Shihan Lin

Ph.D. Candidate, Department of Computer Science, Duke University

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Research Interests

My research interests include **Internet architecture, network security, and network measurement**. My current research focuses on developing networked systems for **secure and efficient Internet resource delivery** through the co-design of the software architecture and algorithms.

Education

Duke University, Durham, NC, USA   **Aug. 2019 – May. 2025 (expected)**
Ph.D. candidate in Computer Science, Networks and Distributed Systems Lab
  • Advisor: **Prof. Xiaowei Yang**

Fudan University, Shanghai, China   **Sep. 2015 – Jun. 2019**
Undergraduate in Computer Science, Honor Class, Denghui Scholar
  • Advisor: **Prof. Yang Chen**

Research Experience

Duke University, Durham, NC, USA   **Aug. 2019 – Present**
Research Assistant, Advisor: *Prof. Xiaowei Yang*
  • *CDN security:* Developed a system to defend against user privacy exposure to CDNs, achieving **3×** higher throughput and **32%** lower page load times than the TEE-based SOTA.
  • *DoS-resistant password authentication:* Developed a system with a novel authentication protocol to prevent the DoS attacks through password login interfaces.
  • *Cloud-Internet routing:* Measured and analyzed the routing strategies of clouds for traffic between the Internet and cloud WANs. Discovered alternative routes improving more than **10%** of latency in most regions of Google Cloud and Azure.
  • *BGP simulator:* Developed a simulator of BGP propagation at the Internet scale with **millions of border routers** to facilitate the evaluation of new routing algorithms.
  • *Cloud networking:* Developed an efficient cloud RPC system, which supports TCP and RDMA and enables L7 policy enforcement and achieves **2×** higher throughput and **83%** lower latency than the SOTA based on gRPC and envoy.

Google, Sunnyvale, CA, USA   **May 2023 – Aug. 2023**
PhD Software Engineering Intern of Google Cloud, Host: *Austin Barket and David Zimmermann*
  • *Cloud-Internet routing:* Investigated the root cause of the BGP detour from Internet to Google Cloud.

Google, Durham, NC, USA   **May 2022 – Aug. 2022**
PhD Software Engineering Intern of Google Cloud, Host: *Sergey Sorokin and Sanjay Khanna*
  • *VPN security:* Implemented PKI in Google Cloud VPN so that two VPN endpoints can authenticate by certificates.

Selected Publications

InviCloak: An End-to-End Approach to Privacy and Performance in Web Content Distribution
  • *Shihan Lin, Rui Xin, Aayush Goel, Xiaowei Yang*. Proceedings of ACM **CCS 2022**.

PreAcher: Secure and Practical Password Pre-Authentication by Content Delivery Networks
  • *Shihan Lin, Suting Chen, Yunming Xiao, Yanqi Gu, Xiaowei Yang, Aleksandar Kuzmanovic*. Under submission.

Tiered Cloud Routing: Methodology, Latency, and Improvement
  • *Shihan Lin, Yi Zhou, Xiao Zhang, Todd Arnold, Ramesh Govindan, Xiaowei Yang*. Under submission.

Remote Procedure Call as an OS-Managed Service
  • *Jingrong Chen, Yongji Wu, Shihan Lin, Yechen Xu, Xinhao Kong, Thomas Anderson, Matthew Lentz, Xiaowei Yang, Danyang Zhuo*. Proceedings of USENIX **NSDI 2023**.

Dissecting the Applicability of HTTP/3 in Content Delivery Networks
  • *Mengying Zhou, Yang Chen, Shihan Lin, Xin Wang, Bingyang Liu, Aaron Ding*. Proceedings of IEEE **ICDCS 2024**.

Quantifying User Password Exposure to Third-Party CDNs

- *Rui Xin, **Shihan Lin**, Xiaowei Yang*. Proceedings of Springer **PAM 2023** (short paper).

Browsing without Third-Party Cookies: What Do You See?.

- *Maxwell Lin, **Shihan Lin**, Helen Wu, Karen Wang, Xiaowei Yang*. To appear on ACM **IMC 2024** (short paper).

GRANT PROPOSALS

- Involved in the proposal writing and the development of NSF grant CNS-2225448: "Optimizing IP Anycast Performance at Scale" ($ 62.5k, PI: Xiaowei Yang, Co-PI: Bruce Maggs).
- Involved in the grant proposal writing of "Low-Latency, Privacy-Preserving, and Programmable Defenses for Internet Services" (Under submission).

TEACHING AND MENTORING EXPERIENCE

Instructor, COMPSCI 514: Advanced Computer Networks	Fall 2024
Teaching Assistant, COMPSCI 512: Distributed Systems	Spring 2022
Teaching Assistant, COMPSCI 590: Cloud-Based Security	Fall 2021
Teaching Assistant, COMPSCI 356: Computer Networks Architecture	Spring 2021
Teaching Assistant, COMPSCI 514: Advanced Computer Networks	Fall 2020
Mentor, Duke CS+ Undergraduate Research Program	2020 – 2024

- Two of the mentored undergraduates published their first-author short papers on **PAM 2023** and **IMC 2024**, respectively.

HONORS AND AWARDS

ICDCS Travel Grant	2024
SIGCOMM Travel Grant	2023
Denghui Scholar of Fudan Undergraduate Research Opportunities Program	2020
National Innovation and Entrepreneurship Training Program for College Students	2019
First Prize of National Olympiad in Informatics in Provinces	2014

TECHNICAL SKILLS

Internet architecture, network protocols, and cybersecurity

- Proficient in network protocols (TCP/IP, DNS, HTTP, QUIC, BGP, etc.) design and implementation.
- Experienced in cybersecurity analysis (TLS 1.2/1.3, DNSSEC, IPsec, OAuth, PAKE, TEE, etc.).

Networked system development

- Languages and tools: C/C++, Rust, Python, Java, JavaScript, SQL, Node.js, NGINX
- Programmed with C++ in programming contests since the middle school, experienced in data structures and algorithms.

Machine learning algorithms

- Decision tree, Random forest, XGBoost, SVM, K-means, GMM, CNN