

Yuchen Liu

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Department of Computer Science

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Research Interests

- **Networks and Systems:** Wireless networking; Millimeter-wave networks; Semantic communications; Connected autonomy and unmanned aerial vehicle systems.
- **AI and Machine Learning:** Agentic AI; Over-the-air machine learning; Reinforcement learning; Applied AI in agriculture, health, and security.
- **Radio-Frequency Sensing:** Multi-modal data sensing; Wireless perception; Environment reconstruction; Localization; Integrated sensing and communication.
- **Digital Twins and Open-Source Software:** Network digital twins; Software-defined testbeds; High-performance computing (HPC) simulators.

Professional Experience

Assistant Professor (Tenure-Track), North Carolina State University 2022–Present
– Department of Computer Science
– Department of Electrical and Computer Engineering (by courtesy)
– Faculty Scholar Affiliated in AI and Machine Learning at N.C. PSI
– Director, Networking and IntelligenCE (NICE) Laboratory

Education Background

Ph.D. in Electrical and Computer Engineering 2017–2022
Georgia Institute of Technology, Atlanta, USA
Thesis: *Location, Location, Location: Maximizing mmWave Network Performance through Intelligent Networking Strategies*
Advisor: Dr. Douglas M. Blough

M.S. in Electrical and Computer Engineering 2014–2017
Shanghai Jiao Tong University, China
Thesis: *Analysis and Design of Authentication and Key Management Protocol for Space Information Network*
Advisor: Dr. Jianhua Li

B.S. in Electrical and Computer Engineering 2010–2014
Shanghai University, Chien Wei-zang Honors College

Industrial Experience

Graphics Processing Unit Developer, Intel Corporation Mar. 2017 – Sep. 2017
Video Processing Group (VPG)
Project on GPU-based video post-processing.

Honors and Awards

- Goodnight Early Career Innovators Award, 2025-2026
- Best Poster Award at NCSU Global Education, Academics, and Research Skills (GEARS), 2026
- National Science Foundation (NSF) CAREER Award, 2025
- NVIDIA Academic Grant Award, 2025
- NSF NAIRR Pilot Demonstration Award, 2025
- NC State Carla Savage Award, 2025
- Featured Paper Award, IEEE Open Journal of Vehicular Technology (OJVT), 2025
- Best Paper Award Runner-up, IEEE/IFIP International Conference on Networking (IFIP Networking), 2024
- Best Paper Award Runner-up, IEEE International Performance Computing and Communications Conference (IPCCC), 2024
- Best Paper Award, IEEE International Conference on Computer Communications and Networks (ICCCN), 2023
- Best Paper Award, ACM International Symposium on Mobility Management and Wireless Access (MobiWac), 2022
- Best Paper Award, IEEE International Symposium on Local and Metropolitan Area Networks (LANMAN), 2022
- Best Paper Award Second Place, IEEE International Conference on Local Computer Networks (LCN), 2020
- Best Paper Award Finalist, ACM International Conference on Modeling, Analysis and Simulation of Wireless and Mobile Systems (MSWiM), 2019

Book Chapters

1. Y. Liu and Z. Yang, “Machine Learning for Digital Twin Over Wireless Networks”, in “Digital Twins for Wireless Networks: Overview, Architecture, and Challenges”, *Springer Nature*, 2025.

Journal Publications

39. B. Han, G. Li, X. Yang, J. Wu, J. Li, and Y. Liu, “When Steganography Meets Semantic Communication: An Authorizable Data Transmission Paradigm,” *IEEE Transactions on Mobile Computing (TMC)*, 2026.
38. M. Hossen, C. Dickerson, Ö. Özdemir, et al., E. Tucker, Y. Liu, et al., “Collection: UAV-Based Wireless Multi-modal Measurements from AERPAW Autonomous Data Mule Challenge in Digital Twin and Real-World Environments,” *IEEE Data Descriptions (DATA)*, 2026.

37. Z. Li, X. Luo, M. Chen, G. Li, and Y. Liu, "Beamforming Feedback-Driven Wireless Positioning: A Transferable Vision Transformer Approach," *IEEE Transactions on Mobile Computing (TMC)*, 2026.
36. R. Xu, G. Li, C. Li, J. Li, Y. Liu, and M. Chen, "Agile, Reliable and Communication-efficient Metaverse 3D Reconstruction via Gaussian Semantic Splatting," *IEEE Transactions on Mobile Computing (TMC)*, 2026.
35. X. Yang, Y. He, G. Li, J. Li, Y. Xu, and Y. Liu, "SemGuard: Toward Intrinsic Trusted Access Framework for Semantic Communication via Backdoor Regularization," *IEEE Wireless Communications Letters (WCL)*, 2026.
34. L. Zhou, S. Leng, Y. Liu, Z. Xiong, and T. Quek, "Digital Twins for Low-Altitude UAV Networks—Cooperation and Learning," *IEEE Transactions on Mobile Computing (TMC)*, 2026.
33. D. Wei, X. Xu, Y. Liu, V. Poor, and M. Chen, "Optimizing Model Splitting and Device Task Assignment for Deceptive Signal Assisted Private Multi-hop Split Learning," *IEEE Journal on Selected Areas in Communications (JSAC)*, 2026.
32. Z. Zhang, Z. Peng, H. Yu, M. Chen, and Y. Liu, "Digital Network Twins for Next-Generation Wireless: Creation, Optimization, and Challenges," *IEEE Network Magazine (Network)*, 2025.
31. X. Luo, Z. Li, M. Chen, R. Yu, S. Mao, and Y. Liu, "Unified Packet Compression and Model Adaptation for Integrated Sensing and Multi-Modal Communications," *IEEE Journal on Selected Areas in Communications (JSAC)*, 2025.
30. N. Yang, S. Wang, Y. Liu, C. Brinton, C. Yin, and M. Chen, "Graph Neural Networks for the Optimization of Collaborative Federated Learning Energy Efficiency," *IEEE Transactions on Mobile Computing (TMC)*, 2025.
29. J. Huang, M. Chen, and Y. Liu, "Achieving Resilient and Self-Adaptive Topology Configuration in 3D UAV Networks," *ACM Transactions on Internet Technology (TOIT)*, 2025.
28. Z. Peng, Y. Liu, G. Li, Z. Yang, M. Chen, D. Xu, and X. Lin, "Generative Artificial Intelligence Models for Emerging Communication Systems: Fundamentals and Challenges," *IEEE Communications Magazine (COMMAG)*, 2025.
27. Y. Zhu, M. Chen, S. Wang, Y. Liu, C. Yin, and T. Quek, "3D UAV Localization Optimization under Jamming Attacks: A Mixture Gaussian Distribution based Collaborative Reinforcement Learning," *IEEE Transactions on Mobile Computing (TMC)*, 2025.
26. R. Xu, G. Li, J. Wu, J. Li, Y. Zhao, Y. Liu, and M. Chen, "Toward Covert and Reliable Communication for Anti-eavesdropping Transmission in V2X Networks," *IEEE Transactions on Wireless Communications (TWC)*, 2025.
25. Z. Li, X. Luo, M. Chen, C. Xu, S. Mao, and Y. Liu, "Contextual Combinatorial Beam Management via Online Probing for Multiple Access mmWave Wireless Networks," *IEEE Journal on Selected Areas in Communications (JSAC)*, 2025.
24. H. Tong, M. Chen, J. Zhao, Y. Hu, Z. Yang, Y. Liu, and C. Yin, "Continual Reinforcement Learning for Digital Twin Synchronization Optimization," *IEEE Transactions on Mobile Computing (TMC)*, 2025.

