

# Shibo Zhang

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With a research focus on *machine learning*, *deep learning* and *human activity recognition*, I have

- rich experience in applying machine learning techniques to IoT sensor data and physiological signals.
- several best paper/poster awards in top ubiquitous computing venues.
- strong willingness to attack the hardest and most challenging problems and make a difference in our lives.

I am expected to graduate in the *summer of 2021*.

## Research Interests

Human Activity Recognition, Time Series Analysis, Machine Learning, Deep Learning, Physiological Sensing

## Employment

**Samsung Research America**, Research Intern, Mountain View, CA Jan - Apr, 2021

Designed and implemented a novel on-device multi-centroid classifier for fast time series classification using sensor fusion on earbuds platform.

**OPPO Research Institute**, Machine Learning Intern, Palo Alto, CA Jul - Sep, 2019

Improved hand pose estimation by developing a physical model based optimization method.

**DJI Technology**, Intern, Shenzhen Jul - Aug, 2015

Developed the control system for an automated vision-based ball-collecting quadrotor.

## Education

**Ph.D.**, Computer Science, Northwestern University 2017 - 2021

**M.S.**, Computer Science, Northwestern University 2015 - 2017

**B.S., M.S.**, Electrical Engineering, Harbin Institute of Technology 2008 - 2014

## Awards and Honors

### Paper Awards

Best Poster Award, UbiComp (2%) 2020

Best Presentation Runner-up Award, UbiComp (1.3%) 2020

Distinguished Paper Award, UbiComp/IMWUT (3.7%) 2019

Best Paper Award, ACM BodyNets 2016

Outstanding Undergraduate Thesis Award (3%) 2012

### Scholarships and Others

Student Travel Scholarship, NSF/Northwestern 2017, 2018

Best Intern Award, Eaton Corporate Research & Technology 2012, 2013

Eaton Innovation Scholarship, Undergraduate School 2012

Freescale Cup Autonomous Race Car Challenge, Regional Second Prize 2011

First-Class Scholarship, Undergraduate School 2008, 2009

## Selected Projects

### Deep Generative On-body Sensor Synthesis and Augmentation from Videos

- Propose a deep generative cross-modal model to synthesize on-body sensor data from videos. Experiments conducted on public sensor-based activity recognition datasets illustrate the validity of the synthetic data.
- Aims at expand on-body sensor dataset, by generating synthetic sensor data from video.

### Sensor Fusion for Complex Activity Detection

- Applied deep learning based multi-sensor (IMUs, respiration sensor, and GPS) fusion algorithms to detect daily activities including smoking and eating gestures in long-term wild settings.
- Proposed a time synchronization method to resolve the clock-sync issue between wearable-camera and on-body accelerometer. Published a paper on top conference Ubicomp as a co-first author.

### An Eating Detection Approach using a Multi-sensor Necklace

- Proposed a multi-sensor necklace based two-stage eating detection approach. Applied a periodic peak detection algorithm in large volume of time series data, followed by gradient boosting algorithm to detect eating activity in free living setting. A density-based clustering method is then used towards eating episode recognition.
- Published a first-author paper on top conference Ubicomp and won the Best Presentation Runner-up Award.

### Machine Learning based Feeding Gesture Detection Using a Smartwatch

- To detect overeating passively, a machine learning framework was designed to detect and accurately count the number of feeding gestures during an eating episode to characterize each eating episode.
- Published a first-author paper on ACM BodyNets and won the Best Paper Award.

## Publications

Please go to [Google Scholar](#) for a complete publication list.

### Journal Papers

- [1] SyncWISE: Window Induced Shift Estimation for Synchronization of Video and Accelerometry from Wearable Sensors  
Yun C. Zhang\*, **Shibo Zhang\***, Miao Liu, Elyse Daly, Samuel Battalio, Santosh Kumar, Bonnie Spring, James M. Rehg, Nabil Alshurafa (\* equal contribution)  
*Proc. ACM Interact. Mob. Wearable Ubiquitous Technol. (IMWUT/UbiComp)* 4.3 (Sept. 2020). 2020
- [2] 🦋 NeckSense: A Multi-Sensor Necklace for Detecting Eating Activities in Free-Living Conditions  
**Shibo Zhang**, Yuqi Zhao, Dzung Tri Nguyen, Runsheng Xu, Sougata Sen, Josiah Hester, Nabil Alshurafa  
*Proc. ACM Interact. Mob. Wearable Ubiquitous Technol. (IMWUT/UbiComp)* 4.2 (June 2020). 2020
- [3] Deep Learning Algorithms for Bearing Fault Diagnostics—A Comprehensive Review  
Shen Zhang, **Shibo Zhang**, Bingnan Wang, Thomas. G. Habetler  
*IEEE Access* 8 (2020) pp. 29857–29881. 2020
- [4] 🏆 micro-Stress EMA: A Passive Sensing Framework for Detecting In-the-wild Stress in Pregnant Mothers  
Zachary D. King, Judith Moskowitz, Begum Egilmez, **Shibo Zhang**, Lida Zhang, Michael Bass, John Rogers, Roozbeh Ghaffari, Laurie Wakschlag, Nabil Alshurafa  
*Proc. ACM Interact. Mob. Wearable Ubiquitous Technol. (IMWUT/UbiComp)* 3.3 (Sept. 2019). ACM, 2019
- [5] I Sense Overeating: Motif-based Machine Learning Framework to Detect Overeating Using Wrist-worn Sensing  
**Shibo Zhang**, William Stogin, Nabil Alshurafa  
*Information Fusion* 41 (2018) pp. 37–47. 2018

