## Cong Shen

**Contact**

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**Research Interests**

My research interests span a number of interdisciplinary topics in machine learning, signal processing, and networking, with an emphasis on theoretical models, algorithms, and practical engineering applications. Some of my current research topics are:

- In-context learning, Transformers, and LLMs
- Reinforcement learning
- Distributed optimization
- Federated learning and distributed/decentralized learning
- Machine learning on the edge
- Statistical signal processing
- ML and AI for engineering and science applications

**Education**

University of California Los Angeles (UCLA), Los Angeles, U.S.A. — Dec. 2009
Ph.D., Electrical and Computer Engineering

Tsinghua University, Beijing, China — June 2004
M. E., Electronic Engineering

Tsinghua University, Beijing, China — June 2002
B. E., Electronic Engineering

**Work Experience**

**Academia:**

University of Virginia (UVA), Charlottesville, VA, U.S.A. — Jul. 2014 – now
Associate Professor, Electrical and Computer Engineering

University of Virginia (UVA), Charlottesville, VA, U.S.A. — Aug. 2019 – June 2024
Assistant Professor, Electrical and Computer Engineering

University of Science and Technology of China, Hefei, China — July. 2015 – Apr. 2019
Professor, School of Information Science and Technology

**Industry:**

Xsense.ai, San Diego, CA, U.S.A. — Jan. 2019 – July 2019
Principle Engineer, Autonomous Driving

Silvus Technologies Inc., San Diego, CA, U.S.A. — Mar. 2017 – July 2017
Consultant

SpiderCloud Wireless Inc., San Jose, CA, U.S.A. — Nov. 2014 – July 2015
Senior Staff Engineer, Corporate Research

Qualcomm Technologies, San Diego, CA, U.S.A. — Oct. 2009 – Nov. 2014
Staff Engineer, Corporate Research and Development
Senior Engineer, Corporate Research and Development

**Awards and Honors**

- *CAREER Award*, National Science Foundation (NSF), 2022
- *Faculty Research Award*, UVA ECE Department, 2022

- *Best Paper Award*, IEEE International Conference on Communications (ICC), 2021
- *Air Force Research Lab (AFRL) Summer Faculty Fellowship*, 2020, 2021
- *Exemplary Editor*, IEEE Wireless Communications Letters, 2019
- *Excellent Paper Award*, The Ninth International Conference on Ubiquitous and Future Networks (ICUFN 2017)
- *Qualstar*, Qualcomm Research, 2010, 2011, 2013 and 2014

**AI/ML Preprints**

Note: Underlined co-authors are my supervised students.

[P1] Z. Chen, X. Fu, **C. Shen**, J. Li, "FedHERO: A Federated Learning Approach for Node Classification Tasks on Heterophilic Graphs," preprint, under review.

[P2] R. Liu, R. Zhou, **C. Shen**, J. Yang, "On the Learn-to-Optimize Capabilities of Transformers in In-Context Sparse Recovery," preprint, under review.

[P3] D. Wu, C. Shi, R. Zhou, **C. Shen**, "Optimal Cost-Aware Pure Pair-wise Exploration," preprint, under review.

[P4] X. Wei, T. Wang, J. Yang, **C. Shen**, "FedPrivSyn: Federated Differentially Private Data Synthesis," preprint, under review.

[P5] F. Gao, R. Zhou, T. Wang, **C. Shen**, J. Yang, "Data-adaptive Differentially Private Prompt Synthesis for In-Context Learning," preprint, under review.

[P6] D. Li, R. Huang, C. Shi, **C. Shen**, J. Yang, "Exploiting Offline Datasets for Efficient Online Learning in Stochastic Linear Bandits," preprint, under review.

[P7] W. Shen, R. Zhou, J. Yang, **C. Shen**, "On the Training Convergence of Transformers for In-Context Classification," preprint, under review.

[P8] S. Wang, Y. Dong, B. Zhang, Z. Chen, X. Fu, Y. He, **C. Shen**, C. Zhang, N. V. Chawla, J. Li, "Safety in Graph Machine Learning: Threats and Safeguards," preprint.

**Top AI/ML Conference Papers**

[C1] C. Shi, K. Yang, J. Yang, and **C. Shen**, "Transformers as Game Players: Provable In-context Game-playing Capabilities of Pre-trained Models," *Thirty-eighth Annual Conference on Neural Information Processing Systems (NeurIPS)*, Dec. 2024.

[C2] C. Shi, K. Yang, Z. Chen, J. Li, J. Yang, and **C. Shen**, "Efficient Prompt Optimization Through the Lens of Best Arm Identification," *Thirty-eighth Annual Conference on Neural Information Processing Systems (NeurIPS)*, Dec. 2024.

[C3] S. Wang, Z. Chen, C. Shi, **C. Shen**, and J. Li, "Mixture of Demonstrations for In-Context Learning," *Thirty-eighth Annual Conference on Neural Information Processing Systems (NeurIPS)*, Dec. 2024.

[C4] C. Shi, R. Zhou, K. Yang, and **C. Shen**, "Harnessing the Power of Federated Learning in Federated Contextual Bandits," *Transactions on Machine Learning Research*, July 2024.

[C5] Z. Chen, S. Wang, **C. Shen**, and J. Li, "FastGAS: Fast Graph-based Annotation Selection for In-Context Learning," *ACL 2024 Findings*, Aug. 2024.

[C6] B. Zhang, Z. Chen, **C. Shen**, and J. Li, "Verification of Machine Unlearning is Fragile," *International Conference on Machine Learning (ICML)*, July 2024.

[C7] R. Liu, **C. Shen**, and J. Yang, "Federated Representation Learning in the Under-Parameterized Regime," *International Conference on Machine Learning (ICML)*, July 2024.

[C8] W. Shen, M. Huang, J. Zhang, and **C. Shen**, "Stochastic Smoothed Gradient Descent Ascent for Federated Minimax Optimization," *International Conference on Artificial Intelligence and Statistics (AISTATS)*, May 2024.