23. X. Luo, Z. Li, Z. Peng, M. Chen, and Y. Liu, "Denoising Diffusion Probabilistic Model for Radio Map Estimation in Generative Wireless Networks," *IEEE Transactions on Cognitive Communications and Networking (TCCN)*, 2025.
22. Y. Zhu, M. Chen, S. Wang, Y. Hu, Y. Liu, C. Yin, and T. Quek, "Passive Inter-Satellite Localization Accuracy Optimization in Low Earth Orbit Satellite Networks," *IEEE Transactions on Wireless Communications (TWC)*, 2025.
21. Z. Zhang, M. Fang, D. Chen, X. Yang, and Y. Liu, "Synergizing AI and Digital Twins for Next-Generation Network Optimization, Forecasting, and Security," *IEEE Wireless Communications (WCM)*, 2025.
20. X. Yang, G. Li, K. Zhou, J. Li, X. Lin, and Y. Liu, "Exploring Graph Neural Backdoors in Vehicular Networks: Fundamentals, Methodologies, Applications, and Future Perspectives," *IEEE Open Journal of Vehicular Technology (OJVT)*, 2025. **(Highlighted Feature Article)**
19. S. Masrur, Ö. Özdemir, A. Gürses, I. Guvenc, et al., Z. Li, Y. Liu, et al., "Collection: UAV-Based RSS Measurements from the AFAR Challenge in Digital Twin and Real-World Environments," *IEEE Data Descriptions (DATA)*, 2025.
18. Y. Liu, S. Li, X. Lin, X. Chen, G. Li, Y. Liu, B. Liao, and J. Li, "QoS-Aware Multi-AIGC Service Orchestration at Edges: An Attention-Diffusion-Aided DRL Method," *IEEE Transactions on Cognitive Communications and Networking (TCCN)*, 2025.
17. H. Yu, Y. Liu, Z. Yang, H. Sun, and M. Chen, "Optimizing Wireless Resource Management and Synchronization in Digital Twin Networks," *IEEE Internet of Things Journal (IoT-J)*, 2025.
16. Z. Zhang, Y. Liu, Z. Peng, M. Chen, D. Xu, and S. Cui, "Digital Twin-Assisted Data-Driven Optimization for Reliable Edge Caching in Wireless Networks," *IEEE Journal on Selected Areas in Communications (JSAC)*, 2024.
15. Z. Li, M. Chen, G. Li, X. Lin, and Y. Liu, "Map-Driven mmWave Link Quality Prediction with Spatial-Temporal Mobility Awareness," *IEEE Transactions on Mobile Computing (TMC)*, 2024.
14. M. Mushi, Y. Liu, S. Sreenivasa, Ö. Özdemir, I. Guvenc, M. Sichitiu, R. Dutta, and R. Gyurek, "Open RAN Testbeds with Controlled Air Mobility," *Computer Communications(ComCom)*, 2024.
13. Y. Zhu, M. Chen, S. Wang, Y. Hu, Y. Liu, and C. Yin, "Collaborative Reinforcement Learning Based Unmanned Aerial Vehicle (UAV) Trajectory Design for 3D UAV Tracking," *IEEE Transactions on Mobile Computing (TMC)*, 2024.
12. X. Yi, G. Li, B. Chen, X. Lin, Z. Peng, Y. Liu, and J. Li, "HSESR: Hierarchical Software Execution State Representation for Ultra-low-Latency Threat Alerting over Internet of Things," *IEEE Internet of Things Journal (IoT-J)*, 2024.
11. W. Ding, Z. Yang, M. Chen, Y. Liu, and M. Shikh-Bahaei, "Joint Vehicle Connection and Beamforming Optimization in Digital Twin Assisted Integrated Sensing and Communication Vehicular Networks", *IEEE Internet of Things Journal (IoT-J)*, 2024.
10. Z. Yang, M. Chen, Y. Liu, and Z. Zhang, "A Joint Communication and Computation Framework for Digital Twin over Wireless Networks," *IEEE Journal of Selected Topics in Signal Processing*, 2024.

