Xiangyu Han

xyhan@smail.nju.edu.cn | +86 181 5163 8160

Education

Nanjing University   Sep 2022 – Jun 2025 (Estimated)
M.Eng. in Computer Science and Technology, Advised by Prof. Chen Tian   Nanjing, China
- Converted GPA: 3.95/4.00
- First-Prize Scholarship * 1 | Second-Prize Scholarship * 2
- Best Courses: Advanced Algorithms, Combinatorics, Graph Theory, Distributed Networks, *etc.*

Nanjing University   Aug 2018 – Jun 2022
B.Sc. in Computer Science and Technology, Advised by Prof. Chen Tian   Nanjing, China
- Overall GPA: 4.46/5.00
- Third-Prize Scholarship * 1 | Second-Prize Scholarship * 1 | China Merchants Bank Scholarship * 1
- Best Courses: Computer Networks, Algorithm Design & Analysis, Formal Languages and Automata, Compiler Principle, Probability and Mathematical Statistics, Computer Architecture, Software Analysis, *etc.*

Research Experiences

Flowbook: Programmable Microsecond-level Traffic Measurement   Mar 2024 – Sep 2024
Key researcher | In preparation for Future Conferences and Journals   Nanjing University
This project focused on precise flow telemetry. Although similar to μMon in granularity, this work was inspired by the need for accurate diagnosis. Approximate results often obfuscate the root cause of network problems, which often leads to troubleshooting delay and financial losses in production environments.
- **Contribution:** Designed the algorithm on many-core programmable switches. Analyzed the computational complexity of the algorithm in comparison to other schemes. Carried out experiments and interpreted results.
- **Feature:** The system is able to run at line-rate on many-core switches with a latency of around 800ns per packet. Both the flow id and statistics at microsecond-level is retained without loss. It also scales well, capable of handling over 80000 concurrent flows without problem.

PRO: Network Load Balancing for Large Language Model Training   Jun 2024 – Sep 2024
Researcher | In preparation for Future Conferences and Journals   Tencent
Unlike conventional cloud services, AI training involves fewer but significantly heavier flows, and methods like ECMP struggle with effective load distribution. This work solved the problem with packet-level load balancing.
- **Contribution:** Modeled the algorithm with Queueing Theory. Proved that the queue length per port has a tight upper bound. Also carried out experiments and revised the algorithm.
- **Feature:** The system can distribute load evenly across all equivalent paths, and the maximum bound helps to distinguish packet loss from out-of-order deliveries, eliminating the impact on the CC algorithms.

μMon: Empowering Microsecond-level Network Monitoring with Wavelets   2023/07 – 2024/08
Key researcher | Published in Proceedings of the ACM SIGCOMM 2024 Conference   Nanjing University
This is a research project, inspired by the need for recording microscopic traffic patterns in modern datacenter networks. Existing SotA telemetry techniques are either too coarse-grained or space-consuming for continuous monitoring of transient flow events, so we devised a new plan for the problem.
- **Contribution:** Designed an online algorithm to compress telemetry results with wavelets. Proved the amortized time complexity of $O(1)$ per packet. Wrote the code in C++. Carried out experiments. Modeled and calculated the error rate based on stationary process.
- **Feature:** The algorithm is mathematically simple and robust, outperforming all SotA techniques with minimal accuracy loss and a mere 5 Mbps bandwidth overhead per host. Our method is capable of identifying congestion control bugs and performance bottlenecks in large-scale RDMA deployments.

Atomic Transactions for Distributed Storage with In-Network Directories   Oct 2021 – May 2022

Undergraduate thesis | Supervised by Prof. Chen Tian   Nanjing University

This project implemented an atomic cache system on a programmable switch. The unique location of switches within the network halves the latency of all operations, drastically accelerating cache transactions.

- **Feature:** For an atomic transaction, the system halves the completion time in the best case, and the pipelined structure of the switch allows line-rate processing.

Teaching & Mentoring Experiences

Computer Networks   Nanjing University

Teaching Assistant   Spring 2023, Fall 2023, Spring 2024

- Prepared lectures and experiment sessions from the link layer to the application layer.
- Hosted office hours for students on assignments and exams.
- Participated in the design and graded the course assessments to ensure students stayed on track.

Professional Experiences

Tencent   Shenzhen, China

TEG/Data Center Network Team Intern   Jun 2024 – Sep 2024

- **Validate Load Balance Algorithm.** LLMs display a network pattern different from prior cloud applications, calling for new LB methods. My team proposed a new LB algorithm, and my job was to model the design with queueing theory and carry out simulations. Results provided a tight bound on switch queuing delay.
- **Implement RACK-TLP in ns3 simulator.** RACK-TLP is a TCP-based scheme by Google that differentiate packet losses from out-of-order deliveries. I wrote about 500 lines to implement it on RoCE in ns3, and compared it to our queueing theory based solution.
- **Analyze Network Patterns in LLM Inference.** An emerging trend in LLM inference is Prefill-Decode disaggregation, demanding frequent KV Cache exchange in the network. My job was to study recent LLM serving systems to identify network patterns, and analyze potential optimizations.

Publications

- Yadong Liu, Qingkai Meng, Yiran Zhang, Weifeng Zhang, Xiao Ma, Shangguang Wang, Yinben Xia, Xiangyu Han et al. PRO: Network Load Balancing for Large Language Model Training. Submission made to the 22nd USENIX Symposium on Networked Systems Design and Implementation (NSDI 25), under review.
- Xiangyu Han, Hao Zheng, Keqiang He, Zhehao Lin, Qingqing Zhao, Chen Tian et al. Flowbook: Programmable Microsecond-level Traffic Measurement with Manycore Network Processors. Submission made to the 22nd USENIX Symposium on Networked Systems Design and Implementation (NSDI 25), under review.
- Hao Zheng, Chengyuan Huang, Xiangyu Han, Jiaqi Zheng, Xiaoliang Wang, Chen Tian, Wanchun Dou, and Guihai Chen. μMon: Empowering Microsecond-level Network Monitoring with Wavelets. In Proceedings of the ACM SIGCOMM 2024 Conference (ACM SIGCOMM '24), pp. 274-290. 2024.

Interests & Skills

Research Interests: Datacenter Network and Network systems, Programmable Networks, Distributed Systems

Programming Languages: C/C++(Advanced), Python(Advanced), Java(Intermediate), Bash(Basic), P4(Basic), Matlab(Basic), Scala(Basic), Golang(Basic), Verilog(Basic)

Tools: Git, LaTeX, ns3, Matlab, gdb, Chisel, Markdown, Docker, *etc.*