[C9] L. Fan, R. Zhou, C. Tian, and **C. Shen**, "Federated Linear Bandits with Finite Adversarial Actions," *Thirty-seventh Conference on Neural Information Processing Systems (NeurIPS)*, Dec. 2023.

[C10] C. Shi, W. Xiong, **C. Shen**, and J. Yang, "Provably Efficient Offline Reinforcement Learning with Perturbed Data Sources," *the 40th International Conference on Machine Learning (ICML)*, July 2023.

[C11] D. Li, R. Huang, **C. Shen**, and J. Yang, "Near-optimal Conservative Exploration in Reinforcement Learning under Episode-wise Constraints," *the 40th International Conference on Machine Learning (ICML)*, July 2023.

[C12] W. Xiong, H. Zhong, C. Shi, **C. Shen**, L. Wang, and T. Zhang, "Nearly Minimax Optimal Offline Reinforcement Learning with Linear Function Approximation: Single-Agent MDP and Markov Game," *the 11th International Conference on Learning Representations (ICLR)*, May 2023.

[C13] W. Xiong, H. Zhong, C. Shi, **C. Shen**, and T. Zhang, "A Self-Play Posterior Sampling Algorithm for Zero-Sum Markov Games,", *the 39th International Conference on Machine Learning (ICML)*, July 2022.

[C14] C. Shi, H. Xu, W. Xiong, and **C. Shen**, "(Almost) Free Incentivized Exploration from Decentralized Learning Agents," *Thirty-fifth Conference on Neural Information Processing Systems (NeurIPS)*, Dec. 2021.

[C15] C. Shi, W. Xiong, **C. Shen**, and J. Yang, "Heterogeneous Multi-player Multi-armed Bandits: Closing the Gap and Generalization," *Thirty-fifth Conference on Neural Information Processing Systems (NeurIPS)*, Dec. 2021.

[C16] R. Huang, W. Wu, J. Yang, and **C. Shen**, "Federated Linear Contextual Bandits," *Thirty-fifth Conference on Neural Information Processing Systems (NeurIPS)*, Dec. 2021.

[C17] H. Lee, **C. Shen**, W. Zame, J. Lee, and M. van der Schaar, "SDF-Bayes: Cautious Optimism in Safe Dose-Finding Clinical Trials with Drug Combinations and Heterogeneous Patient Groups," *the 24rd International Conference on Artificial Intelligence and Statistics (AISTATS)*, Apr. 2021.

[C18] C. Shi, **C. Shen**, and J. Yang, "Federated Multi-Armed Bandits with Personalization," *the 24th International Conference on Artificial Intelligence and Statistics (AISTATS)*, Apr. 2021. (Oral Presentation Acceptance Rate: 3%)

[C19] C. Shi and **C. Shen**, "Federated Multi-Armed Bandits," *the 35th AAAI Conference on Artificial Intelligence (AAAI)*, Feb. 2021.

[C20] H.-S. Lee, Y. Zhang, W. Zame, **C. Shen**, J.-W. Lee, and M. van der Schaar, "Robust Recursive Partitioning for Heterogeneous Treatment Effects with Uncertainty Quantification," *the Thirty-fourth Conference on Neural Information Processing Systems (NeurIPS)*, Dec. 2020.

[C21] **C. Shen**, Z. Wang, S. Villa, and M. van der Schaar, "Learning for Dose Allocation in Adaptive Clinical Trials with Safety Constraints," *International Conference on Machine Learning (ICML)*, July 2020.

[C22] H. Lee, **C. Shen**, J. Jordon, and M. van der Schaar, "Contextual Constrained Learning for Dose-Finding Clinical Trials," *The 23rd International Conference on Artificial Intelligence and Statistics (AISTATS)*, Palermo, Sicily, Italy, June 2020.

[C23] C. Shi, W. Xiong, **C. Shen**, and J. Yang,"Decentralized Multi-player Multi-armed Bandits with No Collision Information," *The 23rd International Conference on Artificial Intelligence and Statistics (AISTATS)*, Palermo, Sicily, Italy, June 2020.

[C24] W. Wu, J. Yang, and **C. Shen**, "Stochastic Linear Contextual Bandits with Diverse Contexts," *The 23rd International Conference on Artificial Intelligence and Statistics (AISTATS)*, Palermo, Sicily, Italy, June 2020.

[C25] R. Zhou, C. Gan, J. Yang, and **C. Shen**, "Cost-aware Cascading Bandits," *The 27th International Joint Conference on Artificial Intelligence (IJCAI)*, Stockholm, Sweden, Jul. 2018.

[C26] Z. Wang, R. Zhou, and **C. Shen**, "Regional Multi-Armed Bandits," *The 21st International Conference on Artificial Intelligence and Statistics (AISTATS)*, Lanzarote, Spain, Apr. 2018.

**Other AI/ML Conference Papers**

[C24] Z. Chen, J. Li, and **C. Shen**, "Personalized Federated Learning with Attention-based Client Selection," *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, Apr. 2024

[C25] R. Liu, J. Yang, and **C. Shen**, "Exploiting Feature Heterogeneity for Improved Generalization in Federated Multi-Task Learning", *IEEE International Symposium on Information Theory (ISIT)*, June 2023.

[C26] C. Shi, **C. Shen**, and N. D. Sidiropoulos, "On High-Dimensional and Low-Rank Tensor Bandits," *IEEE International Symposium on Information Theory (ISIT)*, June 2023.

[C27] C. Shi, W. Xiong, **C. Shen**, and J. Yang, "Reward Teaching for Federated Multi-Armed Bandits," *IEEE International Symposium on Information Theory (ISIT)*, June 2023.

[C28] K. Yang, C. Shi, and **C. Shen**, "Teaching Reinforcement Learning Agents via Reinforcement Learning," *57th Annual Conference on Information Sciences and Systems (CISS)*, March 2023. ***(Invited Paper)***

[C29] Z. Shao, J. Yang, **C. Shen** and S. Ren, "Learning for Robust Combinatorial Optimization: Algorithm and Application," IEEE Conference on Computer Communications (INFOCOM), May 2022.