09. Z. Zhang, M. Fang, M. Chen, G. Li, X. Lin, and Y. Liu, "Securing Distributed Network Digital Twin Systems Against Model Poisoning Attacks", *IEEE Internet of Things Journal (IoT-J)*, 2024.
08. H. Yu, Y. Liu, and M. Chen, "Complex-Valued Neural Network based Federated Learning for Multi-user Indoor Positioning Performance Optimization", *IEEE Internet of Things Journal (IoT-J)*, 2024.
07. X. Li, M. Chen, Y. Liu, Z. Zhang, D. Liu, and S. Mao, "Graph Neural Networks for Joint Sensing and Communication Optimization in Vehicular Networks," *IEEE Journal on Selected Areas in Communications (JSAC)*, 2023.
06. Y. Liu, Y. Jian, R. Sivakumar, and D. Blough, "Maximizing Line-of-Sight Coverage for mmWave Wireless LANs with Multiple Access Points," *IEEE/ACM Transactions on Networking (ToN)*, 2021.
05. Y. Liu and D. Blough, "Blockage Tolerance in Roadside mmWave Backhaul Networks," *Computer Networks*, 2021.
04. Y. Jian, C. Tai, S. Venkateswaran, M. Agarwal, Y. Liu, D. Blough, and R. Sivakumar, "Algorithms for Addressing Line-of-Sight Issues in Robotic mmWave Wi-Fi Systems using Access Point Mobility," *Journal of Parallel and Distributed Computing*, 2021.
03. Y. Liu, Q. Hu, and D. Blough, "Joint Link-level and Network-level Reconfiguration for Urban mmWave Wireless Backhaul Networks," *Computer Communications*, 2020.
02. Y. Liu, A. Zhang, S. Li, J. Tang, and J. Li, "A Lightweight Authentication Scheme based on Self-updating Strategy for Space Information Network," *International Journal of Satellite Communications & Networking*, 2017.
01. J. Wen, W. Liu, Y. Huang, Y. Liu, Y. Luo, G. Peng, and T. Wang, "Spun-Related Effects on Optical Properties of Spun Silica Optical Fibers," *Journal of Lightwave Technology (JLT)*, 2015.

Conference Publications

69. Z. Zhang, D. Chen, A. Gao, M. Wang, M. Chen, M. Fang, X. Yang, and Y. Liu, "Network Digital Untwinning: Towards Backward Optimization of Digital Twins," *46th IEEE International Conference on Distributed Computing Systems (ICDCS)*, 2026. (AR: 18.59%)
68. Y. Cai, Z. He, Z. Zhang, J. Gao, Y. Liu, Z. Luo, and S. Zhao, "LLM-Powered Multi-Agent Attacks on Cooperative Spectrum Sensing," *The 35th IEEE International Conference on Computer Communications and Networks (IC3N)*, 2026. (AR: 25%)
67. J. Huang, E. Tucker, R. Yu, and Y. Liu, "Twin-Guided Meta Learning for Generalizable UAV Trajectory Planning in Low-Altitude Wireless Networks," *The 35th IEEE International Conference on Computer Communications and Networks (IC3N)*, 2026.
66. D. Chen, Z. Zhang, Y. Liu, and X. Yang, "INSIGHT: Enhancing Autonomous Driving Safety through Vision-Language Models on Context-Aware Hazard Detection and Reasoning," *IEEE Intelligent Vehicles Symposium Workshops*, 2026.

65. H. Li, D. Xu, M. Chen, and Y. Liu, "Agentic Open RAN: A Deterministic and Auditable Framework for Intent-Driven Radio Control," *IEEE International Conference on Communications (ICC)*, 2026.
64. Z. Li, X. Luo, X. Ge, L. Zhou, X. Lin, and Y. Liu, "MMSense: Adapting Vision-based Foundation Model for Multi-task Multi-modal Wireless Sensing," *IEEE International Conference on Communications (ICC)*, 2026.
63. B. Han, X. Yang, G. Li, Z. Yang, Y. Liu, and J. Li, "Ownership-Protected Semantic Communication via Signal Processing-Driven Robust Watermark," *IEEE International Conference on Communications (ICC)*, 2026.
62. Z. Zhang, M. Fang, M. Chen, and Y. Liu, "On Transferring, Merging, and Splitting Task-Oriented Network Digital Twins," *IEEE 22nd International Symposium on Mobility Management and Wireless Access (MobiWac)*, 2025.
61. X. Luo, S. Madan Nath Jha, A. Sinha, Z. Li, and Y. Liu, "ALPHA: LLM-Enabled Active Learning for Human-Free Network Anomaly Detection," *IEEE 44th International Performance Computing and Communications Conference (IPCCC)*, 2025.
60. Y. Fu, Z. Zhang, R. Ranganath, Z. Li, Y. Liu, N. Sui, H. Li, and C. Xu, "TouchWave: Exploring mmWave-based Non-contact Fingertip-force Sensing in Activities of Daily Living," *IEEE-EMBS International Conference on Body Sensor Networks (BSN)*, 2025. **(Oral presentation: 15.8%)**
59. S. Yang, D. Wei, H. Yu, Z. Yang, Y. Liu, and M. Chen, "Contrastive Language-Image Pre-Training Model based Semantic Communication Performance Optimization," *IEEE Global Communications Conference (GLOBECOM)*, 2025.
58. Z. Yang, Y. Zhu, M. Chen, and Y. Liu, "Bridging Data and Knowledge: A Neurosymbolic Framework for Reliable Network Analysis," *IEEE Global Communications Conference (GLOBECOM)*, 2025.
57. X. Luo, Z. Li, Z. Peng, R. Yu, and Y. Liu, "Rank-Based Modeling for Universal Packets Compression in Multi-Modal Communications," *IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks (WoWMoM)*, 2025.
56. D. Wei, Q. Zhang, Y. Liu, and M. Chen, "Joint Optimization of Model Splitting and Device Task Assignment for Private Multi-Hop Split Learning," *IEEE Annual Conference on Information Science and Systems (CISS)*, 2025.
55. W. Wang, Q. Ma, Z. Zhang, Y. Liu, Z. Liu, and M. Fang, "Poisoning Attacks and Defenses to Federated Unlearning," *Companion Proceedings of The ACM Web Conference (WWW)*, 2025.
54. U. Sharma, H. Wei, J. Xu, M. Chen, and Y. Liu, "Adaptive Traffic Steering in Open RAN: Integrating Rule-Based Policies with Reinforcement Learning," *Deep Learning for Wireless Communications, Sensing, and Security Workshop on IEEE International Conference on Computer Communications (INFOCOM)*, 2025.
53. Z. Li, X. Luo, M. Chen, C. Xu, and Y. Liu, "BFMLoc: Transformer-Based Indoor Positioning Leveraging Beamforming Feedback Matrices," *IEEE International Conference on Communications (ICC)*, 2025.

