FAN YI

35 Olden Street, Princeton, NJ 08540

🌐 <u>Personal Website</u>   📞 609-356-3198   ✉ <u>fanyi@princeton.edu</u>   🎓 <u>Google Scholar</u>

RESEARCH INTEREST

My research interest lies in systems and networking, perticularly in 5G networks, congestion control, and network measurements. My recent research focuses on developing network measurement techniques to enable low-latency, high-quality video conferencing and interactive streaming applications.

EDUCATION

Princeton University   Sep. 2019 – Present
Ph.D. candidate in Computer Science   *Princeton, NJ*
- Advisor: Prof. Kyle Jamieson

Shanghai Jiao Tong University   Sep. 2014 – June 2018
B.S. in Electrical Engineering   *Shanghai, China*
- Advisor: Prof. Fan Wu

EXPERIENCES

Princeton University | *Research Assistant, Advisor: Kyle Jamieson*   Sep. 2019 – Present
- **Project Athena:**
  - Developed Athena, a novel cross-layer measurement framework that synchronizes and correlates measurements from Layer 1 to Layer 7 to analyze how wireless networks impact video conferencing (VCA) QoE.
  - Designed and implemented high-precision measurement techniques to correlate physical layer 5G control messages, network packets, and application-layer video frames/audio samples.
  - Identified and analyzed key sources of VCA delay variations in 5G networks, including link-layer scheduling and retransmission patterns, demonstrating how these affect VCA performance; published in ACM HotNets 2024.
- **Project PBE-CC:**
  - Designed a wireless-aware congestion control system which captures fine-grained mobile endpoint wireless capacity through a well-defined API to the mobile's cellular physical layer to optimize data transmission.
  - Developed and implemented a novel cellular control channel decoder and measurement framework to accurately track wireless bandwidth allocation and per-user resource usage at millisecond timescales.
  - Implemented the congestion control algorithm in Linux user space using C; published in **ACM SIGCOMM 2020**, premier conference in computer networking area.
- **Project WaveFlex:**
  - Designed and implemented WaveFlex, a novel smart surface that enhances Private 5G/LTE networks in the CBRS band through autonomous beam alignment and operating frequency adaptation.
  - Created a multi-channel hardware design integrating custom tunable filters and real-time control algorithms, enabling simultaneous optimization for multiple nearby base stations; published in ACM CoNEXT 2024.
- **Project Caper:**
  - Developed a cellular-assisted COVID-19 contact tracing system that leverages cellular physical layer channel state information (CSI) and deep learning to identify close contacts while preserving user privacy.
  - Created a novel neural network architecture combining Siamese networks and multi-task attention networks to extract representative features from CSI and achieve accurate proximity estimation.
  - Implemented the experiment testbed in C by modifying srsRAN and trained neural networks using PyTorch; Published in ACM UbiComp 2022.

Qualcomm Technologies | *Research Intern, Host: Alberto Rico Alvariño*   June 2021 – Sep 2021
- Designed a cooperative protocol for low power IoT devices by leveraging both NB-IoT and Bluetooth to save energy.
- Simulated in MATLAB from scratch to evaluate the proposed protocol, where the results show that the cooperative protocol provides more than 11 times longer battery life than the baseline method.

Carnegie Mellon University | *Research Intern, Advisor: Swarun Kumar*   Aug. 2018 – Feb. 2019
- Developed a novel system that enables rapid aggregation of sensor data across LP-WAN devices over a wide area within just one packet duration (seconds), while traditional methods take hours to query all sensors individually.

- Designed synchronized collaborative encoding techniques to coordinate multiple LP-WAN radios to transmit concurrently in time and frequency, enabling efficient spatial data recovery through sparsity-aware aggregation.
- Implemented the system to be compatible with both LoRa and NB-IoT in C++ without hardware modifications; published in ACM/IEEE IPSN 2020 (**Best Paper Award**).

SELECTED PUBLICATIONS

Athena: Seeing and Mitigating Wireless Impact on Video Conferencing and Beyond
- **Fan Yi**, Haoran Wan, Kyle Jamieson, Jennifer Rexford, Yaxiong Xie, Oliver Michel
- *ACM HotNets 2024*

WaveFlex: A Smart Surface for Private 5G CBRS Networks
- **Fan Yi**, Kun Woo Cho, Yaxiong Xie, Kyle Jamieson
- *ACM CoNEXT 2024*

Cellular-assisted, Deep Learning Based COVID-19 Contact Tracing
- **Fan Yi**, Yaxiong Xie, Kyle Jamieson
- *ACM UbiComp/IMUWT 2022*

PBE-CC: Congestion Control via Endpoint-Centric, Physical-Layer Bandwidth Measurements
- Yaxiong Xie, **Fan Yi**, Kyle Jamieson
- *ACM SIGCOMM 2020*

Quick (and Dirty) Aggregate Queries for Low-Power WANs
- Akshay Gadre, **Fan Yi**, Anthony Rowe, Bob Iannucci and Swarun Kumar
- *ACM/IEEE IPSN 2020 (Best Paper Award)*

MISEN: A Mobile Indoor White Space Exploration Method
- Xiaoyang Zheng*, **Fan Yi***, Dongxin Liu and Fan Wu (*co-primary)
- *IEEE ICC 2019*

(Invited Paper) The Case for Small-Scale, Mobile-Enhanced COVID-19 Epidemiology
- **Fan Yi**, Yaxiong Xie, Kyle Jamieson
- *IEEE WiOpt 2021*

(Patent) Cooperation Techniques for Low-power Devices
- **Fan Yi**, Umesh Phuyal, Alberto RICO ALVARINO, Lorenzo Casaccia
- Patent Number: US20230379664A1, Filing Date: 2022-05-20

TEACHING EXPERIENCES

COS 418 **Distributed Systems** | *(Instructor: Wyatt Lloyd), Teaching Assistant, Princeton University*	Spring 2021
COS 461 **Computer Networks** | *(Instructor: Kyle Jamieson), Teaching Assistant, Princeton University*	Fall 2020

HONORS & AWARDS

ACM/IEEE IPSN 2020 Best Paper Award	Apr. 2020
"Hong Yi" Academic Scholarship (1%)	Dec. 2017
"Chun-Tsung" Academic Scholarship (2%)	May 2016
School Excellence Scholarship (5%)	Oct. 2015, 2016, 2017
"Xin Dong" Enterprise Scholarship, First Prize (2%)	Oct. 2015

SKILLS

Programming Languages: C/C++, Python, HTML, CSS, JavaScript, MATLAB
Knowledge: PyTorch, LATEX, Linux, Git, SDR, srsRAN
Others: Familiar with 5G/LTE protocols, data analysis, machine learning, and wireless networks