[C30] K. Yang an **C. Shen**, "On the Convergence of Hybrid Federated Learning with Server-Clients Collaborative Training," *56th Annual Conference on Information Sciences and Systems (CISS)*, March 2022. ***(Invited Paper)***

[C31] D. Cheng, R. Huang, **C. Shen**, and J. Yang, "Cascading Bandits With Two-Level Feedback," *IEEE International Symposium on Information Theory (ISIT)*, June 2022.

[C32] C. Shi and **C. Shen**, "An Attackability Perspective on No-Sensing Adversarial Multi-player Multi-armed Bandits," *IEEE International Symposium on Information Theory*, July 2021.

[C33] C. Gan, J. Yang, R. Zhou, and **C. Shen**, "Online Learning with Diverse User Preferences," *IEEE International Symposium on Information Theory*, Paris, France, July 2019.

[C34] H. Zhang and **C. Shen**, "Best Arm Identification for Both Stochastic and Adversarial Multi-armed Bandits," *IEEE Information Theory Workshop (ITW)*, Guangzhou, China, Nov. 2018. ***(Invited Paper)***

**AI/ML Application Papers**

[C35] K. Yang, J. Yang, and **C. Shen**, "Average Reward Reinforcement Learning for Wireless Radio Resource Management," *Asilomar Conference on Signals, Systems, and Computers*, Oct. 2024. ***(Finalist for the Best Student Paper Award)***

[C36] K. Yang, S. Yeh, M. Zhang, J. Sydir, J. Yang, and **C. Shen**, "Advancing RAN Slicing with Offline Reinforcement Learning," *IEEE International Symposium on Dynamic Spectrum Access Networks (DySPAN)*, May. 2024.

[C37] Y. Mu, X. Wei, and **C. Shen**, "An Autoencoder-Based Constellation Design for AirComp in Wireless Federated Learning," *IEEE International Conference on Communication (ICC)*, Jun. 2024.

[C38] K. Yang, **C. Shen**, J. Yang, S. Yeh, and J. Sydir, "Offline Reinforcement Learning for Wireless Network Optimization with Mixture Datasets," *the 57th Asilomar Conference on Signals, Systems and Computers*, Oct. 2023. ***(Invited Paper)***

[C39] Y. Mu and **C. Shen**, "Communication and Storage Efficient Federated Split Learning," *IEEE International Conference on Communications (ICC)*, May 2023.

[C40] X. Wei, T. Wang, R. Huang, **C. Shen**, J. Yang, and H. V. Poor, "FLORAS: Differentially Private Wireless Federated Learning Using Orthogonal Sequences," *IEEE International Conference on Communications (ICC)*, May 2023.

[C41] J. Bian, **C. Shen**, and J. Xu, "Federated Learning via Indirect Server-Client Communications," *57th Annual Conference on Information Sciences and Systems (CISS)*, March 2023. ***(Invited Paper)***

[C42] K. Yang, D. Li, **C. Shen**, J. Yang, S. Yeh, and J. Sydir, "Multi-Agent Reinforcement Learning for Wireless User Scheduling: Performance, Scalablility, and Generalization," *the 56th Asilomar Conference on Signals, Systems and Computers*, Oct. 2022. ***(Invited Paper)***

[C43] Y. Mu, **C. Shen**, and Y. C. Eldar, "Optimizing Federated Averaging Over Fading Channels," *IEEE International Symposium on Information Theory (ISIT)*, June 2022.

[C44] **C. Shen**, J. Yang, and J. Xu, "On Federated Learning with Energy Harvesting Clients," *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, May 2022. ***(Invited Paper)***

[C45] X. Wei, **C. Shen**, J. Yang, and H. V. Poor, "Random Orthogonalization for Federated Learning in Massive MIMO Systems," *IEEE International Conference on Communications (ICC)*, May 2022.

[C46] Y. Mu, Y. Tan, M. Veeraraghavan, and **C. Shen**, "A Machine Learning Approach for Rate Prediction in Multicast File-stream Distribution Networks," *IEEE Global Communications Conference (GLOBECOM)*, Dec. 2021.

[C47] X. Wei and **C. Shen**, "Federated Learning over Noisy Channels," *IEEE International Conference on Communications (ICC)*, June 2021.

[C48] S. Zheng, **C. Shen**, and X. Chen, "Design and Analysis of Uplink and Downlink Communications for Federated Learning," *IEEE International Conference on Communications (ICC)*, June 2021. ***(Best Paper Award)***

[C49] **C. Shen** and S. Chen, "Federated Learning with Heterogeneous Quantization," *ACM/IEEE Symposium on Edge Computing – Workshop on Edge Computing and Communications (EdgeComm)*, Nov. 2020.

[C50] **C. Shen**, D. Li, and J. Yang, "MIMO Receive Antenna Selection via Deep Learning and Greedy Adaptation," *the 54th Asilomar Conference on Signals, Systems and Computers*, pp. 403-407, Nov. 2020. ***(Invited Paper)***

[C51] C. Gan, J. Yang, and **C. Shen**, "Thresholded Wirtinger Flow for Fast Millimeter Wave Beam Alignment," *the 54th Asilomar Conference on Signals, Systems and Computers*, pp. 32-36, Nov. 2020. ***(Invited Paper)***

[C52] W. Chen, R. Zhou, C. Tian, and **C. Shen**, "On Top-$k$ Selection from $m$-wise Partial Rankings via Borda Counting," *IEEE International Symposium on Information Theory*, June 2020.

[C53] K. Yang, **C. Shen**, and T. Liu, "Deep Reinforcement Learning based Wireless Network Optimization: A Comparative Study," *IEEE INFOCOM 2020 Workshop on Data Driven Intelligence for Networks*, July 2020.

[C54] C. Shi, L. Chen, **C. Shen**, and J. Xu, "Privacy-Aware Edge Computing Based on Adaptive DNN Partitioning," *IEEE Global Communications Conference (GLOBECOM)*, Hawaii, USA, Dec. 2019.