52. X. Xu, H. Xu, H. Yu, Y. Liu, and M. Chen, "Fluid Antenna System (FAS)-assisted 3D UAV Positioning Performance Optimization," *IEEE International Conference on Communications (ICC)*, 2025.
51. D. Wei, H. Yu, S. Mao, Y. Liu, and M. Chen, "Joint Optimization of Communication and Device Clustering for Secure Clustered Federated Learning," *IEEE International Conference on Communications (ICC)*, 2025.
50. Z. Li, P. Wang, X. Liang, X. Luo, Y. Liu, X. Wang, H. Gu, and R. Yu, "AdaOrb: Adapting In-Orbit Analytics Models for Location-aware Earth Observation Tasks," *IEEE International Conference on Pervasive Computing and Communications (PerCom)*, 2025. (AR: 15.7%)
49. C. Chen, C. Zhang, G. Li, and Y. Liu, "Non-Orthogonal Multiple Access Based Multi-Objective Optimization in Emergency Task Offloading," *IEEE Wireless Communications and Networking Conference (WCNC)*, 2025.
48. D. Wu, Z. Peng, M. Chen, and Y. Liu, "Transforming Network Intrusion Detection Using Large Language Models," *IEEE Consumer Communications & Networking Conference (CCNC)*, 2025.
47. J. Liu, Z. Peng, D. Xu, and Y. Liu, "Revolutionizing Wireless Modeling and Simulation with Network-Oriented LLMs," *IEEE International Performance Computing and Communications Conference (IPCCC)*, 2024. (**Best Paper Award Runner-up**)
46. H. Fu, G. Li, J. Wu, J. Li, K. Zhou, and Y. Liu, "Spikewhisper: Temporal Spike Backdoor Attacks on Federated Neuromorphic Learning over Low-power Devices," *Proc. of 31st International Conference on Neural Information Processing (ICNIP)*, 2024.
45. L. Lin, M. Chen, Z. Yang, Y. Wu, and Y. Liu, "A Joint Gradient and Loss Based Clustered Federated Learning Design," *Proc. of IEEE Global Communications Conference (GLOBECOM)*, 2024.
44. H. Yu, Y. Liu, and M. Chen, "Joint Communication and Synchronization Performance Optimization in Digital Twin Enabled Networks," *Proc. of IEEE Global Communications Conference (GLOBECOM)*, 2024.
43. Y. Zhu, M. Chen, S. Wang, Y. Liu, G. Li, C. Yin, and T. Quek, "Mixture Gaussian Distribution-Based Collaborative Reinforcement Learning for 3D UAV Localization Optimization Against Jamming Attacks," *Proc. of IEEE Global Communications Conference (GLOBECOM)*, 2024.
42. R. Xu, G. Li, C. Li, Z. Yang, Y. Liu, and M. Chen, "OSNeRF: On-demand Semantic Neural Radiance Fields for Fast and Robust 3D Object Reconstruction," *ACM Multimedia Conference (MM)*, 2024.
41. X. Zhang, J. Zhang, K. Chow, J. Chen, Y. Mao, M. Rahouti, X. Li, Y. Liu, and W. Wei, "Visualizing the Shadows: Unveiling Data Poisoning Behaviors in Federated Learning," *IEEE International Conference on Distributed Computing Systems (ICDCS)*, Demo paper, 2024.
40. Z. Zhang, M. Chen, Z. Yang, and Y. Liu, "Mapping Wireless Networks into Digital Reality through Joint Vertical and Horizontal Learning," *IFIP/IEEE Networking (Networking)*, 2024. (AR: 24.6%)
39. X. Luo, Z. Li, Z. Peng, D. Xu, and Y. Liu, "RM-Gen: Conditional Diffusion Model-Based Radio Map Generation for Wireless Networks," *IFIP/IEEE Networking*, 2024. (AR: 24.6%)

38. Z. Zhang, M. Fang, J. Huang, and Y. Liu, "Poisoning Attacks on Federated Learning-based Wireless Traffic Prediction," *IFIP/IEEE Networking*, 2024. **(Best Paper Award Runner-up, 2/195)**
37. B. Chatterjee, S. Chaudhari, Z. Li, Y. Liu, and R. Dutta, "Wireless Signal Source Localization by Unmanned Aerial Vehicle using AERPAW Digital Twin and Testbed," *IFIP/IEEE Networking, Workshop on Thought Experiments, Data and Reproducibility for Networking and FutureG Research (SLICES)*, 2024.
36. X. Yi, G. Li, W. Huang, J. Li, X. Lin, and Y. Liu, "LateBA: Latent Backdoor Attacks on Deep Bug Search via Infrequent Execution Codes," *Proceedings of the 15th Asia-Pacific Symposium on Internetware*, 2024.
35. M. Fang, Z. Zhang, F. Hairi, P. Khanduri, J. Liu, S. Lu, Y. Liu, and N. Gong, "Toward Byzantine-Robust Decentralized Federated Learning," *ACM Conference on Computer and Communications Security (CCS)*, 2024.
34. X. Cao, S. Zhao, Y. Pan, and Y. Liu, "Secure Parameter Sharing in Federated Learning via Over-the-Air Computing," *Poster, IEEE Secure Development Conference (SecDev)*, 2024.
33. Z. Yang, Y. Wang, M. Chen, J. Liu, and Y. Liu, "GemNet: Analysis and Prediction of Building Materials for Optimizing Indoor Wireless Networks," *IEEE International Conference on Communications (ICC)*, 2024.
32. Z. Li, X. Luo, M. Chen, C. Xu, and Y. Liu, "Context-Aware Beam Management via Online Probing in Combinatorial Multi-Armed Bandits," *IEEE International Conference on Communications (ICC)*, 2024.
31. R. Xu, G. Li, Z. Yang, M. Chen, Y. Liu, and J. Li, "Covert and Reliable Semantic Communication Against Cross-layer Privacy Inference over Wireless Edge Networks," *IEEE Wireless Communications and Networking Conference (WCNC)*, 2024.
30. Z. Yang, M. Chen, and Y. Liu, "Optimizing Synchronization Delay for Digital Twin over Wireless Networks," *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 2023.
29. B. Chen, G. Li, M. Chen, Y. Liu, X. Yi, and J. Li, "PBE-Plan: Periodic Backdoor Erasing Plan for Trustworthy Federated Learning," *The 25th IEEE International Conference on High Performance Computing and Communications (HPCC)*, 2023.
28. Q. Mao, X. Lin, G. Li, L. Chen, Y. Liu, and J. Li, "Ensuring Minority Group Rights in Social IoT with Fairness-aware Federated Graph Node Classification," *IEEE International Symposium on Parallel and Distributed Processing with Applications (ISPA)*, 2023.
27. B. Xu, X. Liu, H. Shen, Z. Han, Y. Li, M. Yue, Z. Peng, Y. Liu, Z. Yao, and D. Xu, "Gentopia.AI: A Collaborative Platform for Tool-Augmented LLMs," *System Demonstration Program, The Conference on Empirical Methods in Natural Language Processing (EMNLP)*, 2023.
26. J. Chen, S. Zhao, Y. Liu, and Z. Luo, "MMP: A Dynamic Routing Protocol Design to Proactively Defend against Wireless Network Inference Attacks," *ACM Conference on Computer and Communications Security (CCS) Workshop on Moving Target Defense*, 2023.

