Ruiyang Zhu

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EDUCATION

- **University of Michigan, Ann Arbor** Michigan, United States
  Ph.D. in Computer Science and Engineering, Research Assistant; GPA: 3.94/4.00 *Sept. 2020 - present*
  Research Interests: Connected Vehicle Systems, Networked Systems, and Mobile Networks.

- **University of Michigan, Ann Arbor** Michigan, United States
  B.S.E. in Computer Engineering, GPA: 4.00/4.00 *Sept. 2018 - May. 2020*

- **Shanghai Jiao Tong University** Shanghai, China
  B.S.E. in Electrical and Computer Engineering, GPA: 3.73/4.00 *Sept. 2016 - Aug. 2020*

PUBLICATIONS AND PATENTS

- **[IROS'25]** SCORPION: Robust Spatial-Temporal Collaborative Perception Model on Lossy Wireless Network
  Ruiyang Zhu, M. Cho, S. Zeng, F. Bai, Z. Mao
  IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2025

- [CVPRW'25] Scalable Crowd-sourced Global HD Map Construction via Collaborative Map Perception and Sparse Graph Fusion
  Ruiyang Zhu, M. Cho, S. Zeng, F. Bai, X. Gao, Z. Mao
  Proceedings of the 4th Workshop on Transformers for Vision at CVPR, 2025

- **[SenSys'24]** Boosting Collaborative Vehicular Perception on the Edge with Vehicle-to-Vehicle Communication
  Ruiyang Zhu, X. Zhu, A. Zhang, X. Zhang, J. Sun, F. Qian, Z. Mao, H. Qiu, M. Lee
  Proceedings of the 22nd ACM Conference on Embedded Networked Sensor Systems, 2024

- [MMSys'24] OASIS: Collaborative Neural-Enhanced Mobile Video Streaming **Best Paper Award**
  S. Jin, ***Ruiyang Zhu***, A. Hassan, X. Zhu, X. Zhang, Z. Mao, F. Qian, Z. Zhang
  Proceedings of the 15th ACM Multimedia Systems Conference, 2024

- **[MobiCom'23]** Robust Real-time Multi-vehicle Collaboration on Asynchronous Sensors
  Ruiyang Zhu* (co-primary), Q. Zhang* (co-primary), X. Zhang* (co-primary), F. Bai, M. Naserian, Z. Mao
  Proceedings of the 29th Annual International Conference on Mobile Computing and Networking, 2023

- **[SIGCOMM'22]** Vivisecting Mobility Management in 5G Cellular Networks
  A. Hassan, A. Narayanan, A. Zhang, W. Ye, ***Ruiyang Zhu***, S. Jin, J. Carpenter, Z. Mao, F. Qian, Z. Zhang
  Proceedings of the ACM Special Interest Group on Data Communication Conference, 2022

- **[SIGCOMM'21]** A Variegated Look at 5G in the Wild: Performance, Power, and QoE Implications
  A. Narayanan, X. Zhang, ***Ruiyang Zhu***, A. Hassan, S. Jin, X. Zhu, D. Rybkin, M. Yang, D. Zhang, Z. Mao, et al.
  Proceedings of the ACM Special Interest Group on Data Communication Conference, 2021

- [USENIX Security'24] On Data Fabrication in Collaborative Vehicular Perception: Attacks and Countermeasures
  Q. Zhang, S. Jin, ***Ruiyang Zhu***, J. Sun, X. Zhang, A. Chen, Z. Mao
  Proceedings of the 33rd USENIX Security Symposium, 2024

- [HotMobile'24] The Case for Boosting Mobile Application QoE via Smart Band Switching in 5G/xG Networks
  A. Hassan, A. Zhang, W. Ye, J. Carpenter, ***Ruiyang Zhu***, S. Jin, Z. Mao, F. Qian, Z. Zhang
  Proceedings of the 25th International Workshop on Mobile Computing Systems and Applications, 2024

- [US. Patent] Cooperative V2X Sensor Sharing *US17844978, 2023/12/21*
  M. Naserian, F. Bai, X. Zhang, ***Ruiyang Zhu***, Q. Zhang, X. Zhu, Z. Mao

WORK EXPERIENCE

- **Large-scale AI-network Simulation Workload Support with LLM Self-Service** Meta, CA
  Ph.D. Software Engineering Intern - Network Insights Team *May 2025 - Aug 2025*
  - Developed support for launching multiple distributed training topology simulations using Meta's internal LLM agents.
  - Realized a conversion template that allow newly designed and real-world topologies to be simulated with the framework.

