

Zijing Zhang

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Education

Cornell University, Ithaca, NY

Aug. 2019 – (Expected) Aug. 2024

Ph.D. student, Electrical and Computer Engineering (GPA: 3.87)

Thesis Advisor: Edwin C. Kan

Huazhong University of Science and Technology, Wuhan, China

Sep. 2015- Jun. 2019

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

Publications

- [1] **Z. Zhang**, P. Sharma, T. B. Conroy, V. Phongtankuel and E. 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
- [2] **Z. Zhang**, P. Sharma, J. Zhou, X. Hui and E. C. Kan, "Furniture-integrated respiration sensors by notched transmission lines," *IEEE Sensors Journal*, doi: 10.1109/JSEN.2020.3028970, 2020.
- [3] X. Hui, J. Zhou, P. Sharma, T. B. Conroy, **Z. 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] **Z. 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] **Z. 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] **Z. Zhang**, et al., "Micro-machining for TE/TM mode phase matching in high-birefringence planar waveguide and implementation in continuously-tunable fractional Hilbert transform," *Intl. Photonics & Optoelectronics Mtg., OSA Tech. Dig., OT4A.2*, 2018.
- [7] H. Sun, W. Zhou, **Z. Zhang** and Z. 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 Univ., Jan. 2020-present*
 - Developed a non-invasive respiration sensor integrated into furniture that can be invisible to the user to 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 touchless wearable RF sensors *Cornell Univ., Sept. 2020-present*
 - Designed a testing protocol to perform human study ($N=32$) on simulated dyspnea by the exertion and facemasks.
 - Implemented algorithms to identify various features embedded in breathing waveforms to predict the objective dyspnea score in comparison with the self-report scores.
 - Designed a learning model of decision tree and random forest to evaluate the objective dyspnea score.
3. 3D imaging by ambient radio signals using the inverse method and machine learning *Cornell Univ., Oct. 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 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 Univ. & 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.
 - demonstrated the capability to prognosticate sleep apnea around 60 seconds earlier.
5. Precise Vertebral Segmentation with CT images *Cornell Univ., Mar.-May 2021*
 - Developed an automatic system that segments individual vertebrae from CT images utilizing template registration algorithm.
6. 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

Signal Processing Intern in Analog Devices

Analog Devices, Wilmington, MA May –Aug. 2021

1. Developed smart core body temperature sensor
 - Modeled the physics of the sensor interacting with the human body.
 - Designed and validated the algorithm for estimating body and skin temperature.

Awards

CSC Scholarship (Chinese Government Scholarships) for outstanding undergraduate students

Sept. 2017

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

Feb. 2018

Excellent Graduation Thesis in Huazhong University of Science and Technology

June 2019

Skills

Programming and tools: MATLAB; Python; C/C++; CST Microwave Studio; PyTorch; LabVIEW; COMSOL