Xingyu Chen

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Research Interests

Bridging wireless systems and computer graphics through differentiable rendering and electromagnetic (RF) simulation. My research enables physically accurate, learning-based channel modeling for 6G communication and sensing, toward computational wireless systems.

Education

University of California San Diego (UCSD) — Fall 2022 – 2027 (expected)
Ph.D. in Computer Science and Engineering
Advisor: Prof. Xinyu Zhang

University at Buffalo (UB), the State University of New York (SUNY) — August 2018 – June 2021
B.S. in Computer Science with Distinction
Advisor: Prof. Wenyao Xu, Embedded Sensing and Computing (ESC) Group

Awards

Best Paper Award, ACM SIGGRAPH Asia 2026 [J4] — 2026
Best Artifact Honorable Mention, ACM MobiSys 2025 [C13] — 2025
Travel Grants, UC San Diego GPSA; ACM SenSys 2023 (NSF) — 2023
Best Student Paper Award, IEEE ICHI 2022 [C7] — 2022
Best Paper Award, ACM SenSys 2019 [C1] — 2019

Selected Publications

[J4] **Xingyu Chen**, Wuqiong Zhao, Xinyu Zhang, Tzu-Mao Li. "Dirichlet Splatting: Differentiable Rendering for Wave-Based Inverse Problems."
In: ***SIGGRAPH Asia*** 2026 (ACM Transactions on Graphics) **Best Paper Award**

[C16] **Xingyu Chen**, Xinyu Zhang, Kai Zheng, Xinmin Fang, Tzu-Mao Li, Chris Xiaoxuan Lu, Zhengxiong Li. "Physically Accurate Differentiable Inverse Rendering for Radio Frequency Digital Twin."
In: ***MobiCom*** 2026 (ACM International Conference on Mobile Computing and Networking)

[C15] **Xingyu Chen**, Zihao Feng, Wuqiong Zhao, Jianrong Ding, Ke Sun, Xinyu Zhang. "From Bits to Tokens: Knowledge-Driven Generative Communication of Multimodal Data."
In: ***NSDI*** 2026 (USENIX Symposium on Networked Systems Design and Implementation)

[C13] **Xingyu Chen**, Xinmin Fang, Shuting Zhang, Xinyu Zhang, Liang He, Zhengxiong Li. "You Only Render Once: Enhancing Energy and Computation Efficiency of Mobile Virtual Reality."
In: ***MobiSys*** 2025 (ACM International Conference on Mobile Systems, Applications, and Services) **Best Artifact Honorable Mention**

[C12] **Xingyu Chen**, Zihao Feng, Kun Qian, Xinyu Zhang. "Radio Frequency Ray Tracing with Neural Object Representation for Enhanced RF Modeling."
In: ***CVPR*** 2025 (IEEE/CVF Conference on Computer Vision and Pattern Recognition)

[C11] **Xingyu Chen**, Zihao Feng, Ke Sun, Kun Qian, Xinyu Zhang. "RFCanvas: Modeling RF Channel by Fusing Visual Priors and Few-shot RF Measurements."
In: ***SenSys*** 2024 (ACM Conference on Embedded Networked Sensor Systems)

[C9] **Xingyu Chen**, Xinyu Zhang. "RF Genesis: Zero-Shot Generalization of mmWave Sensing through Simulation-Based Data Synthesis and Generative Diffusion Models."
In: ***SenSys*** 2023 (ACM Conference on Embedded Networked Sensor Systems)

[C8] **Xingyu Chen***, Zhengxiong Li*, Baicheng Chen*, Yi Zhu, Chris Xiaoxuan Lu, Zhengyu Peng, Feng Lin, Wenyao Xu, Kui Ren, Chunming Qiao. "MetaWave: Attacking mmWave Sensing with Meta-material-enhanced Tags." *(* equal contribution)*
In: ***NDSS*** 2023 (Network and Distributed System Security Symposium)