### Conference Papers

- [1] Deep Generative Cross-modal On-body Accelerometer Data Synthesis from Videos (Doctoral Colloquium)  
**Shibo Zhang**, Nabil Alshurafa  
*Adjunct Proceedings of the 2020 ACM International Joint Conference on Pervasive and Ubiquitous Computing and Proceedings of the 2020 ACM International Symposium on Wearable Computers (UbiComp/ISWC '20 Adjunct), September 12–16, 2020, Virtual Event, Mexico, 2020*

- [2] 🏆 VibroScale: Turning Your Smartphone into a Weighing Scale  
**Shibo Zhang**, Qiuyang Xu, Sougata Sen, Nabil Alshurafa  
*Adjunct Proceedings of the 2020 ACM International Joint Conference on Pervasive and Ubiquitous Computing and Proceedings of the 2020 ACM International Symposium on Wearable Computers (UbiComp/ISWC '20 Adjunct)*, September 12–16, 2020, Virtual Event, Mexico, 2020
- [3] Multiscale Directional Fusion for Depth Map Super Resolution with Denoising  
 Dan Xu, Xiaopeng Fan, **Shibo Zhang**, Yang Wang, Debin Zhao, Wen Gao  
*2019 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 2019
- [4] Estimating Caloric Intake in Bedridden Hospital Patients with Audio and Neck-worn Sensors  
**Shibo Zhang**, Dzung Nguyen, Gan Zhang, Runsheng Xu, Nikolaos Maglaveras, Nabil Alshurafa  
*2018 IEEE/ACM International Conference on Connected Health: Applications, Systems and Engineering Technologies (CHASE)*, 2018
- [5] HABits Necklace: A Neck-worn Sensor That Captures Eating Related Behavior and More  
**Shibo Zhang**, Dzung Nguyen, Zachary King, Jishnu Pradeep, Nabil Alshurafa  
*Proceedings of the 2018 ACM International Joint Conference and 2018 International Symposium on Pervasive and Ubiquitous Computing and Wearable Computers (UbiComp)*, 2018
- [6] When Generalized Eating Detection Machine Learning Models Fail in the Field?  
**Shibo Zhang**, Rawan Alharbi, Matthew Nicholson, Nabil Alshurafa  
*Proceedings of the 2017 ACM International Joint Conference on Pervasive and Ubiquitous Computing and Proceedings of the 2017 ACM International Symposium on Wearable Computers (UbiComp Workshops)*, 2017
- [7] 🏆 Food Watch: Detecting and Characterizing Eating Episodes Through Feeding Gestures  
**Shibo Zhang**, Rawan Alharbi, William Stogin, Mohamad Pourhomayun, Bonnie Spring, Nabil Alshurafa  
*Proceedings of the 11th EAI International Conference on Body Area Networks (BodyNets)*, 2016

## Academic Services

### Journal Reviewer

|   |             |
|---|-------------|
| Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT) | 2020, 2021  |
| Journal of Biomedical and Health Informatics (JBHI)   | 2019 - 2021 |
| Journal of Medical Internet Research (JMIR)   | 2020        |
| Journal of Vibration and Control (JVC)  | 2019, 2020  |
| IEEE Access   | 2019, 2020  |

### Conference Reviewer

|  |      |
|--|------|
| 24th ACM Conference on Computer-Supported Cooperative Work and Social Computing (CSCW) | 2021 |
| ACM CHI Conference on Human Factors in Computing Systems (CHI)                         | 2021 |
| The annual symposium on Computer-Human Interaction in Play (CHI PLAY)                  | 2020 |
| 22nd ACM International Conference on Multimodal Interaction (ICMI)                     | 2020 |
| 24th Annual International Symposium on Wearable Computers (ISWC)                       | 2020 |
| 18th Annual IEEE Conference on Pervasive Computing and Communications (PerCom)         | 2020 |
| IEEE-EMBS International Conference on Biomedical and Health Informatics (BHI)          | 2019 |

## Teaching

### Teaching Assistant

|   |            |
|---|------------|
| EECS 397/497 Wireless and Mobile Health (mHealth)                     | 2017, 2018 |
| ◦ Held office hours   |            |
| ◦ Designed programming homeworks, graded, assisted in course projects |            |

### Students Mentored

|   |                 |
|---|-----------------|
| Chixiang Wang (accepted as Dartmouth PhD student) | Nov, 2020 - now |
| Qiuyang Xu (now NU undergraduate)                 | Jun - Sep, 2020 |
| Fanfei Meng (now NU PhD student)                  | Jan - Jun, 2019 |
| Ziwei Dong (now Emory PhD student)                | Jun - Sep, 2018 |

## Skills

### Programming Language

Python (PyTorch, TensorFlow, Keras, Scikit-learn), Matlab, C/C++, R, bash, html, CSS, JavaScript

### Tools

AWS, Git, Docker

## References

Available upon request.