RUICHUN MA

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https://rui-chun.github.io/

EDUCATION

Yale University *2020 - 2024*
Research Interests: Wireless networking, Metasurfaces
Ph.D. in ECE
Advisor: Prof. Wenjun Hu, Prof. Lin Zhong

University of Science and Technology of China *2016 - 2020*
School of the Gifted Young (Rank:1/28)
Bachelor of Engineering in EE & AI

PUBLICATIONS

[HotNets'24] <u>Ruichun Ma</u>, Lili Qiu, Wenjun Hu, **SurfOS: Towards an Operating System for Programmable Radio Environments**, In The ACM Workshop on Hot Topics in Networks, 2024. [pdf]

[MobiCom'24] <u>Ruichun Ma</u>, Shicheng Zheng, Hao Pan, Lili Qiu, et al, **AutoMS: Automated Service for mmWave Coverage Optimization using Low-cost Metasurfaces**, In The International Conference On Mobile Computing And Networking, 2024. [pdf]

[MobiCom'24] <u>Ruichun Ma</u> and Wenjun Hu, **RF-Mediator: Tuning Medium Interfaces with Flexible Metasurfaces**, In The International Conference On Mobile Computing And Networking, 2024. [pdf]

[MobiCom'24] Yezhou Wang, Hao Pan, Lili Qiu, Linghui Zhong, Jiting Liu, <u>Ruichun Ma</u>, et al, **GPMS: Enabling Indoor GNSS Positioning using Passive Metasurfaces** , In The International Conference On Mobile Computing And Networking, 2024.

[MobiCom'23] <u>Ruichun Ma</u>, R. Ivan Zelaya, and Wenjun Hu, **Softly, Deftly, Scrolls Unfurl Their Splendor: Rolling Flexible Surfaces for Wideband Wireless**, In The International Conference On Mobile Computing And Networking, 2023. [pdf]

[HotNets'21] R. Ivan Zelaya, <u>Ruichun Ma</u>, and Wenjun Hu, **Towards 6G Wireless: Smarten Everything with Metamorphic Surfaces**, ACM Workshop on Hot Topics in Networks, 2021. [pdf]

RESEARCH EXPERIENCE

Bridging Heterogeneous Wireless Networks with Metasurfaces Sep 2020 - Oct 2024
Research @ Yale *Advisor: Prof. Wenjun Hu*

· Designed metasurfaces as a cross-layer tool to support heterogeneous wireless networks
· Built end-to-end systems to enhance wireless links through beamforming and impedance matching
· Related research works are published in MobiCom'23, MobiCom'24 and HotNets'24

mmWave Sensing for AR/VR May - Aug 2024
Research Internship @ Meta Reality Labs

· Designed and built the first mmWave radar-based eye tracking glasses
· Proposed a tailored ML model and novel pre-training strategy based on contrastive learning

Metasurfaces for Wireless Coverage and Sensing Jan - Aug 2023
Research Internship @ Microsoft Research Asia *Advisor: Prof. Lili Qiu*

· Designed novel metasurfaces for mmWave coverage and wireless sensing projects (one patent pending)

- Developed an automated service framework for metasurface-aided mmWave coverage (MobiCom'24)
- Built a mmWave testbed with 802.11ad routers and a ROS robot
- Demonstrated metasurface-based wireless glucose sensing to Mr. Bill Gates

Wireless Mesh Network Protocol Design
Research Internship @ UIUC

Jul - Oct 2019

Advisor: Prof. Haitham Hassanieh

- Built a mesh network testbed with Raspberry Pi nodes by modifying the 802.11n driver
- Improved the spatial reuse of mesh networks with preamble detection and concurrent transmission
- Reduced the average packet delay by 30% under NS3 simulation of 802.11ax networks

Meta-RL Based Bitrate Adaptation Model
Undergrad Research @ USTC

Apr - Jun 2019

Advisor: Prof. Hancheng Lu

- Applied meta-reinforcement learning method to bitrate adaptation for video streaming
- Implemented a meta-RL model based on Model-Agnostic Meta-Learning framework
- Achieved fast learning for different QoS metrics of rate adaptation

Wireless Backscatter Tracking System
Undergrad Research @ USTC

Mar - Oct 2018

Advisor: Prof. Panlong Yang

- Developed a hand-writing tracking system based on a wireless backscatter tag
- Achieved millimeter-level tracking accuracy and led to a UbiComp'19 paper

TECHNICAL SKILLS

Programming	C (embedded programming), C++ , MATLAB, Python, Rust, Go
Tools	HFSS (RF design and simulation), Altium (PCB design), PyTorch (ML)
	mmWave Radar, SDR (Software Defined Radios), ROS (Robot Operating System)

TEACHING EXPERIENCE

Neural Networks and Learning Systems	Teaching Assistant, 2021 Fall @ Yale
Digital Signals and Systems	Teaching Assistant, 2019 Fall @ USTC

SERVICE

Technical program committee member:	ACM S3 workshop 2023
Artifact evaluation committee member:	MobiCom'24
Invited Reviewer:	IEEE TMC, ICASSP

HONORS AND AWARDS

Distinguished Graduate Scholarship	2020
EE Honor Program (top 10%)	2016-2020
Merit Student Scholarship (top 5%)	2017-2020
Outstanding Cadres of Students Union	2017

PROJECTS

OLSRv2 Protocol Implementation on IoT devices
Course project of Topics in Networked Systems @ Yale

March 2021 - May 2021

- Implemented OLSRv2(RFC7181) for mobile ad-hoc networks based on FreeRTOS with C
- Deployed and tested the implementation on resource-constrained ESP32 embedded devices
- Received Honor grade (highest) from the course instructor, Prof. Y. Richard Yang