[C55] C. Wang, R. Zhou, J. Yang, and **C. Shen**, "A Cascading Bandit Approach to Efficient Mobility Management in Ultra-Dense Networks," IEEE International Workshop on Machine Learning for Signal Processing (MLSP), Pittsburgh, PA, USA, Oct. 2019. ***(Invited Paper)***

[C56] F. Liang, **C. Shen**, W. Yu, and F. Wu, "Power Control for Interference Management via Ensembling Deep Neural Networks," *IEEE/CIC ICCC 2019*, Changchun, China, Aug. 2019. ***(Invited Paper)***

[C57] Z. Wang, Z. Ying, and **C. Shen**, "Opportunistic Spectrum Access via Good Arm Identification," *IEEE GlobalSIP*, Anaheim, California, USA, Nov. 2018.

**Journal Papers**

[J1] J. Bian, L. Wang, K. Yang, **C. Shen**, and J. Xu, "Accelerating Hybrid Federated Learning Convergence under Partial Participation," *IEEE Transactions on Signal Processing*, accepted for publication. (Impact Factor: 5.4)

[J2] Byungjoon Bae, Doeon Lee, Minseong Park, Yujia Mu, Yongmin Baek, Inbo Sim, **Cong Shen**, and Kyusang Lee, "Stereoscopic artificial compound eyes for spatiotemporal perception in three-dimensional space," *Science Robotics*, vol. 9, no. 90, May 2024

[J3] K. Yang, C. Shi, **C. Shen**, J. Yang, S. Yeh, and J. Sydir, "Offline Reinforcement Learning for Wireless Network Optimization with Mixture Datasets," *IEEE Transactions on Wireless Communications*, accepted for publication. (Impact Factor: 8.346)

[J4] X. Wei, **C. Shen**, J. Yang, and H. V. Poor, "Random Orthogonalization for Federated Learning in Massive MIMO Systems," *IEEE Transactions on Wireless Communications*, vol. 23, no. 3, pp. 2469–2485, March 2024. (Impact Factor: 8.346)

[J5] S. Chen, L. Li, G. Wang, M. Pang and **C. Shen**, "Federated Learning with Heterogeneous Quantization Bit Allocation and Aggregation for Internet of Things," *IEEE Internet of Things Journal*, vol. 11, no. 2, pp. 3132–3143, Jan. 2024. (Impact Factor: 10.6)

[J6] C. Shi, W. Xiong, **C. Shen**, and J. Yang, "Reward Teaching for Federated Multi-armed Bandits," *IEEE Transactions on Signal Processing*, vol. 71, pp. 4407 – 4422, Nov. 2023. (Impact Factor: 5.4)

[J7] Z. Peng, B. Li, L. Li, S. Chen, G. Wang, H. Rao, and **C. Shen**, "Performance Optimization for Noise Interference Privacy Protection in Federated Learning," *IEEE Transactions on Cognitive Communications and Networking*, vol. 9, no. 5, pp. 1322–1339, Oct. 2023. (Impact Factor: 6.359)

[J8] K. Yang, S. Chen, and **C. Shen**, "On the Convergence of Hybrid Server-Clients Collaborative Training," *IEEE Journal on Selected Areas in Communications*, vol. 41, no. 3, pp. 802–819, March 2023. (Impact Factor: 13.081)

[J9] W. Chen, R. Zhou, C. Tian, and **C. Shen**, "On Top-$k$ Selection from $m$-wise Partial Rankings via Borda Counting," *IEEE Transactions on Signal Processing*, vol. 70, pp. 2031–2045, Apr. 2022. (Impact Factor: 5.4)

[J10] Y. Li, Y. Guo, M. Alazab, S. Chen, **C. Shen**, and K. Yu, "Joint Optimal Quantization and Aggregation of Federated Learning Scheme in VANETs," *IEEE Transactions on Intelligent Transportation Systems*, vol. 23, no. 10, pp. 19852 – 19863, Oct. 2022. (Impact Factor: 9.551)

[J11] X. Wei and **C. Shen**, "Federated Learning over Noisy Channels: Convergence Analysis and Design Examples," *IEEE Transactions on Cognitive Communications and Networking*, vol. 8, no. 2, pp. 1253–1268, June 2022. (Impact Factor: 6.359)

[J12] X. Wei, Y. Jiang, X. Wang and **C. Shen**, "Tx-Rx Reciprocity Calibration for Hybrid Massive MIMO Systems," *IEEE Wireless Communications Letters*, vol. 11, no. 2, pp. 431–435, Feb. 2022. (Impact Factor: 5.281)

[J13] **C. Shen**, Z. Qian, A. Huyuk, and M. van der Schaar, "MARS: Assisting Human with Information Processing Tasks Using Machine Learning," *ACM Transactions on Computing for Healthcare*, vol. 3, no. 2, pp 1-19, Feb. 2022. (Impact Factor: N/A)

[J14] S. Chen*, **C. Shen***, L. Zhang, and Y. Tang, "Dynamic Aggregation for Heterogeneous Quantization in Federated Learning," *IEEE Transactions on Wireless Communications*, Volume: 20, Issue: 10, Page(s):. 6804–6819, Oct. 2021. (*: equal contribution; Impact Factor: 8.346)

[J15] C. Shi and **C. Shen**, "Multi-player Multi-armed Bandits with Collision-Dependent Reward Distributions," *IEEE Transactions on Signal Processing*, Volume: 69, Page(s): 4385–4402, July 2021. (Impact Factor: 5.4)

[J16] C. Shi and **C. Shen**, "On No-Sensing Adversarial Multi-player Multi-armed Bandits with Collision Communications," *IEEE Journal on Selected Areas in Information Theory*, Special Issue on Sequential, Active, and Reinforcement Learning, Volume: 2, Issue: 2, Page(s): 515–533, June 2021. (Impact Factor: N/A)

[J17] **C. Shen**, J. Xu, S. Zheng, and X. Chen, "Resource Rationing for Wireless Federated Learning: Concept, Benefits, and Challenges," *IEEE Communications Magazine*, vol. 59, no. 5, pp. 82-87, May 2021. (Impact Factor: 9.03)