25. R. Xu, G. Li, and Y. Liu, "Enabling Covert Communication With Full-Duplex Receiver Against Location-Uncertain Eavesdropper," *Poster, IEEE Secure Development Conference (SecDev)*, 2023.
24. Z. Li, M. Chen, G. Li, and Y. Liu, "Spatial-Temporal Attention-based mmWave Link Quality Prediction under Dynamic Blockages," *Proc. of IEEE Global Communications Conference (GLOBECOM)*, 2023.
23. Y. Zhu, S. Wang, Y. Liu, and C. Yin, "Trajectory Design for 3D UAV Localization in UAV Based Network," *Proc. of IEEE Global Communications Conference (GLOBECOM)*, 2023.
22. H. Yu, M. Chen, Z. Yang, and Y. Liu, "Complex Neural Networks for Indoor Positioning with Complex-Valued Channel State Information," *Proc. of IEEE Global Communications Conference (GLOBECOM)*, 2023.
21. G. Li, Y. Zhao, W. Wei, and Y. Liu, "Few-Shot Multi-Domain Knowledge Rearming for Context-Aware Defence Against Advanced Persistent Threats," *Proc. of IEEE International Conference on Smart Applications, Communications and Networking (SCN)*, 2023.
20. Y. Liu, M. Chen, D. Xu, Z. Yang, and S. Zhao, "E-App: Adaptive mmWave Access Point Planning with Environmental Awareness in Wireless LANs," *Proc. of Int'l Conference on Computer Communications and Networks (IC3N)*, 2023. **(Best Paper Award)**
19. A. Ding, G. Li, X. Yi, and Y. Liu, "TVSign: Interpretable Vulnerability Signature via Code Embedding and Static Analysis," *Proc. of IEEE/IFIP International Conference on Dependable Systems and Networks (DSN) Workshop on Data-Centric Dependability and Security*, 2023.
18. X. Li, M. Chen, Z. Zhang, D. Liu, Y. Liu, and S. Mao, "Joint Optimization of Sensing and Communications in Vehicular Networks: A Graph Neural Network-based Approach," *Proc. of IEEE International Conference on Communications (ICC)*, 2023.
17. Y. Liu and D. Blough, "Environment-Aware Link Quality Prediction for Millimeter-Wave Wireless LANs," *Proc. of ACM International Symposium on Mobility Management and Wireless Access (MobiWac)*, 2022. **(Best Paper Award)**
16. A. Deng, Y. Liu, and D. Blough, "Exploring Performance Limits on Proactive Fair Scheduling for mmWave WLANs," *Proc. of IEEE International Symposium on Local and Metropolitan Area Networks (LANMAN)*, 2022. **(Best Paper Award)**
15. Y. Liu, S. Crisp, and D. Blough, "Performance Study of Statistical and Deterministic Channel Models for mmWave Wi-Fi Networks in ns-3," *Proc. of ACM Workshop on ns-3 (WNS3)*, 2021.
14. A. Deng, Y. Liu, and D. Blough, "Maximizing Coverage for mmWave WLANs with Dedicated Reflectors," *Proc. of IEEE International Conference on Communications (ICC)*, 2021.
13. Y. Liu and D. Blough, "Blockage Robustness in Access Point Association for mmWave Wireless LANs with Mobility," *Proc. of IEEE International Conference on Local Computer Networks (LCN)*, 2020. **(Best Paper Award Second Place)**
12. Y. Liu, Y. Jian, R. Sivakumar, and D. Blough, "On the Potential Benefits of Mobile Access Points in mmWave Wireless LANs," *Proc. of IEEE International Symposium on Local and Metropolitan Area Networks (LANMAN)*, 2020.

