

Zhutian Liu

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Riverside, CA 92507, USA

RESEARCH INTERESTS

Ph.D. candidate in Computer Science, specializing in performance optimization and system security of computer networks. My research focuses on measurement that bridges application performance with cross-layer network behavior, developing optimization techniques informed by data-driven insights. My areas of expertise include:

- **TCP/IP Networking:** Transport-layer protocols, congestion control, and network measurement
- **5G Cellular Networks:** 5G protocol stack and Open RAN architecture
- **Wireless Security:** 802.11 security analysis and Open RAN system testing
- **Video Streaming:** Adaptive video delivery (DASH/HLS) and real-time streaming (WebRTC)
- **Computer Vision and Image Processing:** Machine learning frameworks for vision-based analysis

EDUCATION

Ph.D. in Computer Science and Engineering <i>University of California, Riverside. Advisor: Zhaowei Tan</i>	Jan 2021 – Dec 2026 <i>Riverside, USA</i>
B.S. in Computer Science and Technology, Minor in Mathematics <i>University of Electronic Science and Technology of China</i>	Sep 2016 – Jun 2020 <i>Chengdu, China</i>

PROFESSIONAL EXPERIENCE

Graduate Student Researcher <i>University of California, Riverside</i>	Jan 2021 - Present <i>Riverside, USA</i>
Student Research Intern <i>Tencent</i>	Aug 2018 - Oct 2018 <i>Chengdu, China</i>

SELECTED PROJECTS

[P.7] WebRTC Live Streaming Orchestration and Measurement Framework [U.1]

C/C++, Golang, Python, WebRTC 

- An automated experiment and measurement framework that conduct experiment and aggregate information from video QoE, streaming application and network transport layer
- Instrument native WebRTC client, capturing fine-grained frame and packet metrics
- Automate P2P experiments orchestration over machine clusters
- Streamline metrics and video processing for CV model training

[P.6] Cross-Layer Measurement Framework for HTTP Adaptive Streaming over 5G

C/C++, JavaScript, Python, TCP/IP, QUIC, HTTP, 5G 

- A DASH measurement framework from video encoding to measurement
- Customize *dash.js* and measure video QoE, ABR internal metrics
- Collect transport layer congestion control metrics and 5G link-layer metrics

[P.5] ARCANE: Model-Based Fuzzing for 5G O-RAN Conformance [C.2]

C/C++, Python, TLA++, Docker

- A systematic test suite leveraging LLM-assisted specification analysis to identify cross interface procedures
- Auto-generate conformance test cases from operation traces for crucial procedures
- Evaluate the F1AP protocol on *OpenAirInterface*; uncovered 149 unique bugs across 9 categories

[P.4] M2HO: An in-depth study on 5G Handover Impact on TCP Performance[C.1]

C/C++, TCP/IP, 5G 

- A study into TCP performance anomalies induced by 5G handover mechanisms
- Designed a client-side adaptive TCP enhancement via a Linux Netfilter module
- Developed an Android-based emulator reproducing real handover traces for evaluation

[P.3] Cross-interface spoofing Attack between Wi-Fi Clients [C.3]

Python, ARP, 802.11

- A MITM attack that hijack client traffic from other Wi-Fi interfaces
- Successfully perform the attack on enterprise hardwares

[P.2] Proxy for Fast Bulk Downloading over Lossy Networks

C/C++, TCP/IP, HTTP 

- An HTTP proxy boosting download speed in metered network with artificial packet loss
- Proposed strategy that utilizes redundancy to skip-ahead while downloading in parallel
- Implemented as a transparent proxy on top of *Squid*

[P.1] Mobile LoRa Gateway for Off-Grid Agricultural Sensing

Docker, C, Python, LoRaWAN  

- Designed a portable LoRaWAN gateway setup for off-grid telemetry
- Implemented gateway on a Pi mounted on UAV, collaborated with DAF mentees

SELECTED PUBLICATIONS

[U]: Under Submission, [C]: Conference, [W]: Workshop

[U.1] Forgery Detection in Real-time Streaming *Author*

[C.3] Demystifying and Breaking Client Isolation in Wi-Fi Networks [P.3] *NDSS 26* *X. Zhou, J. Pu, Z. Liu, Z. Qian, Z. Tan, S. Krishnamurthy, M. Vanhoef.* *To be published in Network and Distributed Systems Security, 2026*

[C.2] Automated Model-Based Fuzzing for 5G O-RAN [P.5] *MobiCom 25* *Sixu Tan, Zeyu Li, Zhutian Liu, Harsh Patel, Zhaowei Tan* *Conference on Mobile Computing and Networking, 2025*

[C.1] M2HO: Mitigating the Adverse Effects of 5G Handovers on TCP [P.4] *MobiCom 24* *Zhutian Liu, Qing Deng, Zhaowei Tan, Zhiyun Qian, Xinyu Zhang, Ananthram Swami, Srikanth V. Krishnamurthy* *Conference on Mobile Computing and Networking, 2024*

[W.1] DU-level UE Context Migration [P.4] *MobiCom 24* *Presenter: Zhutian Liu* *ACM Open-AI RAN 2024 Workshop*

SKILLS

- **Languages:** C/C++, Go, Python, JavaScript, Shell, Nix
- **Tools:** Docker, eBPF, QXDM, NS3, OpenCV, Android NDK, Pytorch, Git
- **Knowledge:** TCP/IP, Streaming Codecs, Congestion Control, 5G Protocol, Open RAN, Linux, Android, Machine Learning

SERVICES

- **Conference Reviewer:** ICPADS 2025
- **Volunteer:** ACM CoNext 2025

TEACHING EXPERIENCE

Mentorship

- UR2PhD: Anthony Padilla, Claire Lu and Sethya Pugal – 5G energy measurement Aug 2024 – Dec 2024
- DAF: Monse Lopez, Jooahn Park and Sofia Tapia – LoRaWAN sensing Summer 2024, 2025

Teaching Assistant

- CS 169: Mobile Wireless Networks Winter 2022, 2023, 2025

- CS 164: Computer Networks Fall 2024
- CS 153: Design of Operating Systems Spring 2025
- CS 178A: Project Sequence in CSE Fall 2025