[J18] S. Zheng, **C. Shen**, and X. Chen, "Design and Analysis of Uplink and Downlink Communications for Federated Learning,", *IEEE Journal on Selected Areas in Communications*, Series on Machine Learning for Communications and Networks, Volume: 39, Issue: 7, Page(s): 2150–2167, July 2021. (Impact Factor: 13.081)

[J19] L. Chen, **C. Shen**, P. Zhou, and J. Xu, "Collaborative Service Placement for Edge Computing in Dense Small Cell Networks," *IEEE Transactions on Mobile Computing*, Volume: 20, Issue: 2, Page(s): 377-390, Feb. 2021. (Impact Factor: 6.075)

[J20] S. Chen, L. Zhang, Y. Tang, **C. Shen**, R. Kumar, K. Yu, U. Tariq, and A. K. Bashir, "Indoor temperature monitoring using wireless sensor networks: A SMAC application in smart cities," *Elsevier Sustainable Cities and Society*, Volume: 61, Page(s): 102333, Oct. 2020. (Impact Factor: 10.696)

[J21] W. R. Zame, I. Bica, **C. Shen**, A. Curth, H.-S. Lee, S. Bailey, J. Weatherall, D. Wright, F. Bretz, and M. van der Schaar, "Machine learning for clinical trials in the era of COVID-19," *Statistics in Biopharmaceutical Research*, Special Issue on Covid-19, Aug. 2020. (Impact Factor: 1.586)

[J22] S. Liu, S. Chen, **C. Shen**, M. Ismail, and R. Kumar, "Improved Low-Resolution Quantized SIMO Estimation via Deep Learning,", *IEEE Wireless Communications Letters*, Volume: 9, Issue: 8, Page(s): 1331-1335, Aug. 2020. (Impact Factor: 5.281)

[J23] C. Gan, R. Zhou, J. Yang, and **C. Shen**, "Cost-aware Cascading Bandits," *IEEE Transactions on Signal Processing*, Volume: 68, Page(s): 3692-3706, June 2020. (Impact Factor: 5.4)

[J24] X. Xu, M. Tao, and **C. Shen**, "Collaborative Multi-Agent Multi-Armed Bandit Learning for Small-Cell Caching," *IEEE Transactions on Wireless Communications*, Volume: 19, Issue: 4, Page(s): 2570-2585, April 2020. (Impact Factor: 7.016)

[J25] F. Liang, **C. Shen**, W. Yu, and F. Wu, "Towards Optimal Power Control via Ensembling Deep Neural Networks," *Transactions on Communications*, Volume: 68, Issue: 3, Page(s): 1760-1776, Mar. 2020. (Impact Factor: 6.166)

[J26] S. Chen, L. Zhang, **C. Shen**, K. Yu, S. H. Myint and Z. Wen, "On Scheduling Policies with Heavy-Tailed Dynamics in Wireless Queueing Systems," *IEEE Access*, Volume: 8, Issue: 1, Page(s): 32137-32149, Feb. 2020. (Impact Factor: 3.476)

[J27] W. Zhang, Y. Wang, **C. Shen**, and N. Liang, "A Regression Approach to Certain Information Transmission Problems," *IEEE Journal on Selected Areas in Communications*, Volume: 37, Issue: 11, pp. 2517-2531, Nov. 2019. (Impact Factor: 13.081)

[J28] **C. Shen**, "Universal Best Arm Identification," *IEEE Transactions on Signal Processing*, Volume: 67, Issue: 17, Page(s): 4464-4478, Sept. 2019. (Impact Factor: 5.4)

[J29] C. Gan, R. Zhou, J. Yang, and **C. Shen**, "Cost-Aware Learning and Optimization for Opportunistic Spectrum Access," *IEEE Transactions on Cognitive Communications and Networking*, Volume: 5, Issue: 1, Page(s): 15-27, Mar. 2019. (Impact Factor: 6.359)

[J30] Y. Zhou, **C. Shen**, and M. van der Schaar, "A Non-Stationary Online Learning Approach to Mobility Management," *IEEE Transactions on Wireless Communications*, Volume: 18, Issue: 2, Page(s): 1434-1446, Feb. 2019. (Impact Factor: 7.016)

[J31] Z. Wang, R. Zhou, and **C. Shen**, "Regional Multi-Armed Bandits with Partial Informativeness," *IEEE Transactions on Signal Processing*, Volume: 66, Issue: 21, Page(s): 5705-5717, Nov. 2018. (Impact Factor: 5.4)

[J32] S. Shao, T. Liu, C. Tian, and **C. Shen**, "New Results on Multilevel Diversity Coding with Secure Regeneration," *SCIENCE CHINA Information Sciences (SCIS)*, Special Issue on Distributed Storage Coding, 2018, 61(10): 100307. (Impact Factor: 7.275)

[J33] S. Shao, T. Liu, C. Tian, and **C. Shen**, "Multilevel Diversity Coding with Secure Regeneration: Separate Coding Achieves the MBR Point," *Entropy*, Special Issue on Multiuser Information Theory II, 2018, 20(10): 751. (Impact Factor: 2.738)

[J34] J. Xu, L. Chen, K. Liu, and **C. Shen**, "Designing Security-Aware Incentives for Computation Offloading via Device-to-Device Communication," *IEEE Transactions on Wireless Communications*, Volume: 17, Issue: 9, Page(s): 6053-6066, Sept. 2018. (Impact Factor: 7.016)

[J35] F. Liang, **C. Shen**, and F. Wu, "An Iterative BP-CNN Architecture for Channel Decoding," *IEEE Journal of Selected Topics in Signal Processing*, Volume: 12, Issue:1, Page(s): 144-159, Feb. 2018. (Impact Factor: 7.695)

[J36] **C. Shen**, R. Zhou, C. Tekin, and M. van der Schaar, "Generalized Global Bandits and Its Application in Cellular Coverage Optimization," *IEEE Journal of Selected Topics in Signal Processing*, Volume: 12, Issue:1, Page(s): 218-232, Feb. 2018. (Impact Factor: 7.695)