11. Y. Jian, M. Agarwal, S. Venkateswaran, Y. Liu, R. Sivakumar, and D. Blough, "WiMove: Toward Infrastructure Mobility in mmWave WiFi," *Proc. of ACM International Symposium on Mobility Management and Wireless Access (MobiWac)*, 2020.
10. Y. Jian, Y. Liu, S. Venkateswaran, D. Blough, and R. Sivakumar, "A Quantitative Exploration of Access Point Mobility for mmWave WiFi Networks," *Proc. of IEEE International Conference on Communications (ICC)*, 2020.
9. Y. Liu, Q. Hu, and D. Blough, "Joint Link-level and Network-level Reconfiguration for mmWave Backhaul Survivability in Urban Environments," *Proc. of Modeling, Analysis and Simulation of Wireless and Mobile Systems (MSWiM), ACM*, 2019. **(Best Paper Award Finalist)**
8. Y. Liu, Y. Jian, R. Sivakumar, and D. Blough, "Optimal Access Point Placement in Multi-AP mmWave WLANs," *Proc. of ACM Modeling, Analysis and Simulation of Wireless and Mobile Systems (MSWiM)*, 2019.
7. Y. Jian, M. Agarwal, Y. Liu, D. Blough, and R. Sivakumar, "Poster: Hawkeye - Predictive Positioning of a Ceiling-Mounted Mobile AP in mmWave WLANs for Maximizing Line-of-sight," *ACM International Conference on Mobile Computing and Networking (MobiCom)*, 2019.
6. Y. Liu and D. Blough, "Analysis of Blockage Effects on Roadside Relay-assisted mmWave Backhaul Networks," *Proc. of IEEE International Conference on Communications (ICC)*, 2019.
5. Q. Hu, Y. Liu, Y. Yan, and D. Blough, "End-to-end Simulation of mmWave Out-of-band Backhaul Networks in ns-3," *Proc. of the Workshop on Next-Generation Wireless with ns-3 (WNGW)*, 2019.
4. Y. Liu, Q. Hu, and D. Blough, "Blockage Avoidance in Relay Paths for Roadside mmWave Backhaul Networks," *Proc. of IEEE Int'l Symposium on Personal, Indoor, and Mobile Radio Communications (PIMRC)*, 2018.
3. Y. Liu, A. Zhang, J. Li, and J. Wu, "An Anonymous Distributed Key Management System based on CL-PKC for Space Information Network," *Proc. of IEEE International Conference on Communications (ICC)*, 2016.
2. W. Zhao, A. Zhang, J. Li, X. Wu, and Y. Liu, "Analysis and Design of an Authentication Protocol for Space Information Network," *Proc. of IEEE Military Communications Conference (MILCOM)*, 2016.
1. X. Wu, A. Zhang, J. Li, W. Zhao, and Y. Liu, "A Lightweight Authentication and Key Agreement Scheme for Mobile Satellite Communication Systems," *Proc. of International Conference on Information Security and Cryptology (ISC), Springer*, 2016.

Technical Reports and Preprints

6. X. Liu, Z. Peng, X. Yi, X. Xie, L. Xiang, Y. Liu, and D. Xu, "ToolNet: Connecting Large Language Models with Massive Tools via Tool Graph," *arXiv preprint arXiv:2403.00839*.
5. B. Xu, Z. Peng, B. Lei, S. Mukherjee, Y. Liu, and D. Xu, "ReWOO: Decoupling Reasoning from Observations for Efficient Augmented Language Models," *arXiv preprint arXiv:2305.18323*.
4. Q. Hu, Y. Liu, Y. Yan, M. Liu, J. Zheng, and D. Blough, "An Efficient Distributed Scheduling Algorithm for Relay-Assisted mmWave Backhaul Networks," *arXiv preprint arXiv:2202.07872*.

3. Q. Hu, Y. Liu, Y. Yan, M. Liu, J. Zheng, and D. Blough, “Towards the Maximum Traffic Demand and Throughput Supported by Relay-Assisted mmWave Backhaul Networks,” *arXiv preprint arXiv:2202.05908*.
2. Y. Liu and D. Blough, “Analysis of Secondary Effects in Roadside mmWave Backhaul Networks,” *arXiv preprint arXiv:2010.10479 [eess.SY]*.
1. Y. Liu, Q. Hu, and D. Blough, “Blockage Type Detection Process in Triangular-wave Topology for mmWave Wireless Backhaul,” *arXiv preprint arXiv:2010.08430 [cs.NI]*.

Open-Source Software and Tools

- **ExaDigiT/RAPS (2025 R&D 100 Award)** – An open source digital twin framework for liquid-cooled supercomputers and HPC. Contribute to the ExaDigiT’s RAPS module with DOE Oak Ridge National Laboratory. (<https://code.ornl.gov/exadigit>)
*The R&D 100 Awards recognize the 100 most technologically significant products and innovations introduced to the research market over the past year.
- **3D-DT** – A UAV digital twin for multi-objective optimization and communication task planning. (<https://github.com/EverettTucker471/RL-AERPAW-DT>)
- **AERPAW-Sionna** – NVIDIA Sionna Interface for AERPAW Digital Twin that provides fastAPI endpoints and a sionna wrapper and controller system. (<https://github.com/AERPAW/AERPAW-DT-SIONNA-EXTENSION>)
- **ByteTrans** – A universal packet compressor in multi-modal wireless communications using rank-based predictive models. (<https://github.com/Xuanhao-Luo/ByteTrans>)
- **LogAnalyzer** – A simple LLM-enabled tool to analyze and classify large-scale network logs. (<https://github.com/tjzvbokbnft/llm-for-network-log-analysis>)
- **NDTOmni** – A roadmap to develop network digital twins Leveraging NVIDIA Omniverse for infrastructure planning and radio unit configuration. (<https://github.com/rmv102/aodtoptimization>)
- **LLM-IDS** – A platform for enhancing network intrusion detection by integrating large language models to improve attack detection, analysis, and interpretability. (<https://github.com/Dongming1010/IDS-LLM>)
- **AutoSim** – An interactive, automated, and script-free simulation tool using Network-oriented LLMs. (<https://github.com/ak-maker/sionna-LLMs/tree/main>)
- **FLVis** – An interactive platform to dynamically visualize data and poisoning behaviour in federated learning systems. (<https://github.com/CathyXueqingZhang/DataPoisoningVis>)
- **NetEdu** – A network visualizer with hands-on scripts and examples for education. (<https://github.com/rohitkotanc/rkotans3/tree/main/ns-3.38>)
- **Gentopia** – A collaborative platform for tool-augmented LLMs. (<https://github.com/Gentopia-AI/Gentopia>)
- **WirelessDT** – A digital twin tool in next-generation wireless network (mmWave, 5G/6G) based on ns-3 and ray tracer. (<https://github.com/yuchen-sh/Network-Digital-Twin>)

- **LQ-Data** – Measurements and synthetic 60GHz link quality datasets, contributing to NIST NextG Channel Model Alliance. (https://nextg.nist.gov/participants/sign_in)
- **RT-Sig** – A ray-tracing software for mapping signal propagation profiles. (<https://github.com/yuchen-sh/Ray-tracer-for-network-twinning>)
- **ReWOO** – A tool-augmented language model paradigm, leveraging foreseeable reasoning ability to improve system parameter and prompt efficiency [arXiv:2305.18323]. (<https://github.com/billxbf/ReWOO>)
- **ns3-WiGiG** – ns-3 WiGiG implementation [ns-3 App Store]. (<https://apps.nsnam.org/app/wigig>)
- **mmLAN-Sim** – An enhanced mmWave local-area network (LAN) simulator. (<https://github.com/yuchen-sh/mmWave-WLAN-802.11ad/tree/master>)
- **RelaySim** – A relay-assisted mmWave backhaul network simulator. (<https://github.com/hqfrank/ns3-mmwave-relay/tree/master>)

