Xizixiang Wei

Contact

Department of Electrical and Computer Engineering
University of Virginia
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Education

University of Virginia, Charlottesville, VA — Aug 2020 - Present
Ph.D. Candidate, Electrical Engineering
Passed EE qualifying exam in Fall 2021
Passed Dissertation Proposal in Spring 2023
GPA: 4.00

Fudan University, Shanghai, China — Sept 2017 - June 2020
M.E., Communication and Information Systems

Tongji University, Shanghai, China — Sept 2013 - June 2017
B.E., Communication Engineering

Publications

Journal

[J1] **X. Wei**, C. Shen, J. Yang and H. V. Poor, "Random Orthogonalization for Federated Learning in Massive MIMO Systems," *IEEE Transactions on Wireless Communications*, accepted.

[J2] **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.

[J3] **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.

[J4] **X. Wei**, Y. Jiang, Q. Liu and X. Wang, "Calibration of Phase Shifter Network for Hybrid Beamforming in mmWave Massive MIMO Systems," *IEEE Transactions on Signal Processing*, vol. 68, pp. 2302-2315, 2020.

[J5] **X. Wei**, T. Wang, R. Huang, C. Shen, J. Yang and H. V. Poor, "FLORAS: Differentially Private Wireless Federated Learning Using Orthogonal Sequences," *IEEE Transactions on Wireless Communications*, to be submitted in August, 2023.

Conference

[C1] **X. Wei**, T. Wang, R. Huang, C. Shen, J. Yang and H. V. Poor, "FLORAS: Differentially Private Wireless Federated Learning Using Orthogonal Sequences," *to be appeared in Proc. IEEE International Conference on Communications*, May, 2023.

[C2] **X. Wei**, C. Shen, J. Yang and H. V. Poor, "Random Orthogonalization for Federated Learning in Massive MIMO Systems," *in Proc. IEEE International Conference on Communications*, May, 2022.

[C3] **X. Wei** and C. Shen, "Federated Learning over Noisy Channels," in *In Proc. IEEE International Conference on Communications*, May, 2021.

[C4] **X. Wei**, Y. Jiang and X. Wang, "Online Calibration of Phase Shifter Network for mmWave Massive MIMO Systems in Multipath Channels," in *In Proc. International*

Conference on Wireless Communications and Signal Processing, Oct., 2019.

[C5] **X. Wei**, Y. Jiang and X. Wang, "Calibration of Phase Shifter Network for Hybrid Beamforming in mmWave Massive MIMO Systems," in *In Proc. IEEE International Conference on Communications*, May, 2019.

[C6] Y. Mu, **X. Wei**, and C. Shen, "An Autoencoder-Based Constellation Design for AirComp in Wireless Federated Learning," in *In Proc. IEEE Vehicular Technology Conference*, submitted.

Patent

[P1] (Granted) Y. Jiang, X. Wang, **X. Wei**, H. Long and W. Wang, "Phased array network calibration method and device, equipment and storage medium", CN110350990A, 2019.

Research Experience

University of Virginia, Charlottesville, VA — Aug 2020 - present
Graduate Research Assistant, Electrical Engineering

Communication Design for Wireless Federated Learning

- Proposed $O(t^2)$ power allocation scheme that guarantees the convergence of FedAvg in presence of communication errors in both uplink and downlink transmissions.
- Proposed random orthogonalization design for wireless distributed machine learning in massive MIMO systems, which dramatically reduces system overhead (10% of baseline), computational complexity and latency (1% of baseline).

Differentially Private Wireless Federated Learning

- Proposed novel physical layer design for wireless federated learning based on orthogonal sequences, which only requires partial channel state information at receiver (CSIR) for reliable analog aggregation.
- The proposed method naturally offers privacy protection from communication noise and provides flexible both item-level and client-level differential privacy guarantee by adjustment of system parameters.

Fudan University, Shanghai, China — Sept 2017 - June 2020
Graduate Research Assistant, Key Laboratory for EMW Information

Calibration Algorithm Design for mmWave Massive MIMO Systems

- Proposed algorithms for the over-the-air (OTA) calibration of phase shifter networks (PSN) in massive MIMO transceivers, which ensure the efficient hybrid beamforming design in both LOS and non-LOS mmWave channel models.
- Gave the minimum number of the required measurements for the effective calibration via the analysis of the Fisher information matrix. MATLAB simulations showed that the estimated phase deviations reached the Cramer-Rao Lower Bounds (CRLBs) even under a low SNR.

Online-learning-based Interference Cancellation for MIMO systems

- Formulated the interference cancellation problem as a quadratic minimize program in an unknown unimodular-constrained discrete feasible set.
- Designed novel descent algorithm within the highly non-convex feasible set in the online setting.

Work Experience

Apple Inc.
Hardware Technology Intern, May 2023 - Aug 2023 — San Diego, CA

- Researched on sensing and ranging application based on ultra-wideband (UWB) signal.

Software Engineering Intern, Dec 2020 - Jul 2021 — Beijing, China

- Researched on vehicle-to-everything (V2X) user cases based on message types in SAE J2375 standard. Prototyped products with V2X features and developed demo app for various V2X user cases.

Qualcomm Technologies, Inc.,
Modem System Test Intern, Jul 2019 - Oct 2019 Shanghai, China

- Tested Qualcomm modem chipsets using the Anritsu test equipment and the lab test tool Qualcomm eXtensible Diagnostic Monitor (QXDM). Debugged problems founded after the tests with software development team.

Huawei Technologies Co., Ltd.,
Wireless Algorithm Intern, Spet 2019 - Oct 2019 Shanghai, China

- Implemented and evaluated PSS/SSS sequence detection algorithms for LTE and 5G NR systems.

Reviewer Services

More than 50 times of review experience.

Journal: IEEE Transactions on Signal Processing, IEEE Transactions on Wireless Communications, IEEE Transactions on Green Communications and Networking, IEEE Transactions on Communications, IEEE Journal on Selected Areas in Communications, IEEE Wireless Communication Letters, IEEE Communication Letters, IEEE Signal Processing Letters, IEEE Internet of Things Journal
Conference: IEEE Globecom 2019/2020, IEEE SPAWC 2020, IEEE WCSP 2019, WiOpt 2021, IEEE ICC 2023, MILCOM 2022

Adwards

McVey Graduate Student Fellowship
Ann Lee Brown Rookie of the Year Graduate Research Award
UVA Engineering Distinguished Fellowship
Outstanding Graduate of Fudan University
Five scholarships of excellence during bachelor's and master's program.