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Yiwen Song

Education

2021- **Ph.D. Electrical & Computer Engineering**, *Carnegie Mellon University*, Pittsburgh, *United States*
Advisor: Prof. Swarun Kumar

2017-2021 **B.Eng. Information Engineering**, *Shanghai Jiao Tong University*, Shanghai, *China*
IEEE Honors Class & Zhiyuan Honors Program

Research Interest

My current research mainly focuses on *wireless and mobile systems*. Specifically, I am investigating how to develop *sensing, communication and IoT systems* for better productivity with new materials and novel software & hardware designs of radio frequency devices. My goal of research is to develop effective, efficient and economic wireless systems for different purposes, e.g., robotics, health services, and medical services.
Keywords: wireless systems, sensing, energy harvesting, soft robots.

Publications

C8 **Yiwen Song**, Hao Pan, Longyuan Ge, Lili Qiu, Swarun Kumar, Yi-Chao Chen. "Guiding Energy Distribution inside Microwave Oven", in *Annual International Conference On Mobile Computing And Networking (MobiCom)*. 2024.

C7 Jiahui Sun, Guiyun Fan, Haiming Jin, **Yiwen Song**, Tianyuan Liu, Chenhao Ying, Yuan Luo, Jie Li. "Multi-Task-Oriented UAV Crowd Sensing with Charging Budget Constraint", in *International Symposium on Theory, Algorithmic Foundations, and Protocol Design for Mobile Networks and Mobile Computing (MobiHoc)*. 2024.

J2 Kuang Yuan, Mohamed Ibrahim, **Yiwen Song**, Guoxiang Deng, Suvendra Vijayan, Robert A. A. Nerone, Akshay Gadre, Swarun Kumar. "ToMoBrush: Exploring Dental Health Sensing using a Sonic Toothbrush", in *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT)*. 2024.

C6 **Yiwen Song**, Changhan Ge, Lili Qiu, Yin Zhang. "2ACE: Spectral Profile-driven Multi-resolutional Compressive Sensing for mmWave Channel Estimation", in *International Symposium on Theory, Algorithmic Foundations, and Protocol Design for Mobile Networks and Mobile Computing (MobiHoc)*. 2023.

C5 **Yiwen Song**, Mason Zadan, Jingxian Wang, Kushaan Misra, Zefang Li, Carmel Majidi, Swarun Kumar. "Navigating Soft Robots through Wireless Heating", in *IEEE International Conference on Robotics and Automation (ICRA)*. 2023.

C4 Jingxian Wang, **Yiwen Song**, Mason Zadan, Yuyi Shen, Vanessa Chen, Carmel Majidi, Swarun Kumar. "Wireless Actuation for Soft Electronics-free Robots", in *Annual International Conference On Mobile Computing And Networking (MobiCom)*. 2023.

C3 Guiyun Fan, Haiming Jin, Yiran Zhao, **Yiwen Song**, Xiaoying Gan, Jiaxin Ding, Lu Su, Xinbing Wang. "Joint Order Dispatch and Charging for Electric Self-Driving Taxi Systems", in *IEEE International Conference on Computer Communications (INFOCOM)*. 2022.

J1 Chonghuan Wang, **Yiwen Song**, Guiyun Fan, Haiming Jin, Lu Su, Fan Zhang, Xinbing Wang. "Optimizing Cross-Line Dispatching for Minimum Electric Bus Fleet", in *IEEE Trans. on Mobile Computing (TMC)*. 2021.

C2 **Yiwen Song**, Haiming Jin. "Minimizing Entropy for Crowdsourcing with Combinatorial Multi-Armed Bandit", in *IEEE International Conference on Computer Communications (INFOCOM)*. 2021.

C1 Chonghuan Wang, **Yiwen Song**, Yifei Wei, Guiyun Fan, Haiming Jin, Fan Zhang. "Towards Minimum Fleet for Ridesharing-Aware Mobility-on-Demand Systems", in *IEEE International Conference on Computer Communications (INFOCOM)*. 2021.

Experience

2023.6-2023.8 **Research Intern (Wireless Group)**, *Microsoft Research Asia*, Shanghai, *China*
- Manager: Lili Qiu.

2021- **Graduate Research Assistant**, *Carnegie Mellon University*, Pittsburgh, *United States*
- Advisor: Prof. Swarun Kumar.

2020-2021 **Undergraduate Research Intern**, *The University of Texas at Austin*, Austin, *United States*
- Advisor: Prof. Lili Qiu.

2019-2021 **Undergraduate Research Assistant**, *Shanghai Jiao Tong University*, Shanghai, *China*
- Advisor: Prof. Haiming Jin.

Selected Projects

- **Wireless actuated soft robots.**
  - World's first far-field soft robotic actuation platform using radio-frequency heating.
  - Design and implement a 6-antenna microwave beamforming system to generate heat to actuate soft robots.
  - Design and fabricate flexible conductive patterns on top of actuators to improve heating efficiency.
  - Create low-temperature LCE material to enable low-power actuation.
  - Develop frequency-selectivity patterns and spatial beamforming to enable selective actuation of separate actuators.
  - Enable multiple locomotions with different structural designs.
- **Flexible waveguide system for TTField.**
  - Create soft & flexible waveguide to direct the transmission of tumor-treating field (TTField) at 125 kHz.
  - The waveguide is made of silicone rubber core and liquid metal cladding to enable large flexibility.
  - Implement & test the waveguide system on zebrafish embryos for cancer research.
- **Fast & accurate channel estimation for mmWave.**
  - mmWave channel estimation is crucial for 802.11ad/ay and cellular networks due to complex indoor environments and client movement.

- Develop a spectral profile that describes the multipath power distribution and accelerates channel estimation with that.

Honors & Awards

- Best Poster Award (*"Controlling soft robots through wireless actuation"*), ACM S3 Workshop'23.
- Benjamin Garver Lamme/Westinghouse Graduate Fellowship in Electrical & Computer Engineering, 2023-2024

Technical Skills

- Programming Languages: Python (Numpy, PyTorch, TensorFlow, Scikit-Py), MATLAB, C/C++.
- Tools: Simulink, LabVIEW, Solidworks, Ansys HFSS, CST Studio.
- Fabrication: PCB prototype (LPKF S104), 3D printing (Plastic/Resin), Laser cutting, Silicone rubber fabrication.

Services

- Reviewer: ACM IMWUT (Ubicomp) 2022, IEEE IROS 2023-24, IEEE TMC 2023-24.

Collaborators

Other than my advisors, I have closely collaborated/been advised by the following collaborators:

- Prof. Carmel Majidi, Carnegie Mellon University.
- Prof. Jingxian Wang, National University of Singapore.
- Chonghuan Wang, Massachusetts Institute of Technology.
- Dr. Mason Zadan, Massachusetts Institute of Technology.
- Zefang Li, Johns Hopkins University.
- Changhan Ge, The University of Texas at Austin.
- Kuang Yuan, Carnegie Mellon University.