[J37] **C. Shen**, "Downlink Multi-User MIMO Precoding Design via Signal-over-Leakage Capacity," *IEEE Access*, Volume: 6, Issue:1, Page(s): 2812-2824, Jan. 2018. (Impact Factor: 3.476)

[J38] S. Shao, T. Liu, C. Tian, and **C. Shen**, "On the Tradeoff Region of Secure Exact-Repair Regenerating Codes," *IEEE Transactions on Information Theory*, Volume: 63, Issue:11, Page(s): 7253-7266, Nov. 2017. (Impact Factor: 2.978)

[J39] X. Luo, P. Cai, X. Zhang, D. Hu, and **C. Shen**, "A Scalable Framework for CSI Feedback in FDD Massive MIMO via DL Path Aligning," *IEEE Transactions on Signal Processing*, Volume: 65, Issue:18, Page(s): 4702-4716, Sept. 2017. (Impact Factor: 5.4)

[J40] Z. Wang and **C. Shen**, "Small Cell Transmit Power Assignment Based on Correlated Bandit Learning," *IEEE Journal on Selected Areas in Communications*, Volume: 35, Issue: 5, Page(s): 1030-1045, May 2017. (Impact Factor: 13.081)

[J41] **C. Shen**, C. Tekin, and M. van der Schaar, "A Non-stochastic Learning Approach to Energy Efficient Mobility Management," *IEEE Journal on Selected Areas in Communications*, Volume: 34, Issue: 12, Page(s): 3854-3868, December 2016. (Impact Factor: 13.081)

[J42] **C. Shen**, J. Xu, and M. van der Schaar, "Silence is Gold: Strategic Interference Mitigation Using Tokens in Heterogeneous Small Cell Networks," *IEEE Journal on Selected Areas in Communications*, Volume: 33, Issue: 6, Page(s): 1097-1111, June 2015. (Impact Factor: 13.081)

[J43] **C. Shen** and M. P. Fitz, "Hybrid ARQ in Multiple-Antenna Slow Fading Channels: Performance Limits and Optimal Linear Dispersion Code Design," *IEEE Transactions on Information Theory*, Volume: 57, Issue: 9, Page(s): 5863-5883, Sept. 2011. (Impact Factor: 2.978)

[J44] **C. Shen** and M. P. Fitz, "Opportunistic Spatial Orthogonalization and Its Application in Fading Cognitive Radio Networks," *IEEE Journal of Selected Topics in Signal Processing*, Volume: 5, Issue: 1, Page(s): 182-189, Feb. 2011. (Impact Factor: 7.695)

[J45] **C. Shen**, T. Liu, and M. P. Fitz, "On the Average Rate Performance of Hybrid-ARQ in Quasi-Static Fading Channels," *Transactions on Communications*, Volume: 57, Issue: 11, Page(s): 3339-3352, Nov. 2009. (Impact Factor: 6.166)

[J46] **C. Shen** and M. van der Schaar, "Optimal Resource Allocation for Multimedia Applications over Multiaccess Fading Channels," *IEEE Transactions on Wireless Communications*, Volume: 7, Issue: 9, Page(s): 3546-3557, Sept. 2008. (Impact Factor: 7.016)

[J47] **C. Shen** and M. P. Fitz, "MIMO-OFDM Beamforming for Improved Channel Estimation," *IEEE Journal on Selected Areas in Communications*, Volume: 26, Issue: 6, Page(s): 948-959, Aug. 2008. (Impact Factor: 13.081)

[J48] **C. Shen**, H. Zhuang, D. Dai, and S. Zhou, "Detection algorithm improving V-BLAST performance over error propagation," *IET Electronics Letters*, Volume: 39, Issue: 13, Page(s): 1007-1008, June 2003. (Impact Factor: 1.202)

**Tutorials**

[T1] **Cong Shen**, Cem Tekin, and Mihaela van der Schaar, "Online Learning for Wireless Communications: Theory, Algorithms, and Applications," tutorial given at the 2021 IEEE International Conference on Communications (ICC), July 2021.

[T2] **Cong Shen**, "Case Studies of Deep Learning for Channel Decoding and Power Control," IEEE Signal Processing Society Webinar Series, September 14, 2021.

**Invited Presentations**

Federated Bandits: From Incentivized Exploration to Reward Teaching

- Amazon, U.S.A. Jan. 2024

Towards Real-Time Federated Learning over Wireless Communications

- Virginia CCI CVN Speaker Series, U.S.A. Nov. 2023

The role of random orthogonality in federated learning

- National University of Singapore, Singapore Jan. 2023
- University at Buffalo, U.S.A. Oct. 2023

On federated learning over wireless fading channels

- *EE Department Colloquium*, The Pennsylvania State University, U.S.A. Mar. 2022

Federated multi-armed bandits

- Intel Labs, U.S.A. Aug. 2021

Flying under the radar: federated learning over noisy channels

- Texas A&M University, U.S.A. Sept. 2021
- University of Texas Austin, U.S.A. Nov. 2020
- Tsinghua University, China May 2021

Cost-aware cascading bandits

- Oxford University, U.K. Nov. 2017
- ShanghaiTech University, China Nov. 2017
- University of California, Davis, U.S.A. Feb. 2018
- City University of Hong Kong, Hong Kong Jun. 2018
- The Alan-Turing Institute, London, U.K. Oct. 2018
- National Institute of Informatics, Tokyo, Japan Nov. 2018

Universal best arm identification

- Qualcomm Inc., San Diego, U.S.A. Feb. 2018
- The Pennsylvania State University, U.S.A. Sept. 2018

Regional multi-armed bandits

- Qualcomm Inc., San Diego, U.S.A. Feb. 2018
- Texas A&M University, U.S.A. Mar. 2018

An iterative BP-CNN architecture for channel decoding

- University of Texas, Austin, U.S.A. Mar. 2018
- University at Buffalo, U.S.A. May 2018
- City University of Hong Kong, Hong Kong Jun. 2018