Other Conference Publications

[C18] Wuqiong Zhao, Baicheng Chen, Kai Zheng, **Xingyu Chen**, Wenqian Zhang, Xinyu Zhang. "FlowForm: Scalable Passive Metasurface Network for mmWave Coverage Expansion."
In: ***SIGCOMM*** 2026 (ACM Conference on Applications, Technologies, Architectures, and Protocols for Computer Communication)

[C17] Yinyan Bu, Jiajie Yu, **Xingyu Chen**, Bo Wen, Xinyu Zhang, Piya Pal. "Stochastic Neural Ray Tracing for Radio Frequency Channel Modeling."
In: ***ICML*** 2026 (International Conference on Machine Learning)

[C14] Yadong Li, Shuning Wang, Yongjian Fu, Justin Chen, **Xingyu Chen**, Ju Ren, Xinyu Zhang, Akshay Gadre, Ke Sun. "UltraPoser: Pushing the Limits of IMU-based Full-Body Pose Estimation with Ultrasound Sensing on Consumer Wearables."
In: ***UIST*** 2025 (ACM Symposium on User Interface Software and Technology)

[C10] Ruichun Ma, Shicheng Zheng, Hao Pan, Lili Qiu, **Xingyu Chen**, Liangyu Liu, Yihong Liu, Wenjun Hu, Ju Ren. "AutoMS: Automated Service for mmWave Coverage Optimization using Low-cost Metasurfaces."
In: ***MobiCom*** 2024 (ACM International Conference on Mobile Computing and Networking)

[C7] Chenhan Xu, Huining Li, Zhengxiong Li, **Xingyu Chen**, Aditya Singh Rathore, Hanbin Zhang, Kun Wang, Wenyao Xu. "The Visual Accelerometer: A High-fidelity Optic-to-Inertial Transformation Framework for Wearable Health Computing."
In: ***ICHI*** 2022 (IEEE International Conference on Healthcare Informatics)
Best Student Paper Award

[C6] Zhengxiong Li, Baicheng Chen, **Xingyu Chen**, Chenhan Xu, Yuyang Chen, Feng Lin, Changzhi Li, Karthik Dantu, Kui Ren, Wenyao Xu. "Reliable Digital Forensics in the Air: Exploring an RF-based Drone Identification System."
In: ***UbiComp*** 2022 (ACM International Joint Conference on Pervasive and Ubiquitous Computing, ACM IMWUT)

[C5] Zhengxiong Li, Baicheng Chen, **Xingyu Chen**, Huining Li, Chenhan Xu, Feng Lin, Chris Xiaoxuan Lu, Kui Ren, Wenyao Xu. "SpiralSpy: Exploring a Stealthy and Practical Covert Channel to Attack Air-gapped Computing Devices via mmWave Sensing."
In: ***NDSS*** 2022 (Network and Distributed System Security Symposium)

[C4] Chenhan Xu, Huining Li, Zhengxiong Li, Hanbin Zhang, Aditya Singh Rathore, **Xingyu Chen**, Kun Wang, Ming-Chun Huang, Wenyao Xu. "CardiacWave: A mmWave-based Scheme of Non-Contact and High-Definition Heart Activity Computing."
In: ***UbiComp*** 2021 (ACM International Joint Conference on Pervasive and Ubiquitous Computing, ACM IMWUT)

[C3] Baicheng Chen, Huining Li, Zhengxiong Li, **Xingyu Chen**, Chenhan Xu, Wenyao Xu. "ThermoWave: A New Paradigm of Wireless Passive Temperature Monitoring via mmWave Sensing."
In: ***MobiCom*** 2020 (ACM International Conference on Mobile Computing and Networking)

[C2] Hanbin Zhang, Gabriel Guo, Emery Comstock, Baicheng Chen, **Xingyu Chen**, Chen Song, Jerry Ajay, Jeanne Langan, Sutanuka Bhattacharjya, Lora Cavuoto, Wenyao Xu. "RehabPhone: A Software-Defined Tool using 3D Printing and Smartphones for Personalized Home-based Rehabilitation."
In: ***MobiSys*** 2020 (ACM International Conference on Mobile Systems, Applications, and Services)

