RUICHUN MA

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

EDUCATION

Yale University *September 2020 - Now*
Research Interests: Wireless networking, Network systems, Internet of Things
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

Ruichun Ma and Wenjun Hu, **Cross-Media Wireless Made Easier: Tuning Media Interfaces with Flexible Metasurfaces**, https://arxiv.org/abs/2306.02367

- The first programmable media impedance matching metasurface design and an end-to-end system that performs impedance matching and beamforming jointly at media interfaces.

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

- A soft smart surface with a wideband tunable operating frequency and a control algorithm to simultaneously enhance different 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

RESEARCH EXPERIENCE

Bridging heterogeneous wireless networks with metasurfaces September 2020 - Now
Research @ Yale *Advisor: Prof. Wenjun Hu*

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

Metasurfaces for mmWave Coverage Jan 2023 - August 2023
Research Internship @ MSR Asia *Advisor: Prof. Lili Qiu*

- Developed an automated service framework for metasurface-aided mmWave network deployment
- Designed 60 GHz metasurfaces that allow low-cost hot-stamping fabrication with papers
- Demonstrated metasurface-based wireless 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 tracking system based on a wireless backscatter tag
· Collected experiment data to verify the system and achieved millimeter-level accuracy
· Implemented a real-time system for hand-writing tracking demo

PROJECTS

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 ESP32 IoT devices
· Received Honor grade (highest) from the course instructor, Prof. Y. Richard Yang

Medical Robot Arm Project August 2018
Summer school project @ Imperial College London

· Developed an auxiliary robot arm prototype for surgery
· Designed a control system based on voice recognition and image processing
· Led the team and received Runner-up Award (second among 7 teams)

Online Forum Website April 2018 - August 2018
course project of Modern Software Engineering @ USTC

· Developed and deployed an online forum using Django framework through teamwork
· Designed and programmed the backend database model of the website
· Received full score from the course instructor

TECHNICAL SKILLS

Programming	C/C++, Python, Rust, Go
Tools	HFSS (EM/RF simulation for metasurfaces), Altium (PCB design), Matlab, PyTorch, LaTeX, NS-3 (network simulator)

TEACHING EXPERIENCE

Neural Networks and Learning Systems — Teaching Assistant, 2021 Fall @ Yale
Digital signal and systems — Teaching Assistant, 2019 Fall @ USTC

HONORS AND AWARDS

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

SELECTED COURSES

Mathematical Analysis (96)
Principles of Modern Communications (95)
Microwave Techniques and Measurement (Honor)
Wireless Technologies and Internet of Things (Honor)
Stochastic Processes (95)
Modern Software Engineering (100)
Mobile and Embedded Systems (Honor)
Topics in Networked Systems (Honor)