**Professional Activities**

**Senior Program Committee and Area Chair for AI and ML Conferences:**

- *International Joint Conference on Artificial Intelligence (IJCAI), Senior Program Committee:* 2021, 2023
- *International Conference on Artificial Intelligence and Statistics (AISTATS), Area Chair:* 2023, 2024, 2025

**Program Committee & Reviewer for AI and ML Conferences:**

- *International Conference on Machine Learning (ICML):* 2022, 2023, 2024
- *International Conference on Learning Representations (ICLR):* 2022, 2023, 2024
- *Conference on Neural Information Processing Systems (NeurIPS):* 2021, 2022, 2023
- *International Joint Conference on Artificial Intelligence (IJCAI):* 2020, 2021, 2023
- *AAAI Conference on Artificial Intelligence (AAAI):* 2019, 2020, 2021

**Technical Program Committee (TPC) for Signal Processing and Networking Conferences:**

- *ACM SIGMETRICS:* 2023
- *ACM MobiCom:* 2013
- *IEEE INFOCOM:* 2024, 2025
- *IEEE DySPAN:* 2024
- *IEEE MASS:* 2022, 2023
- *IEEE WiOpt:* 2021, 2022, 2023, 2024
- *IEEE ICC:* 2010, 2012, 2015, 2018, 2019, 2020, 2021, 2022, 2023, 2024
- *IEEE GLOBECOM:* 2010, 2011, 2017, 2018, 2019, 2020, 2021, 2022, 2023
- *IEEE WCNC:* 2013, 2014, 2015, 2016, 2019, 2020, 2021, 2022, 2023
- *IEEE ICME:* 2019
- *IEEE GlobalSIP:* 2015
- *IEEE ICNC:* 2017, 2018, 2019, 2020
- *IEEE VTC:* 2022-Spring, 2023-Spring, 2023-Fall
- *MILCOM:* 2022, 2023, 2024

**IEEE Technical Committee Activities:**

- Chair: Special Interest Group on Signal Processing Techniques for Big Data and Wireless Edge Intelligence, IEEE ComSoc SPCC Technical Committee Jan. 2020 – Dec. 2022

**Conference Chair:**

- *TPC Co-Chair:* 1st SIGKDD International Workshop on NL2Code-Reasoning and Planning with LLM for Code Development, 2024
- *Program Co-Chair:* 10th SIGKDD International Workshop on Mining and Learning from Time Series Workshop: From Classical Methods to LLMs, 2024
- *Program Co-Chair:* 9th SIGKDD International Workshop on Mining and Learning from Time Series – Deep Forecasting: Models, Interpretability, and Applications, 2023
- *Program Co-Chair:* 8th SIGKDD International Workshop on Mining and Learning from Time Series – Deep Forecasting: Models, Interpretability, and Applications, 2022
- *Publicity Co-Chair:* WiOpt 2024
- *Workshop Co-Chair:* IEEE ICC 2024 The 3rd Workshop on Spectrum Sharing Tech-

nology for Next Generation Communications
- *Publicity Co-Chair:* IEEE International Symposium on Dynamic Spectrum Access Networks (DySPAN) 2024
- *TPC Co-Chair:* IEEE Global Communications Conference (GLOBECOM) 2021: Wireless Communications Symposium
- *TPC Chair:* The 2nd Workshop on Edge Computing and Communications (EdgeComm), in conjunction with the Sixth ACM/IEEE Symposium on Edge Computing
- *Invited Session Chair:* CISS 2023: Distributed & Robust Machine Learning
- *Invited Session Co-Chair (Lead):* Asilomar 2022: Machine Learning for Wireless Communications and Networking
- *Invited Session Co-Chair (Lead):* Asilomar 2020: Machine Learning for Advanced Wireless Communications
- *Poster/Demo Co-Chair:* 2019 IEEE International Conference on Multimedia and Expo (ICME 2019)
- *Symposium Co-Chair (Lead):* The 11th International Conference on Wireless Communications and Signal Processing (WCSP 2019): Symposium on Intelligent Informatics and Big Data
- *Symposium Co-Chair:* IEEE Vehicular Technology Conference (VTC) Spring 2017: Track 8 - Multiple Antenna Systems and Services
- *TPC Co-Chair:* The 4th IEEE ICCC International Workshop on Wireless Communications for Internet of Things Networking (WIN2016)
- *Symposium Co-Chair:* The 6th International Conference on Wireless Communications and Signal Processing (WCSP 2014): Symposium on Emerging Areas in Wireless Communications

**NSF Spectrum Week 2024**

- Chair, Career Fair
- Co-chair, Publicity, DySPAN 2024
- Member, Organizing Committee

**NSF SWIFT Program**

- PI Meeting Program Co-Chair (co-organized with NSF Program Director Dr. Huaiyu Dai), April 2023

**SpectrumX – The National Center for Spectrum Innovation by NSF**

- Part of the UVA WHISPERS team (senior personnel) that won the SII planning grant
- Member of *SpectrumX*, a multi-university effort for NSF National Center for Wireless Spectrum Research (SII-Center)

**Journal Editorial Board:**

- IEEE Transactions on Communications (TCOM, Associate Editor) June 2022 – now
- IEEE Transactions on Machine Learning in Communications and Networking (TMLCN, Associate Editor) Sept. 2022 – now
- IEEE Transactions on Green Communications and Networking (TGCN, Editor) Oct. 2021 – now
- IEEE Wireless Communications Letters (WCL, Editor) May 2018 – May 2023

- Frontiers in Communications and Networks (Associate Editor) May 2020 – now
- IEEE Transactions on Wireless Communications (TWC, Editor) Nov. 2016 – Dec. 2021
- IEEE Transactions on Green Communications and Networking (TGCN), Lead Guest Editor for Special Issue "Energy Efficient Distributed AI over Wireless Networks", 2021 – 2022
- IEEE COMSOC MMTC Communications–Review (Editor) Dec. 2016 – now
- Journal of Communications and Information Networks (JCIN, Associate Editor) Jan. 2017 – Dec. 2018

**Membership:**

- *Senior Member:* ACM, IEEE, IEEE ComSoc, IT, and SP societies
- *Member:* Sigma Xi