[C1] Zhengxiong Li, Baicheng Chen, Zhuolin Yang, Huining Li, Chenhan Xu, **Xingyu Chen**, Kun Wang, Wenyao Xu. "FerroTag: A Paper-based mmWave-Scannable Tagging Infrastructure."
In: ***SenSys*** 2019 (ACM Conference on Embedded Networked Sensor Systems)
Best Paper Award

Journal Publications

[J5] Chi-Shiang Gau, **Xingyu Chen**, Wuqiong Zhao, Xinyu Zhang, Tara Javidi. "Active Sampling and Gaussian Reconstruction for Radio Frequency Radiance Field."
In: ***IEEE Journal on Selected Areas in Information Theory*** (***JSAIT***), vol. 7, 2026.

[J3] **Xingyu Chen***, Zhengxiong Li*, Srirangaraj Setlur, Wenyao Xu. "Exploring Racial and Gender Disparities in Voice Biometrics."
In: ***Scientific Reports*** 12(1):3723, 2022.

[J2] Huining Li, **Xingyu Chen**, Xiaoye Qian, Huan Chen, Zhengxiong Li, Soumyadeep Bhattacharjee, Hanbin Zhang, Ming-Chun Huang, Wenyao Xu. "An Explainable COVID-19 Detection System Based on Human Sounds."
In: ***Smart Health*** 26:100332, 2022 (presented at IEEE/ACM International Conference on Connected Health: Applications, Systems and Engineering Technologies (***CHASE*** 2022)).

[J1] Huining Li, Huan Chen, Chenhan Xu, Anarghya Das, **Xingyu Chen**, Zhengxiong Li, Jian Xiao, Ming-Chun Huang, Wenyao Xu. "Privacy Computing using Deep Compression Learning Techniques for Neural Decoding."
In: ***Smart Health*** 23:100229, 2022.

Workshop Publications

[W1] Zihao Feng, **Xingyu Chen**, Xuyang Cao, Xinyu Zhang. "Hybrid Data-Driven and Simulation-Driven Prediction of mmWave Network Performance."
In: ***PICASSO*** 2024 (Workshop at ACM International Conference on Mobile Computing and Networking, ***MobiCom*** 2024)

Posters and Demos

[D4] **Xingyu Chen**, Xinyu Zhang. "Generalizing mmWave Sensing with Simulation Synthesis and Generative Models."
In: ***HotMobile*** 2024 (ACM International Workshop on Mobile Computing Systems and Applications)

[D3] **Xingyu Chen**, Xinmin Fang, Wenchuan Wei, Wenyao Xu, Zhengxiong Li. "Exploring an Extensible Children Game Framework based on Augmented Reality Building Blocks."
In: ***SenSys*** 2021 (ACM Conference on Embedded Networked Sensor Systems)

[D2] Xinmin Fang*, **Xingyu Chen***, Wenyao Xu, Zhengxiong Li. "Enhanced Virtual Reality: Exploring an Immersive and Realistic Virtual Reality Training for Nursing."
In: ***SenSys*** 2021 (ACM Conference on Embedded Networked Sensor Systems)

[D1] **Xingyu Chen**, Chenhan Xu, Baicheng Chen, Zhengxiong Li, Wenyao Xu. "In-Ear Thermometer: Wearable Real-time Core Body Temperature Monitoring."
In: ***SenSys*** 2020 (ACM Conference on Embedded Networked Sensor Systems)

Grants

Amazon Research Gift, $80,000 2026
Role: Lead proposal writer. PI: Prof. Xinyu Zhang.

NSF NeTS Medium, $900,000 October 2024 – September 2028
"Generative Channel Cartography for Giga MIMO Networks on the 6G Upper Mid-band" (Award 2403124)
Role: Contributed to proposal development and writing.
PI: Prof. Kun Qian (University of Virginia); Co-PI: Prof. Xinyu Zhang (UC San Diego).
Related publications: [C16], [C15], [C12].

NSF Future CoRe RI (Proposal Submitted)
Topics: Differentiable RF rendering for human sensing.
Role: Contributed to proposal development and writing, serving as lead writer for one research thrust.

