

# 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 - May, 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.