**Research Grants**

1. **PI**, *NTIA*, "AI and ML for Spectrum Management"
2. **PI**, *Juniper Networks*, unrestricted gift
3. **Co-PI**, *UVA Internal Commonwealth Cyber Initiative (CCI) Cybersecurity Research Continuation*, "Smart Cities"
4. **Co-PI**, *UVA Internal FY24 Research Innovation Awards*, "Artificial Insect Eye for Spatiotemporal Perception and Cognition in 3D Space via Edge Computing"
5. **Co-PI**, *UVA Internal CCI Commercialization and Innovation*, "Privacy-preserving Synthetic Data Generation"
6. **Co-PI**, *2024 NoVA Node CCI+A (CATAPULT) Fund*, " Privacy-preserving Synthetic Data Generation"
7. **Co-PI**, *National Science Foundation (NSF) ECCS Core Program*, "Integrating Federated Split Neural Network with Artificial Stereoscopic Compound Eyes for Optical Flow Sensing in 3D Space with Precision"
8. **PI**, *National Science Foundation (NSF) Cyber-Physical Systems Core Program, Medium Project*, "Learning through the Air: Cross-Layer UAV Orchestration for Online Federated Optimization"
9. **PI**, *National Science Foundation (NSF) CAREER Program*, "CAREER: Towards a Communication Foundation for Distributed and Decentralized Machine Learning"
10. **PI**, *National Science Foundation (NSF) SWIFT Program*, "SWIFT: SMALL: Learning-Efficient Spectrum Access for No-Sensing Devices in Shared Spectrum"
11. **PI**, *National Science Foundation (NSF) ECCS Core Program*, "Towards a Resource Rationing Framework for Wireless Federated Learning"
12. **PI**, *National Science Foundation (NSF) and Intel MLWiNS Program*, "MLWiNS: Dino-RL: A Domain Knowledge Enriched Reinforcement Learning Framework for Wireless Network Optimization"
13. **Co-PI**, *Commonwealth Cyber Initiative (CCI) Commercialization Fund*, "Connected Vehicle Identification System and Cybersecurity Assessment Testbed"

14. **Co-PI**, *Commonwealth Cyber Initiative (CCI) CVN Innovation and Commercialization Grant*, "Towards Real-Time Federated Learning over Wireless Communications"
15. **PI**, *Commonwealth Cyber Initiative (CCI) Cybersecurity Research Collaboration Grants*, "Open-source, Multi-band, Multi-dimensional Spectrum Access system with Interfaces to Wireless Testbeds and Network Simulation Software"
16. **Co-PI**, *Commonwealth Cyber Initiative (CCI) Cybersecurity Research Collaboration Grants*, "Secure and Privacy 5G Network for Connected Vehicles"
17. **Co-PI**, *Commonwealth Cyber Initiative (CCI) Cybersecurity Research Collaboration Grants*, "SmallSat Cybersecurity and Resiliency"
18. **Co-PI**, *UVA Internal Commonwealth Cyber Initiative (CCI) Cybersecurity Research Continuation*, "Smart Cities"
19. **PI**, *Kneron Inc.*, "Low-resolution Machine Learning Model Representation in Distributed Learning"
20. **PI**, *Bloomberg L.P.*, unrestricted gift
21. **PI**, *Kneron Inc.*, "Efficient Deep Learning Architecture in Mobile Edge Computing"
22. **PI**, subcontract from *VT-ARC*, "Towards low-latency, energy-efficient and resilient 5G network for smart warehouse"
23. **Senior Personnel**, *National Science Foundation (NSF) Research Traineeship (NRT) Program*, "Secure Emergency Communications", Supplementary funding to "NRT: A Graduate Traineeship in Cyber Physical Systems"
24. **Senior Personnel**, *National Science Foundation (NSF) Spectrum Innovation Initiative (SII) Program*, "SII Planning: WHISPERS: Wireless Hardware Innovations and Signal Processing for Enhanced Radio-astronomy and Scientific Spectrum Sharing"
25. **Senior Personnel**, *National Science Foundation (NSF)*, "SII-Center: SpectrumX – The National Center for Spectrum Innovation"

**Supervised Students**

- Chengshuai Shi (August 2019 – May 2024): PhD. First job: Bloomberg
- Xizixiang Wei (August 2020 – May 2024): PhD. First job: Apple
- Kun Yang (August 2020 – July 2024): PhD. First job: Juniper Networks
- Yujia Mu (August 2020 – now): PhD candidate
- Li Fan (August 2020 – now): PhD candidate
- Wei Shen (August 2022 – now): PhD student
- Zhihan Chen (Jan. 2023 – now): PhD student
- Di Wu (August 2024 – now): PhD student
- Songwei Dong (August 2024 – now): PhD student
- Zihao Liang (August 2024 – now): PhD student

**Students Honors**

- Yujia Mu received the Malathi Veeraraghavan Legacy Fellowship from the Charles L. Brown Department of Electrical and Computer Engineering for 2022
- Xizixiang Wei received the Charles L. Brown Department of Electrical and Computer Engineering's Ann Lee Brown Rookie of the Year (graduate) for 2022

- Chengshuai Shi received the Bloomberg Data Science Ph.D. Fellowship for 2021-2022 and 2022-2023
- Chengshuai Shi received the McVey Fellowship from the Charles L. Brown Department of Electrical and Computer Engineering for 2022 - 2023
- Chengshuai Shi received the 2022-2023 Endowed Graduate Fellowship from the Engineering School at UVa
- Chengshuai Shi received the Charles L. Brown Department of Electrical and Computer Engineering's Louis T Rader Graduate Research Award for 2023
- Xizixiang Wei received the McVey Fellowship from the Charles L. Brown Department of Electrical and Computer Engineering for 2023 - 2024
- Xizixiang Wei received the 2023-2024 Endowed Graduate Fellowship from the Engineering School at UVa
- Kun Yang won the third place award in the Fall 2023 ECE Student Research Poster Session
- Zihan Chen received the Charles L. Brown Department of Electrical and Computer Engineering's Ann Lee Brown Rookie of the Year (graduate) for 2024