Lingzhi Zhao PhD Candidate

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https://chutoutian.github.io/

Research Interests

I am recently interested in leveraging recent advances in generative AI and vision-language models to enhance the reliability and efficiency of multimedia systems. I am also broadly interested in designing and building multimedia streaming systems that sustain high-quality user experience across diverse and challenging network conditions.

Education

University of Illinois Urbana-Champaign
Ph.D. in Computer Science 2022 - 2026 *(expected)*
- Advisor: Prof. Klara Nahrstedt

Shanghai Jiao Tong University
M.S. in Information and Communication Engineering 2019 - 2022
- Advisor: Prof. Ying Cui

Shanghai University
B.S. in Communication Engineering 2015 - 2019

Research Projects

GenStream: Loss-resilient Video Streaming via Generative Codecs *UIUC*, 2025.01 -
- Employed and fine-tuned an ViT-based video tokenizer to improve the compression efficiency and loss-resilience in video streaming.
- Proposed a practical token adaptation approach that integrates both frame-level and packet-level knowledge to handle the dynamics of network conditions.
- Improved Learned Perceptual Image Patch Similarity (LPIPS), by 38%-59% under similar bitrates compared to the existing solutions.

AquaVLM: Improving Situational Awareness Underwater via Mobile VLM *UIUC*, 2024.09 - 2025.05
- Employed context-aware instruction tuning based on multimodal data to improve comprehension and adaptability of mobile VLM within underwater environments.
- Implemented error-resilient fine-tuning to further improve the reliability of message transmission among mobile devices.
- Developed a fully functional prototype system on the iOS platform that consistently maintained an average 90% similarity between the received and original messages over distances of up to 20 meters in real-world experiments.
- Helped with building a VR-based simulation platform for subjective evaluation.
- Paper submitted to ACM MMSys 2026.

AquaScope: Underwater Image Transmission between Mobile Devices *UIUC*, 2023.08 - 2024.09
- Designed and implemented the first underwater acoustic system that enables reliable image transmission between mobile devices.
- Employed CNN and transformer-based image tokenizer and enhanced its bandwidth efficiency and error resilience for underwater communication.
- Implemented reliability-enhancing techniques at the PHY layer to mitigate the impact of underwater transmission errors.
- Implemented a prototype on Android devices and reliably delivered the image under 9 seconds at distances of up to 20 meters.
- Paper submitted to ACM MobiCom 2026.

Neural Adaptive Wireless Video Streaming *SJTU*, 2022.08 - 2023.08
- Optimized the actor-critic reinforcement learning algorithm for video streaming and improved convergence speed and performance (by 14.4%).
- Modeled the impacts of lower-layer information in adaptive video streaming, achieving a flexible tradeoff among QoE, training, and inference costs.
- Leveraged continual learning-based online tuning methods to solve the model mismatch issue for various network environments.
- Deployed the algorithm on Tencent online platform for large-scale video streaming.

Internships

Bytedance | Research Intern @ Multimedia Lab, San Diego, USA 2025.05 - 2025.08

- *Project: Bandwidth-efficient Cloud VR Streaming*
- Manager: Shu Shi
- Developed a motion-aware rate adaptation algorithm for cloud VR streaming, achieving 15% reduction in bandwidth without degrading viewers' QoE.
- Deployed and validated the algorithm in an end-to-end cloud VR streaming system, supported by a comprehensive user study with real-world applications.
- Extended the system to support multiple rate control modes (CBR, VBR, CQP) and integrated motion vector extraction for rate adaptation optimization.

Bytedance | Research Intern @ Multimedia Lab, San Diego, USA 2024.05 - 2024.08

- *Project: QoE Optimization for Cloud VR Gaming*
- Manager: Shu Shi
- Proposed and validated an insight that users have varying latency tolerance for different types of actions to bridge the MTP latency gap in cloud VR gaming.
- Developed an end-to-end cloud VR gaming system that supports most latency-sensitive FPS games.
- Conducted extensive user studies to demonstrate the system delivers gaming experiences comparable to, or better than, local streaming.
- Paper submitted to ACM MMSys 2026.

DPVR Co., Ltd | SDE Intern @ Graphic Group, Shanghai, China 2018.04 - 2019.05

- Manager: Ziyi Xu
- Developed a streaming assistant software for commercial VR headset using C++.

