

# Zijing Zhang

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github.com/zijingzhang1997

## Education

Cornell University, Ithaca, NY

August 2019 - Expected August 2024

PhD Student, Electrical and Computer Engineering (GPA: 3.87)

Advisor: Prof. Edwin C. Kan

Huazhong University of Science and Technology, Wuhan, China

September 2015- June 2019

Bachelor of Engineering, Optoelectronic Information Science and Engineering (GPA: 3.91/4.0)

## Publications

- [1] **Zijing Zhang**, Pragya Sharma, Jianlin Zhou, Xiaonan Hui and Edwin C. Kan, "Furniture-integrated respiration sensors by notched transmission lines," *IEEE Sensors Journal*, doi: 10.1109/JSEN.2020.3028970, 2020.
- [2] **Zijing Zhang**, Pragya Sharma, Thomas Bradley Conroy, Veerawat Phongtankuel and Edwin C. Kan, "Objective scoring of Physiologically Induced dyspnea with non-invasive RF respiratory sensors", *IEEE Transactions on Biomedical Engineering*, doi: 10.1109/TBME.2021.3096462
- [3] Xiaonan Hui, Jianlin Zhou, Pragya Sharma, Thomas Conroy, **Zijing Zhang** and E. C. Kan "Wearable RF Near-Field Cough Monitoring by Frequency-Time Deep Learning", accepted by *IEEE Transactions on Biomedical Circuits and Systems*
- [4] **Zijing Zhang**, et al., "Wideband and continuously-tunable fractional photonic Hilbert transformer based on a single high-birefringence planar Bragg grating," *Optics Express*, vol. 26, pp. 20450-20458, 2018.
- [5] **Zijing Zhang**, et al., "Design of a broadband achromatic dielectric meta-lens for linear polarization in the near-infrared spectrum," *OSA Continuum*, vol. 1, pp. 882-890, 2018.
- [6] **Zijing Zhang**, et al., "Micro-machining for TE/TM mode phase matching in high- birefringence planar waveguide and implementation in continuously-tunable fractional Hilbert transform," *The International Photonics and Optoelectronics Meeting, OSA Technical Digest*, paper OT4A.2, 2018.
- [7] Huangqingbo Sun, Wei Zhou, **Zijing Zhang** and Zhujun Wan. "A MEMS variable optical attenuator with ultra-low wavelength-dependent loss and polarization-dependent loss," *Micromachines*, vol. 9, no. 12, p. 632, 2018.

## Research Experiences

1. Respiratory pattern monitoring with RF near-field coherent sensing (NCS) *Cornell University, Spring 2020-present*
  - Developed a non-invasive respiration sensor integrated into furniture that can be invisible to the user and enhance comfort and convenience. The sensor was modified from an RF coaxial cable with a designed notch.
  - Captured the cardiopulmonary waveforms and derived the breath rate and heart rate with variations in positions.
  - Implemented the sensor to detect simulated respiratory disorders including central and obstructive sleep apnea.
  - Performed a human study ( $N=10$ ) that confirmed the validity of the sensing system and signal processing.
2. Objective scoring of dyspnea with unrestrictive wearable RF sensors *Cornell University, Fall 2020-present*
  - Designed and implemented a testing protocol to perform human study ( $N=15$ ) on simulated dyspnea (shortness of breath) by the exertion and Borg scales.
  - Implemented algorithms to identify various features embedded in breathing waveforms to predict the dyspnea score in comparison with the self-report scores.
  - Designed an automatic system using machine learning algorithms of decision tree and random forest to evaluate the objective dyspnea score.
3. 3D Imaging by ambient radio signals using the CNN model *Cornell University, Fall 2019-present*
  - Employed ambient low-cost passive RFID tags for the shape and size of human body and feet in a closet-like space.
  - Developed a CNN model that can accurately reconstruct the 3D image of an object by the simulation of CST Microwave Studio.
4. Sleep Apnea Detection and Prediction based on Bed-integrated RF sensor *Cornell University & Cornell Weill medical sleep center, Summer 2020-present*
  - Performed clinical study on 30 patients in Weill sleep center and collected overnight recording data using bed-integrated sensor which is invisible to the user.
  - Developed machine-learning algorithm that can automatically detect and predict sleep disorder on real patients with high fidelity.
5. Varifocal dielectric meta-lens based on diffractive Moire elements *Georgia Tech, Jun-Oct 2018*
  - Formulated the concept to incorporate the Moire elements into nanoscale meta-lens design; fabricated the meta-lens in the clean room; measured the imaging qualities

## **Internship Experience**

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Signal Processing Intern in Analog Devices

*Analog Devices, Wilmington, MA May -Aug 2021*

1. Develop core body temperature sensor using heat flux
  - model the physics of the sensor interacting with the human body.
  - design and validate the algorithm for estimating body and skin temperature based on heat flux.
2. PPG based heart rate monitoring, respiration rate estimation, and signal quality index estimation

## **Awards**

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CSC Scholarship (Chinese Government Scholarships) for outstanding undergraduate students

*Sep 2017*

Meritorious Prize (First Prize) in Mathematical Contest in Modeling of America

*Feb 2018*

Excellent Graduation Thesis in Huazhong University of Science and Technology

*Jun 2019*

## **Skills**

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**Programming:** MATLAB; Python; C/C++.

**Tools:** CST Microwave Studio; PyTorch; LabVIEW.