Hao **Luo**

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Research Interest

Wireless Communication, Wireless Sensing, Machine Learning (ML), Edge Computing

Education

Arizona State University   *Tempe, Arizona, United States*
PH.D. IN ELECTRICAL ENGINEERING   *Aug. 2022 - Present*
- Wireless Intelligence Lab. Advised by Prof. Ahmed Alkhateeb

National Taiwan University   *Taipei, Taiwan*
M.S. IN ELECTRICAL ENGINEERING   *Feb. 2020 - Jan. 2022*
- Wireless Mobile Network Lab. Advised by Prof. Hung-Yu Wei
- Thesis: "Orchestration of Machine Learning Aided mmWave System for Mobile Edge Gaming QoE Enhancement"
- GPA: 4.17/4.3 (4.0/4.0)

National Taiwan University   *Taipei, Taiwan*
B.S. IN ELECTRICAL ENGINEERING   *Sep. 2015 - Jan. 2020*

Publications

Journals

1. Yao Chiang, Yi Zhang, Hao Luo, Tse-Yu Chen, Guan-Hao Chen, Huan-Ting Chen, Yan-Jhu Wang, Hung-Yu Wei, and Chun-Ting Chou, "Management and Orchestration of Edge Computing for IoT: A Comprehensive Survey," *IEEE Internet of Things Journal*, Volume 10, Issue 16, Page 14307 - 14331, Aug. 2023

2. Hao Luo and Hung-Yu Wei, "Resource Orchestration at the Edge: Intelligent Management of mmWave RAN and Gaming Application QoE Enhancement," *IEEE Transactions on Network and Service Management*, Volume 20, Issue 1, Page 385-399, Mar. 2023

3. Po-Yuan Su, Yi-Chia Wei, Hao Luo, Chi-Hung Liu, Wen-Yi Huang, Kuan-Fu Chen, Ching-Po Lin, Hung-Yu Wei, and Tsong-Hai Lee, "Machine Learning Models for Predicting Influential Factors of Early Outcomes in Acute Ischemic Stroke," *JMIR Medical Informatics*, Volume 10, Issue 3, Mar. 2022

4. Wen-Chin Huang, Hao Luo, Hsin-Te Hwang, Chen-Chou Lo, Yu-Huai Peng, Yu Tsao, and Hsin-Min Wang, "Unsupervised Representation Disentanglement using Cross Domain Features and Adversarial Learning in Variational Autoencoder based Voice Conversion," *IEEE Transactions on Emerging Topics in Computational Intelligence*, Volume 4, Issue 4, Page 468–479, Apr. 2020

Peer-reviewed Conferences and Workshops

1. Hao Luo and Ahmed Alkhateeb, "Integrated Imaging and Communication with Reconfigurable Intelligent Surfaces," *Asilomar*, 2023

2. Hao Luo, Umut Demirhan and Ahmed Alkhateeb, "Millimeter Wave V2V Beam Tracking using Radar: Algorithms and Real-World Demonstration," *EUSIPCO*, 2023

3. Abdelrahman Taha, Hao Luo, and Ahmed Alkhateeb, "Reconfigurable Intelligent Surface Aided Wireless Sensing for Scene Depth Estimation," *IEEE ICC*, 2023

4. Hao Luo and Hung-Yu Wei, "Machine Learning Based mmWave Orchestration for Edge Gaming QoE Enhancement," *IEEE VTC-Fall*, 2021

Research Experience

Wireless Intelligence Lab, Arizona State University *(Prof. Ahmed Alkhateeb)*   *Tempe, Arizona, United States*
GRADUATE RESEARCH ASSOCIATE   *Aug. 2022 - Present*

Project 1: Integrated Imaging and Communication with Reconfigurable Intelligent Surfaces (RIS)
- Proposed a novel RIS-aided integrated imaging and communication system that utilizes the high spatial dimensions of the RIS for depth estimation of the surrounding environment.
- Developed a user detection algorithm to extract user positions from the depth map, enabling the design of an RIS interaction vector for communication.
- Designed an efficient beam selection strategy, incorporating a pre-defined RIS interaction codebook, to optimize communication with minimal overhead
- Publications: One accepted conference paper.

