship, Peking University *2015*

## PROFESSIONAL ACTIVITIES

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- PC Member: ACM SIGCOMM Poster/Demo 2023, IEEE INFOCOM Workshop on Networking Algorithms 2020.
- Reviewer (Conferences): ACM SIGKDD 2023.
- Reviewer (Journals): ACM Transactions on Modeling and Performance Evaluation of Computing Systems, IEEE/ACM Transactions on Networking, IEEE Journal on Selected Areas in Communications.
- Panelist: “Getting started with systems research” at Students@Systems 2022.

## REFERENCES

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