Research Software

WiTwin.AI — Open-source differentiable RF simulation platform.
Architect and lead developer. Built on RFDT [C16] to support wireless digital twins, inverse rendering, and gradient-based optimization from RF measurements.

Experience

Research Intern, Microsoft Research Asia — June 2023 – September 2023
Supervised by Prof. Lili Qiu

Researcher, University of Colorado Denver — August 2021 – August 2022
Mobile, Emerging Technologies & Applications (META) Lab
Supervised by Prof. Zhengxiong Li

Patents

[P3] "System and Method for 3D Scene Reconstruction Using Differentiable Radiofrequency Inverse Rendering." U.S. Patent Application No. 19/786,738, 2026.

[P2] "Optimized Virtual Reality System." U.S. Patent Application No. 19/178,366, 2025.

[P1] "Millimeter Wave Attacks with Meta-Material-Enhanced Attack Tags." International Patent Application WO2024178210, published 2024.

Selected Talks

Apple — April 2026
"From Bits to Tokens: Knowledge-Driven Generative Communication of Multimodal Data"
"RF Digital Twin: A Physics-Grounded Framework for Simulation and Inverse Design of Wireless Systems"

Amazon Lab126 — April 2026
"Radio Frequency Digital Twin"

UC San Diego, CSE 291 Pixel Cafe Seminar — April 2026
"Differentiable Rendering of Radio Frequency"

Samsung Research America, SPARK Session — March 2026
"From Bits to Tokens: Knowledge-Driven Generative Communication of Multimodal Data"

UC San Diego, Center for Wireless Communications (CWC) Seminar — March 2026
"Differentiable Radio Frequency Digital Twin"

Selected Press

- UC San Diego Today, "Inexpensive Reflective Tiles Pave the Way for Cost Effective Millimeter Wave Wireless Communications," August 2026 [C18]. Also covered by TechXplore and EurekAlert!
- UploadVR, "YORO Increases VR Frame Rates By Rendering One Eye & Synthesizing The Other," August 2025 [C13].

Teaching

Teaching Assistant, University of Colorado Denver

- CSCI 4773/5773 Introduction to Emerging System Security — Spring 2022
- CSCI 4771/5771 Introduction to Mobile Computing — Fall 2021

Mentoring

Graduate Students

- Zihao Feng, UC San Diego M.S.; now Ph.D. student at the University of Southern California. Co-authored [C15], [C12], [C11]; first author of [W1].
- Wenxuan Guo, M.S. student at UC San Diego.
- Chih-Chung Shen, M.S. student at UC San Diego. Project: generative recovery for knowledge-driven communication, building on [C15].
- Chaeyeon Kim, M.S. student in ECE at UC San Diego. Project: RFDT-based multi-person tracking for integrated sensing and communication (ISAC), building on [C16].

Undergraduate Students

- Yuvraj Bhatia, B.S. student in Computer Science at UC San Diego. Project: RF digital twin (RFDT), building on [C16].

Long-Term Research Mentoring

- Xinmin Fang, mentored from middle school through undergraduate study; now Ph.D. student at the University of Colorado Denver. Co-authored [C16], [C13], [D3], [D2].

High School Students

- David Lee Mayen and Vania Reyes Cruz, ENLACE 2026 high-school research mentees. Project: simulating radio waves for activity recognition in smart homes.

Professional Service

Artifact Evaluation Committee

- ACM MobiCom 2023
- ACM MobiSys 2022
- ACM SenSys/BuildSys 2022 Workshop on Data (DATA 2022)

Conference Reviewer

- IEEE PIMRC 2025
- IEEE GLOBECOM 2023 CISS

Journal and Magazine Reviewer

- ACM IMWUT / UbiComp 2024
- IEEE Journal on Selected Areas in Communications (JSAC)
- IEEE Transactions on Mobile Computing (TMC)
- IEEE Transactions on Services Computing (TSC)
- IEEE Transactions on Communications (TCOM)
- IEEE Transactions on Robotics (T-RO)
- IEEE Network Magazine

References

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