Project 2: Radar-aided mmWave Beam Tracking for V2V Communication
- Formalized the radar-aided beam tracking problem by considering practical communication and radar models.
- Developed two LSTM-based approaches with the combination of various degrees of radar signal processing and machine learning.
- Evaluated the performance of the proposed solutions on real-world data collected with the V2V testbed of the DeepSense 6G dataset.
- Publications: One published conference paper.

Project 3: Reconfigurable Intelligent Surfaces Aided Wireless Sensing for Depth Estimation
- Proposed a general RIS-aided wireless sensing framework.
- Designed a specific RIS interaction codebook for depth estimation.
- Developed a signal processing approach for building high-resolution depth map.
- Publications: One published conference paper.

Wireless Mobile Network Lab, National Taiwan University *(Prof. Hung-Yu Wei)* *Taipei, Taiwan*

MASTER STUDENT *Feb. 2020 - Jan. 2022*

Project 1: Edge Orchestration for Intelligent mmWave Management and Gaming Application QoE Enhancement
- Proposed a sequence-to-sequence learning (Seq2Seq) based mmWave beam tracking model for codebook-based beamforming design.
- Researched on resource management strategies for ML-aided wireless communication systems supported by edge computing techniques.
- Studied the scenario of ML-based network management algorithms and user applications operating on a shared edge computing platform.
- Publications: One published conference paper, one accepted journal article, and the M.S. thesis.

Project 2: Edge Computing Platform Prototyping
- Implemented an edge computing system aligned with the IEEE P1935 Standard using Python scripts, Kubernetes, and Openstack.
- Designed UI for P1935-compliant edge computing system to support the management and orchestration of applications and resources.

Project 3: Machine Learning Based Prediction of Early Outcomes in Stroke Patients
- Studied ML development, validation and model analysis for predicting Discharge-mRS and deterioration of stroke patients.
- Publication: One published journal article.

Speech, Language and Music Processing Lab, Academia Sinica *(Prof. Hsin-Min Wang)* *Taipei, Taiwan*

RESEARCH INTERN *Jul. 2018 - Feb. 2020*

Project 1: Variational Autoencoder Based Voice Conversion with Adversarial Learning
- Improved the cross-domain variational autoencoder (VAE) voice conversion model by introducing generative adversarial networks (GANs) and domain adversarial training.
- Analyzed the degree of disentanglement of the voice conversion model to achieve enhanced latent representation.
- Publication: one published journal article.

Project 2: Speech Enhancement for Electrolarynx Speech
- Studied speech enhancement for electrolarynx speech using voice conversion and speech synthesis techniques.

Honors & Awards

2023	**Winner**, Qualcomm Innovation Fellowship (North America)
2023	**Finalist**, Meta PhD Research Fellowship for AR/VR Wireless
2020	**Second Place**, ViWi Vision-Aided Millimeter Wave Beam Tracking Competition (ViWi-BT) at ICC 2020

Teaching Experience

National Taiwan University *Taipei, Taiwan*

COMPUTER PROGRAMMING LABORATORY, TEACHING ASSISTANT *2020, Fall*
- Designed C++ practice problems for students every week.
- Provided homework consultancy for students 3 hours per week.

Selected Courses

Arizona State University Digital & Wireless Communication, Advanced Probability Theory

National Taiwan University Introduction to Wireless and Mobile Networking, Personal Communications Services, Machine Learning, Convex Optimization, Algorithms, Data Structure and Programming

Skills

Programming Languages Python, Matlab, Javascript, HTML/CSS, C/C++

Software Knowledge Pytorch, Tensorflow, Blender, Wireless Insite

Professional Activities

Technical Reviewer IEEE TCOM, IEEE TCCN, IEEE JSTSP