Zhenyu Lei

Contact Information

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Education

Huazhong University of Science and Technology (HUST), Wuhan, Hubei, China

B.Eng., Optoelectronic Information Science and Engineering **(with honors)**
GPA 3.93/4.0
Sep, 2016 - Jun, 2020

Research Interests

Ubiquitous Computing, Wearable and Embedded Systems, Wireless Networks, Human Computer Interaction, Cyber-physical Systems, Sensors, VLSI

Research Experience

Cornell University, Ithaca, New York, USA
Advisor: Prof. Cheng Zhang

Student Intern, Department of Information Science July, 2019 - Present

- Project 1: **Investigating the feasibility of recognizing fine-grained activities throughout the home by monitoring surface vibrations at a single point using laser Doppler vibrometry (In Preparation for IMWUT 2020, first author)**
  - Put forward the idea of the whole project and led the team
  - Set up the Laser Doppler Vibrometer and built a data acquisition, signal processing, and machine learning pipeline
  - Designed and completed the experiment for feasibility and user study
  - Did a thorough literature review including fields of human-computer interaction, optics, mechanical engineering, biomedical, etc.
- Project 2: **Reconstruction of fine-grained hand gestures using Electrical Impedance Tomography (EIT) (In Process)**
  - Design a 4-layer PCB for a 2×16-channel EIT system
  - Develop the firmware of the MCU for scanning
  - Develop the software for data processing and machine learning
- Project 3: **ThumbTrak: Recognizing micro-finger poses using a ring with proximity sensing (Submitted to CHI 2020, co-author)**
  - Made a prototype of a ring-like hardware containing 9 proximity sensors and modified the code of data collection
  - Wrote part of the paper
  - Conducted part of the user study
- Project 4: **Continuous tracking of the thumb of a single hand using high frequency electric currents**
  - Designed a PCB as the hardware of the project

Huazhong University of Science and Technology, Wuhan, Hubei, China
Advisor: Prof. Wei Wang

Research Assistant, School of Electronic Information and Communications July, 2018 - July, 2019

- Project: **Design of a novel wireless backscatter communication system**
  - Designed a 4-layer PCB for the backscatter tag working at 900MHz, including the energy-harvesting section and the communication section
  - Developed the firmware of the MCU which could work at low-power-consuming mode flawlessly
- Miscellaneous:
  - Developed an FPGA firmware to control 20 antennas simultaneously

- Built a hardware testbench for a Wi-Fi backscatter tag using FPGA

Huazhong University of Science and Technology, Wuhan, Hubei, China
Advisor: Prof. Jing Xu

Research Assistant, School of Optical and Electronic Information March, 2019 - May, 2019

– Project: **Fast integrated photonic power splitters inverse design using deep learning**
  - Built a model of MultiMode Interference (MMI) light power splitter working at 1550 nm using FDTD Solution
  - Developed Python code for automatically modifying the internal structure of the splitter and generating the simulation results as the dataset
  - Developed a neural network to predict the frequency response and inversely design the structure of MMI

Huazhong University of Science and Technology, Wuhan, Hubei, China
Advisor: Prof. Ming Xu

Research Assistant, School of Optical and Electronic Information April, 2017 - May, 2018

– Project 1: **Structural disorder in the high-temperature cubic phase of GeTe**
  - Completed a paper as a co-author
  - Developed a program to calculate the distribution of the distances between the atomic trajectories and their central positions
– Project 2: **Research on the ion migration path in Sc_2WO_3 as a kind of electrolyte of solid-state-battery**
  - Calculated and analyzed the migration path of Sc ions using ab initio method in VASP

Publications and Submissions

1. **Zhenyu Lei**, Wei Sun, Peng He, Benjamin Steeper, and Cheng Zhang. Investigating the feasibility of recognizing fine-grained activities throughout the home by monitoring surface vibrations at a single point using laser doppler vibrometry. ***In Preparation for*** *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT) 2020*
2. Wei Sun, Congshu Huang, **Zhenyu Lei**, Benjamin Steeper, Songyun Tao, Feng Tian, and Cheng Zhang. Thumbtrak: Recognizing micro-finger poses using a ring with proximity sensing. ***Submitted to*** *ACM Conference on Human Factors in Computing Systems (CHI) 2020*
3. Wei Sun, Songlin Xu, Benjamin Steeper, Congshu Huang, **Zhenyu Lei**, Feng Tian, and Cheng Zhang. Teethtap: Recognizing discrete teeth gestures using motion and acoustic sensing on an earpiece. ***Submitted to*** *ACM Conference on Human Factors in Computing Systems (CHI) 2020*
4. Ming Xu, **Zhenyu Lei**, Junhui Yuan, Kanhao Xue, Yanrong Guo, Songyou Wang, Xiangshui Miao, and Riccardo Mazzarello. Structural disorder in the high-temperature cubic phase of GeTe. *RSC advances*, 8(31):17435-17442, 2018

Extra-curriculum Projects

- **Oct, 2016-Jun, 2018** Team leader, Electrical and Electronic Technology Innovation Center, HUST
- **Mar, 2018-Jun, 2018** Group member, Special Interest Group on Fiber Embedded Microfluidic Chip for Molecular Detection, HUST
- **Dec, 2018** Group member, group work on Optics Metasurface and Invisibility Cloak, HUST
- **Jul, 2017** Team leader, group work on 3D printing, HUST

Honors and Awards

- Outstanding Undergraduate of Academic Performance **(Top 1%)**, HUST, 2018
- Scholarship for Excellent Academic Performance, HUST, 2018
- Scholarship for Innovation, HUST, 2017 & 2018

Skills

- Programming Language: C, MATLAB, Python, SystemVerilog, LaTeX, HTML, CSS
- Circuits: Altium Designer, Pspice
- Mechanics: SolidWorks, AutoCAD, Autodesk Inventor
- Optics: Zemax, FDTD Solutions
- Materials: VASP, Materials Studio
- Multimedia: Adobe Pr, Ae, Au, Ps