

# RUICHUN MA

ruichun.ma@yale.edu

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

## EDUCATION

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### Yale University

September 2020 - 2024 (Expected)

Research Interests: Wireless networking, Network systems, IoT  
Ph.D. student in Electrical Engineering (CE track)  
Advisor: Prof. Wenjun Hu

### University of Science and Technology of China

September 2016 - July 2020

School of the Gifted Young (Rank:1/28)  
Bachelor of Engineering in EE & AI

## PUBLICATIONS

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Ruichun Ma, Shicheng Zheng, Hao Pan, Lili Qiu, et al, **AutoMS: Automated Service for mmWave Coverage Optimization using Low-cost Metasurfaces**, In MobiCom'24

- *An automated service framework for ultra-low-cost metasurface-aided mmWave coverage.*

Ruichun Ma and Wenjun Hu, **RF-Mediator: Tuning Medium Interfaces with Flexible Metasurfaces**, In MobiCom'24

- *The first programmable medium impedance matching metasurface for cross-medium wireless connectivity.*

Ruichun Ma, R. Ivan Zelaya, and Wenjun Hu, **Softly, Deftly, Scrolls Unfurl Their Splendor: Rolling Flexible Surfaces for Wideband Wireless**, In MobiCom'23

- *A wideband smart surface to simultaneously enhance multiple wireless networks across sub-6 GHz bands.*

R. Ivan Zelaya, Ruichun Ma, and Wenjun Hu, **Towards 6G Wireless: Smarten Everything with Metamorphic Surfaces**, In HotNets'21

Hao Pan, Ruichun Ma, Lili Qiu, et al, **GluCSI: Enabling Glucose Sensing in Wireless Networks with a Passive Metasurface**, under submission

## RESEARCH EXPERIENCE

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### Bridging Heterogeneous Wireless Networks with Metasurfaces

September 2020 - Now

Research @ Yale

Advisor: Prof. Wenjun Hu

- Designed metasurface systems as a cross-layer tool to support heterogeneous wireless networks
- Built prototypes to enhance wireless/IoT links through beamforming and impedance matching
- Related research works are published in MobiCom'24, MobiCom'23 and HotNets'21

### Metasurfaces for Next-gen Networks

Jan 2023 - August 2023

Research Internship @ Microsoft Research Asia

Advisor: Prof. Lili Qiu

- Designed several metasurfaces for mmWave coverage and wireless sensing projects
- 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

July 2019 - October 2019

Research Internship @ UIUC

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

April 2019 - June 2019

*Undergrad Research @ USTC*

*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

March 2018 - October 2018

*Undergrad Research @ USTC*

*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

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<b>Programming Tools</b>	C (embedded programming), C++ , MATLAB, Python, Rust, Go HFSS (RF design and simulation), Altium (PCB design), PyTorch (ML) SDR (Software Defined Radios), ROS (Robot Operating System)
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## TEACHING EXPERIENCE

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

## HONORS AND AWARDS

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

## SELECTED COURSES

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Microwave Techniques and Measurement	Mobile and Embedded Systems
Building Distributed Systems	Topics in Networked Systems
Optimization and Computation	Stochastic Processes
Principles of Modern Communications	Computer Vision

## PROJECTS

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### OLSRv2 Protocol Implementation on IoT devices

March 2021 - May 2021

*Course project of Topics in Networked Systems @ Yale*

- 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

### Real-time RSSI and CSI Collection and Display

March 2021 - May 2021

*Course project of Wireless Technologies and IoT @ Yale*

- Implemented remote RSSI and CSI data collection and display on embedded ESP32 devices
- Demonstrated real-time CSI-based movement sensing application (code and videos)
- Received Honor grade (highest) from the course instructor, Prof. Wenjun Hu