Active Research Grants

- National Science Foundation Grant #2440756: *CAREER: CatFly: Towards Resilience-Native Wireless Networks through Learning, Twinning, and Reconfiguring Co-Design* (NSF CISE/CNS \$680,760; PI)
- National Science Foundation Grant #2312138: *Digital Network Twins: Mapping Next Generation Wireless into Digital Reality* (NSF CNS: CORE: NeTS, \$600,000; Lead PI: Share - \$300,000)
- National Science Foundation Grant #2350075: *Towards Secure, Resilient, Privacy-enhancing Digital World Experiences* (NSF SaTC: CORE, \$600,000; Co-PI: Share - \$200,000)
- National Science Foundation Grant #2506757: Pilot Demonstration Project: *Advancing Multi-Dimensional Data Generation and Continuous Modeling in AI-based Cyber-Physical Systems* (NSF CISE/OAC-NAIRR, \$59,940; PI)
- National Science Foundation CISE REU: *Developing Data-Driven Pipelines for Joint Planning and Optimization in Space–Air–Ground Wireless Networks* (NSF CISE/CRA, \$10,000; PI)
- NVIDIA Academic Grant: *Orchestrating Multi-Level Network Modeling and Scientific Simulation with LLMs* (PI: \$20,000 Equivalent)
- NC State Goodnight Early Career Innovators Award Grant: (Awardee: \$66,000)
- NCSU Educational and Technology Fund: *Integrated RF Sensing and Multimodal Learning Analytics* (\$6K; PI: Share – 3K)
- N.C. PSI Grant: *Connecting2Grow: Optimizing the Plant-Animal Interface through Real-Time Sensing and AI Decision Support* (\$20K; Co-PI: Share – 10K)

Teaching Experience

- CSC 401 Data and Computer Communication Networks, NCSU 2026
- CSC/ECE-791 Advanced NextG Network Design, NCSU 2022–2025
- CSC/ECE-570 Computer Networks, NCSU 2023–2024
- Engineering Place Summer Camp: Seeing Through a Digital World, NCSU 2024–2026
- ECE-3710 Circuit and Electronics, Georgia Institute of Technology 2018–2019

Mentoring Experience

Ph.D. Students

- Zhizhen Li, North Carolina State University, USA. 2022–2026
- Xuanhao Luo, North Carolina State University (Outstanding Research Award), USA. 2023–Now
- Zifan Zhang, North Carolina State University, USA. 2023–Now
- Zhijin Yang, North Carolina State University, USA. 2024–Now
- Jiayuan Huang, North Carolina State University, USA. 2024–Now
- Dongming Wu, North Carolina State University, USA. 2025–Now
- Siyuan Gao, North Carolina State University, USA. 2026–Now

M.S. Students

- Soham Sawant, North Carolina State University, USA. 2025–Now
- Hengxu Li, Tufts University, USA. 2025–Now
- Janam Ajay Patel, North Carolina State University, USA. 2026–Now

Undergraduate Students

- Everett Tucker, North Carolina State University (REU Fellowship), USA. 2025–Now
- Sandeep Sreenivasan, North Carolina State University, USA. 2026–Now
- Jason Nguyen, North Carolina State University, USA. 2026–Now
- Maulik Verma, North Carolina State University, USA. 2025–Now
- Hemanth Sudhakaran, North Carolina State University, USA. 2026–Now

Research Interns

- Annie Zhou, Georgia Institute of Technology, USA. 2025–Now

Alumni

- Zhiyuan Peng, North Carolina State University, USA. Postdoc, Now at Meta, CA, USA
- Shivesh Jha, North Carolina State University, USA. M.S. Now at Amazon, WA, USA
- Apurv Choudhari, North Carolina State University, USA. M.S. Now at Microsoft, CA, USA
- Utkarsh Sharma, North Carolina State University, USA. M.S. Now at Intuit, NY, USA
- Asrita Kuchibhotla, North Carolina State University, USA. M.S. Now at Sweetsheet, NY, USA
- Akruti Sinha, North Carolina State University, USA. M.S. Now at Startup, CA, USA
- Kai Gao, North Carolina State University, USA. M.S. Now at Lenwell Digital
- Zikang Wang, North Carolina State University, USA. M.S.
- Aboli Makarand Kulkarni, North Carolina State University, USA. M.S.
- Jiewen Liu, North Carolina State University, USA. M.S. Now Ph.D. at NCSU, USA
- Yumo Shen, North Carolina State University, USA. M.S.
- Ruichen Gao, North Carolina State University, USA. B.S.
- Jordan Miller, North Carolina State University, USA. B.S.
- Nitesh Kanamarlapudi, North Carolina State University, USA. B.S.
- Krushu Bandam, North Carolina State University, USA. B.S.

Aaron Nichols, North Carolina State University, USA. B.S.
Adnane El Hachami, North Carolina State University, USA. B.S.
Vadim Bondarenko, North Carolina State University, USA. B.S.
Adharsh Rajagopal, North Carolina State University, USA. B.S.
Adrian Chan, North Carolina State University, USA. B.S.
Yujie Liang, Shanghai University of Finance and Economics, China. B.S.
Yuhao Wen, Tsinghua University, China. B.S.
Jie Ji, Tsinghua University, China. B.S.
Jinchen Zhang, Tsinghua University, China. B.S.
Shaokang Ren, Tsinghua University, China. B.S.
Nuo Yi, Nanjing University, China. B.S.
Haotian Zhu, Huazhong University of Science and Technology, China. B.S.
Sreesanth Adelli, USA. Pre-college
Anirudh Janapati, USA. Pre-college

