

# Laixi Shi

## Education

2018 – Present **Ph.D. Student, Electrical and Computer Engineering**, *Carnegie Mellon University*, Pittsburgh, USA.

**Honors:** The ACM International Workshop on Device-Free Human Sensing (DFHS) Travel Grant (2019)  
Women in Machine Learning Workshop Travel Grant (2019)  
Presidential Fellowship granted by Carnegie Mellon University (2018)

2014 – 2017 **B.Eng., Electronic Engineering**, *Tsinghua University*, Beijing, China.

**Honors:** The First Prize in 35th Tsinghua University Academic Challenge Cup (2017)  
Technology Innovation Excellence Award granted by Tsinghua University (2015 – 2017)  
National Scholarship granted by the government of China (2016)  
Outstanding Project of Undergraduate Research Promotion Plan Competition of Tsinghua University (2016)  
Qualcomm Scholarship granted by Tsinghua University (2016)  
The First Prize in National Physics Contest for College Student (2015)  
The Silver Medal of Chinese Physics Olympiad, ranked 77th nationally (2014)

## Research Experience

- 2018.9–Present **Multi-channel Sparse Blind Deconvolution via Nonconvex Optimization**,  
*Dept. of Electrical and Computer Engineering, Carnegie Mellon University, Pittsburgh, USA*,  
Research Assistant, Advisor: Yuejie Chi.  
We propose an efficient and provable nonconvex optimization approach for multi-channel sparse blind deconvolution based on manifold gradient descent with random initialization.
- 2018.9–Present **Multiple Occupants Localization through Vibration Sensing**,  
*Dept. of Electrical and Computer Engineering, Carnegie Mellon University, Pittsburgh, USA*,  
Research Assistant, Advisor: Yuejie Chi, Shijia Pan, Pei Zhang, Hae Young Noh.  
We propose a non-intrusive pedestrian sensing system that localizes multiple pedestrians walking in a sensing area through ambient structural vibrations.
- 2016.8–2018.8 **Micro Hand Gesture Recognition System using Ultrasonic Active Sensing**,  
*Dept. of Electronic Engineering, Tsinghua University, Beijing, China*,  
Research Assistant, Advisor: Yimin Liu.  
We proposed a system, which uses micro dynamic hand gestures for recognition to achieve human–computer interaction (HCI). The implemented system, called hand-ultrasonic gesture (HUG), consists of ultrasonic active sensing, pulsed radar signal processing, and time-sequence pattern recognition by machine learning.
- 2017.7 – 2018 **Improving Pedestrian Safety in Urban Cities Using a Wearable Acoustic System**,  
*Intelligent and Connected Systems Lab, Columbia University, New York, USA*,  
Advisor: Xiaofan Jiang.  
This project aims at using an acoustic wearable system on the headset to detect and localize approaching cars in order to alert the pedestrian of the danger.
- 2016.5 – 9 **Collaborative Distributed System based on cars/Unmanned Aerial Vehicle Coordinated Formation Design**,  
*SRT (Students Research Training) program, Tsinghua University, Beijing, China*,  
Advisor: Yuan Shen.  
We developed a multiple robot collaborative localization and navigation system using a self-made mobile robot platform. The robots in our system are equipped with a wireless distributed localization system based on UWB(Ultra Wide Band), which enables them automatically to form a pre-defined formation with mutual localization information.

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## Work Experience

2017.3 – 6 **Momenta**, *Beijing, China*,  
Mentor: Gang Sun, Le Shan.

Momenta aims at building the “brains” for autonomous vehicles. Its deep-learning based software in perception, HD semantic mapping, and data-driven path planning enables full autonomy. I worked on displaying the HD semantic mapping of the road condition.

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## Projects

2016.1-11 **Non-Wearable Three-Dimensional Display and Interaction Cube Based on Multi-Screen**,  
(As team leader) *Tsinghua University, Beijing, China*,  
**Demo:** [https://youtu.be/Xa\\_WMTfhJIo](https://youtu.be/Xa_WMTfhJIo).

We designed a real-time virtual reality cubic interaction metaphor, arranged 5 LED panels into a cube to create a 3D object illusion, utilizing binocular vision to track user's eyes and rendering the perspective of each screen to fit the user's eyes positions. This work was awarded the **First Prize** in the 35th Academic Challenge Cup, the most outstanding project among Undergraduate Research Promotion Plan Competition, in Tsinghua University.

2016.1-8 **Air Hockey Robot Based on Moving Object Tracking**,  
*Tsinghua University, Beijing, China*.

We built a robot to play the air-hockey game with human. This robot consists of a suspension camera (capturing the moving ball) and an executive arm (a striking device with two degrees of freedom).

2016.2-6 **TI Automobile Electronic Design Competition**,  
*Tsinghua University, Beijing, China*.

We designed a smartphone-controlled car capable of automatical collision avoidance, using the TI development board and got **Top 2** in the competition.

2016.2-6 **TI Intelligent Car Competition**,  
*Tsinghua University, Beijing, China*.

We designed image signal processing algorithms for detecting the road condition to automatically run in the specific road and got **Top 4** in the competition.

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## Skills

Languages: C/C++, Python, Matlab, Verilog, etc.

Technologies: Tensorflow, Caffe, OpenGL, OpenCV, Altium Designer, OpenSceneGraph, OGRE, etc

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## Publications

- [1] Laixi Shi and Yuejie Chi. "Manifold Gradient Descent Solves Multi-channel Sparse Blind Deconvolution Provably and Efficiently." In submission.
- [2] Laixi Shi, Mostafa Mirshekari, Jonathon Fagert, Yuejie Chi, Hae Young Noh, Pei Zhang, and Shijia Pan. "Device-free Multiple People Localization through Floor Vibration." First ACM Workshop on Device-Free Human Sensing, 2019, New York, USA.
- [3] Sang Yu, Laixi Shi, and Yimin Liu. "Micro hand gesture recognition system using ultrasonic active sensing." IEEE Access 6 (2018): 49339-49347.