Ruizhi Cheng

CONTACT INFORMATION

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Scholar

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George Mason University

EDUCATION

Ph.D. Student in Computer Science — Aug. 2021 - Present
George Mason University — Fairfax, VA, USA
Advisor: Dr. Bo Han

WORKING EXPERIENCE

George Mason University, USA
Research Assistant — Aug. 2021 - Present

- Design semantic-aware live interactive holographic communication system.
- Design gaze-driven volumetric video streaming system.
- Design privacy-preserving biometric-based user authentication system in virtual reality (VR).
- Conduct network measurement study on social VR platforms.

PUBLICATIONS

Under Review

15. **Ruizhi Cheng**, Yuetong Wu, Ashish Kundu, Hugo Latapie, Myungjin Lee, Songqing Chen, Bo Han
MetaFL: Federated Learning for User Authentication in Metaverse
Submitted to **USENIX Security**, 2024

14. Nan Wu, Kaiyan Liu, **Ruizhi Cheng**, Puqi Zhou, Bo Han
Theia: Gaze-driven and Perception-aware Volumetric Content Delivery for Mixed Reality Headsets
Submitted to **USENIX NSDI**, 2024

13. **Ruizhi Cheng**, Kaiyan Liu, Nan Wu, Bo Han
Enriching Telepresence with Semantic-driven Holographic Communication
Submitted to **ACM HotNets**, 2023

12. Kaiyan Liu, **Ruizhi Cheng**, Nan Wu, Bo Han
Toward Next-generation Volumetric Video Streaming with Neural-based Content Representations
Submitted to **ImmerCom @ ACM Mobicom**, 2023

11. Puqi Zhou, **Ruizhi Cheng**, Songqing Chen, Bo Han
Understanding Remote Collaboration with Mixed Reality: A Case Study of JoinXR
Submitted to **ImmerCom @ ACM Mobicom**, 2023

10. Yixiao Gao, **Ruizhi Cheng**, Muhammad Saad, Adam Oest, Jean Zhang, Bo Han, Songqing Chen
NFT Games: a Peek into the Platform Architecture and Play-to-Earn Model
Submitted to **ACM IMC**, 2023

9. Ruizhe Shi, **Ruizhi Cheng**, Bo Han, Yue Cheng, Songqing Chen
A Closer Look into IPFS: Exploring What is Behind the Scenes
Submitted to **ACM IMC**, 2023

8. **Ruizhi Cheng**, Erdem Murat, Lap-Fai Yu, Songqing Chen, Bo Han
Understanding User Experience of Online Education in Metaverse: A Systems Perspective
Submitted to **ACM UbiComp**, 2023

7. **Ruizhi Cheng**, Puqi Zhou, Jie Li, Songqing Chen, Bo Han
Dissecting User Experience of Social VR: A Tale of Five Popular Platforms
Submitted to **ACM UbiComp**, 2023

6. Nan Wu, **Ruizhi Cheng**, Songqing Chen, Bo Han
PIPE: Privacy-preserving Image-based 6DoF Pose Estimation for Emerging Applications
Submitted to **ACM Sensys**, 2023

Peer-reviewed Papers

5. **Ruizhi Cheng**, Songqing Chen, Bo Han
   Towards Zero-trust Security for the Metaverse
   IEEE Communication, 2023
4. **Ruizhi Cheng**, Nan Wu, Songqing Chen, Bo Han
   Will Metaverse be NextG Internet? Vision, Hype, and Reality
   IEEE Network, 2022
3. **Ruizhi Cheng**, Nan Wu, Matteo Varvello, Songqing Chen, Bo Han
   Are We Ready for Metaverse? A Measurement Study of Social Virtual Reality Platforms
   ACM IMC, 2022
2. Nan Wu, **Ruizhi Cheng**, Songqing Chen, Bo Han
   Preserving Privacy in Mobile Spatial Computing
   ACM NOSSDAV, 2022
1. **Ruizhi Cheng**, Nan Wu, Songqing Chen, Bo Han
   Reality Check of Metaverse: A First Look at Commercial Social Virtual Reality Platforms
   Metabuild@IEEE VR, 2022 Best Paper Award

Selected Projects

Semantic-aware, Interactive, and Live Holographic Communication

- Build an end-to-end live volumetric content capture, creation, delivery, and rendering system set up at multiple locations.
- Deliver semantic information extracted from telepresence participants to drastically reduce Internet bandwidth usage while preserving high FPS and satisfactory visual quality.

Gaze-driven and Perception-aware Volumetric Content Delivery

- Build a gaze-driven and perception-aware volumetric content delivery system on HoloLens 2.
- Reduce bandwidth consumption by up to 67.0% and enhance visual quality by up to 92.5%.

Privacy-preserving Biometric-based User Authentication in VR

- Utilize federated learning (FL), a privacy-preserving distributed machine learning technique, to conduct user authentication while protecting user privacy in social VR.
- Design a personalized within-client and between-client modality selection algorithm.
- Develop a personalized strategy for initializing FL models.
- Improve authentication accuracy by up to 27% compared to the state-of-the-art FL-based model.

Network Measurement in Social VR

- Conduct an in-depth measurement study on several social VR platforms.
- Identify all measured platforms facing scalability issues in terms of throughput, end-to-end latency, and on-device computation resource utilization.

Honors and Awards

Best Paper Award, Metabuild@IEEE VR	2022
Student Travel Grant, IEEE VR	2022
Mason Engineers Week Poster Winner, George Mason University	2022

Services

Conference Reviewer

- IEEE VR 2022; ACM UbiComp 2022

Journal Reviewer

- IEEE Network; IEEE Multimedia; SAGE Open

Technical Skills

Programming Languages. Python, C++, C#, JAVA
Deep Learning Frameworks. Pytorch, Keras