Invited Talks and Demonstrations

- “Advanced Wireless and Edge AI Workshop in the Research Triangle,” Duke University, 2026.
- “NSF CAREER Proposal Workshop – Panel Discussion Session,” North Carolina State University, 2026.
- “Digital Network Twins: Mapping Next Generation Wireless into Digital Reality,” NSF NAIRR Webinar Series, 2026.
- “Network Digital Twins for High-Performance Computing,” Lightning talk, The International Conference for High Performance Computing, Networking, Storage, and Analysis (SC), 2025.
- “Digital Twins and Agentic Networking in Open Environments,” Invited talk, DOE Oak Ridge National Laboratory (AIRES 6 ORNL Events), 2025.
- “Advancing Multi-Dimensional Data Generation and Continuous Modeling in AI-based Cyber-Physical Systems,” NSF NAIRR Webinar Series, 2025.
- “Using AERPAW for 6G, O-RAN, and Digital Twin Research,” Invited talk and panelist, The AERPAW Community Workshop, 2025.
- “Network Digital Twins and Cyber-Physical Systems,” CS Research Day, NC State University, 2025.
- “Mapping Data Networks into Digital Reality: Fundamentals, Challenges, and Security,” Presentation, Advanced Technologies Section (ATS) Seminar Series, Oak Ridge National Laboratory, 2025.
- “Large Language Models for Computer Networking and Simulations,” Presentation, NC State Data Science and AI Academy, 2024.
- “Mapping Data Networks into Digital Reality,” Presentation, Digital Twin Seminar, Oak Ridge National Laboratory, 2024.
- “Context-Aware Beam Management via Online Probing,” Presentation, IEEE International Conference on Communications (ICC), 2024.

- “Spatial-Temporal Link Quality Prediction,” Presentation, IEEE Global Communications Conference (GLOBECOM), 2023.
- “Adaptive mmWave Access Point Planning with Environmental Awareness in Wireless LANs,” Presentation, International Conference on Computer Communications and Networks (IC3N), 2023.
- “Data-driven mmWave Link Quality Prediction Mechanism,” Invited Speaker, NIST NextG Channel Model Alliance, 2022.
- “Towards Efficient Distributed Simulation of Next-Generation Wireless Use Cases in ns-3,” Lightning talk, ACM WNS3, 2022.
- “Location, Location, Location: Intelligent mmWave Networking Design for Next-Generation Wireless Systems,” Invited talk, Department of Informatics and Networked Systems, University of Pittsburgh, 2022.
- “Intelligent mmWave Networking Design for Next-Generation Wireless Systems,” Invited talk, Department of Computer Science and Engineering, the University of Notre Dame, 2022.

Professional Service

Journal Editorship

- Editorial Board (Lead Guest Editor), *IEEE Journal on Selected Areas in Communications (JSAC)*, 2025–2026
- Editorial Board (Associate Editor), *IEEE Transactions on Cognitive Communications and Networking (TCCN)*, 2026–present
- Editorial Board (Area Editor), *Elsevier Computer Networks*, 2024–present
- Editorial Board (Associate Editor), *IEEE Transactions on Machine Learning in Communications and Networking (TMLCN)*, 2024–present
- Editorial Board (Associate Editor), *IEEE Transactions on Green Communications and Networking (TGCN)*, 2023–present
- Editorial Board (Associate Editor), *Elsevier Computer Communications*, 2024–present

Conference and Workshop Organization

- Publicity Chair, IEEE INFOCOM, 2026
- Workshop Co-Chair, ACM MobiCom Workshop on Digital Twins over NextG Wireless Networks, 2026
- Special Track Co-Chair, IEEE SPAWC on Integrated Learning and Communication for Wireless Agent Networks, 2026
- TPC Co-Chair, IEEE VTC Workshop on the 3rd Synergizing Digital Twins and Pervasive Intelligence for NextG IoT/IoV, 2026

- Workshop Chair, IEEE GLOBECOM Workshop on the Interplay of Digital Twins and Artificial Intelligence for Next-Generation IoT, 2025
- Special Track Chair, IEEE SPAWC on Generative AI for Next Generation Wireless Communications, 2025
- Workshop Chair, IEEE INFOCOM Workshop on Digital Twins over Wireless Networks, 2025
- Workshop Chair, IEEE ICC Workshop on Digital Twins over Wireless Networks, 2025
- Workshop Chair, IEEE GLOBECOM Workshop on Digital Twins over Wireless Networks, 2024
- Workshop Chair, IEEE COMPSAC Workshop on Digital Twins for the Metaverse, 2024–2025
- TPC Chair, IEEE ICC Workshop on Edge Learning over 5G Mobile Networks and Beyond, 2024
- Session Chair, IEEE ICC on SPC: Massive MIMO and mmWave Communications, 2024
- Workshop Co-Chair, ACM WNS3, 2022–2023

Conference Technical Program Committee (TPC)

- ACM CCS (2026); IEEE INFOCOM (2025–2026); ACM MobiHoc (2024–2026); IEEE GLOBECOM (2026); IEEE CLUSTER (2026); IEEE CCNC (2025–2026); IEEE Intelligent Vehicles Symposium (IV) (2026); IFIP Networking (2023–2026); ACM MSWiM (2023, 2025–2026); IEEE HPSR (2023–2025); IEEE LCN (2023–2026); IEEE ICNC (2025); IEEE NFV-SDN (2025); IEEE ICNS3 (2025–2026); IEEE IPCCC (2023, 2025); ACM MobiWac (2023, 2025); IEEE ICPADS (2023); IEEE MetaCom (2023–2025); IEEE ICCCN (2023, 2026); IEEE ICC (2019, 2020, 2022, 2023, 2025, 2026); IEEE VTC (Spring) (2019, 2023).

Funding Review Panelist

- NSF Panelist: CAREER, CNS, SaTC Programs
- DOE Office of Science Graduate Student Research (SCGSR) Program
- New Jersey Sea Grant Consortium Biennial Research Program

Professional Membership

- Member of Institute of Electrical and Electronics Engineers (IEEE) (2017 – Present)
- Member of National Spectrum Consortium (2025 – Present)
- Member of Technical Committee on Cognitive Networks (2022 – Present)
- Member of NIST NextG Channel Model Alliance (2022 – Present)

References

Available upon request.