- **Unified Spatial-Temporal Multi-Vehicle Collaborative Perception** General Motors, MI
  Research Intern - Connected Autonomous Vehicle Group *June 2024 - Sept 2024*

- Benchmarked performance of existing collaborative perception methods under sensor localization and synchronization errors.
- Designed a transformer-based model to fuse multi-vehicle features with tolerance to data misalignment caused by GPS measurement errors, network transmission latency and network packet loss.

- **Robust Multi-vehicle LiDAR Perception on Asynchronous Sensors** — General Motors, MI
  Research Intern - Connected Autonomous Vehicle Group — *May 2023 - August 2023*
  - Implemented a range-image-based LiDAR point cloud clustering algorithm on Velodyne VLS-128 sensors with **4k+** LoC.
  - Constructed a real-time multi-vehicle perception system with NVIDIA Jetson Orin on Cadillac ATS vehicles and improved object detection accuracy by up to **40%**.

Research Experience

- **Hybrid Architecture for Edge-supported Vehicular Collaborative Sensing** — University of Michigan, MI
  Research Assistant - RobustNet Group — *May 2021 - Dec. 2023*
  - Designed a multi-vehicle multi-sensor data sharing system with a hybrid architecture that leverages both vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications to allow collaboration among vehicles.
  - Instrumented the Linux kernel to implement the MAC layer prioritization to achieve lower latency for delay-sensitive sensing results and reduced the end-to-end system latency by **18.7%**.
  - Demonstrated the real-time processing capability and achieved **37.1%** end-to-end sensing latency improvement of the system by conducting both trace-driven emulation and real-world driving tests.

- **Cutting-edge Video Streaming System Design** — University of Michigan, MI
  Research Assistant - RobustNet Group — *Dec. 2020 - May 2022*
  - Built an adaptive bitrate (ABR) video streaming performance emulation platform based on the DASH.js framework and studied the implication of 5G network to the Quality of Experience of video streaming using various ABR algorithms.
  - Designed and implemented a video streaming system leveraging the 5G Handover prediction model to reduce the video stalls by **37.14-43.22%** and increase the video quality by 1.72% during mobility.
  - Leveraged super-resolution (SR) technique to build a multi-user collaborative video streaming system.

- **Data-driven Precision Localization on Commodity Android Smartphones** — T-Mobile, MI
  Research Assistant - RobustNet Group (in collaboration with T-Mobile) — *July 2021 - May 2022*
  - Implemented a multi-sensor profiling tool on Android 10 to collect on-board sensor data from smartphones with 3k+ LoC.
  - Designed a sensor fusion Machine Learning model for commodity smartphones to infer the indoor/outdoor localization status without GPS with over **89%** accuracy and only **0.1%** of battery overhead.
  - Integrated the ML models and prediction algorithms into an library on Android API 29 and performed unit testing.

- **Comprehensive 5G Measurement Study** — University of Michigan, MI
  Research Assistant - RobustNet Group — *Sept. 2020 - Feb. 2022*
  - Performed Radio Resource Control (RRC) parameter inference of 5G network to understand the power consumption.
  - Analyzed and quantified the 5G handover performance of major carriers in the U.S. using a cross-country data collection dataset of over **600** GB data and **47,000+** handovers.

Awards And Service

- **Reviewer of ACM Multimedia Conference (ACM MM)**: Apr. 2024
- **ACM Multimedia Systems Conference (MMSys) Best Paper Award**: Apr. 2024
- **University of Michigan Dean's Honor List**: Winter 2020, Fall 2019, Winter 2019, Fall 2018
- **Shanghai Jiao Tong University Undergraduate Excellent Scholarship**: Nov. 2017

Teaching Experience And Invited Talks

- **University of Michigan, EECS**: Graduate Student Instructor for EECS 589 Advanced Computer Networks, Fall 2022
- **Athena AI Institute Seminar Talk**: Enhancing 3D Collaborative Vehicular Perception: Hybrid Communication and Asynchronous Sensor Fusion, Winter 2025
- **Center for Connected and Automated Transportation (CCAT) Safety Working Group Meeting**: Addressing Safety and Security Challenges in ML-based AV Software Stack – Remote Operation Support and Balancing Trade-offs, Winter 2025

Skills Summary

- **Programming Languages**: Python, C++, C, Java, Golang, SQL, Unix scripting
- **Tools**: PyTorch, Docker, GIT, Android Studio, Matlab, LaTeX, LLVM