Publications

1. Yongqiang Gui, Yanyan Suo, **Lingzhi Zhao**, and Shu Shi. 360PI: A Practical Performance Index for 360-Degree Video Streaming Systems. *ACM MobiCom Workshop, ImmerCom*, 2025.
2. **Lingzhi Zhao**, Qian Zhou, Bo Chen, and Klara Nahrstedt. 360LiveCast: A Low-Latency and Bandwidth-efficient Multicast Framework for Live 360 Video. *IEEE MIPR*, 2025.
3. **Lingzhi Zhao**, Ying Cui, Yuhang Jia, Yunfei Zhang, and Klara Nahrstedt. Enhancing Neural Adaptive Wireless Video Streaming via Lower-Layer Information Exposure and Online Tuning. *IEEE Trans. Multimedia*, 2025. (Short version published in *IEEE ICC 2024*)
4. **Lingzhi Zhao**, Ying Cui, Sheng Yang, and Shlomo Shamai (Shitz). An Optimization Framework for General Rate Splitting for General Multicast. *IEEE Trans. Wireless Commun.*, 2022. (Short version published in *IEEE ICC 2022*)
5. **Lingzhi Zhao**, Ying Cui, Zhi Liu, Yunfei Zhang, and Sheng Yang. Adaptive Streaming of 360 Videos with Perfect, Imperfect, and Unknown FoV Viewing Probabilities in Wireless Networks. *IEEE Trans. Image Process.*, 2021. (Short version published in *IEEE GLOBECOM 2020*)
6. Chengjun Guo, **Lingzhi Zhao**, Ying Cui, Zhi Liu, and Derrick Wing Kwan. Power-Efficient Wireless Streaming of Multi-Quality Tiled 360 VR Video in MIMO-OFDMA Systems. *IEEE Trans. Wireless Commun.*, 2021.
7. Yangchen Li, **Lingzhi Zhao**, Tianle Wang, Lianghui Ding, and Feng Yang. Knowledge- and Model-Driven Deep Reinforcement Learning for Efficient Federated Edge Learning: Single- and Multi-Agent Frameworks. *IEEE Trans. Mach. Learn. Commun. Netw.*, 2025. (Short version published in *IEEE GLOBECOM 2024*)
8. Yaohui Wang, Bo Chen, Beitong Tian, **Lingzhi Zhao**, Robert Kaufman, Leah Espenhahn, and John Dallesasse. EcoMAT: Energy-Efficient and Accurate Tracking of Chemical Containers with Magnets Toward Automated Laboratory Management. *IEEE WF-IoT*, 2025.

In Submission

1. **Lingzhi Zhao**, Yongqiang Gui, Yanyan Suo, Sandesh Dhawaskar Sathyanarayana, Ruixiao Zhang, Shu Shi, and Klara Nahrstedt. Trinity: Exploiting Latency Sensitivity to Improve Quality of Experience on Cloud VR Gaming. *ACM MMSys*, 2026, under review.
2. **Lingzhi Zhao**, Yongqiang Gui, Yanyan Suo, Shu Shi, and Klara Nahrstedt. MARS: Motion-aware Rate Adaptation for Bandwidth-efficient Cloud VR Streaming. *ACM MMSys*, 2026, under review.
3. Beitong Tian*, **Lingzhi Zhao***, Bo Chen, Haozhen Zheng, Jingcheng Yang, Mingyuan Wu, Deepak Vasisht, and Klara Nahrstedt. AquaVLM: Improving Underwater Situation Awareness with Mobile Vision Language Models. *ACM MMSys*, 2026, under review. (*: equal contributions)
4. Beitong Tian*, **Lingzhi Zhao***, Bo Chen, Mingyuan Wu, Haozhen Zheng, Deepak Vasisht, Francis Y. Yan, and Klara Nahrstedt. AquaScope: Reliable Underwater Image Transmission on Mobile Devices. *ACM MobiCom*, 2026, under review. (*: equal contributions)

Awards

- **IEEE ICC Travel Grant** 2024
- **SJTU Outstanding Scholarship** 2020, 2021

Academic Services

Session Chair for: *IEEE ICC 2024*

Reviewers for: *ACM Multimedia 2025*,
IEEE ICME 2024, 2025,
ACM MobiHoc 2021,
IEEE Trans. Wireless Commun.,
IEEE Trans. Commun.,
IEEE Trans. Green Commun. Netw.,

Teaching

- **CS598 Cloud Computing Capstone** 2025 Fall, UIUC
- **EE372 Computing and Communication Theory** 2021 Fall, SJTU
- **ICE7301H, ICE7302H Convex Optimization** 2020 Fall, SJTU