

HAO ZHOU

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RESEARCH INTERESTS

Internet of Things, Wearable Computing, Wireless Sensing, and Machine Learning

EDUCATION

The Pennsylvania State University <i>Doctor of Philosophy in Computer Science and Engineering</i>	State College, PA, USA <i>2021 - Present</i>
The University of Mississippi <i>Master of Science in Computer Science</i> <i>Bachelor of Science in Computer Science</i>	Oxford, MS, USA <i>2019 - 2021</i> <i>2016 - 2019</i>
North China University of Technology <i>Bachelor of Science in Computer Science</i>	Beijing, China <i>2014 - 2016</i>

HONORS & AWARDS

<i>Outstanding Teaching Assistant Award, The Pennsylvania State University</i>	2022
<i>Best Paper Award, SBAC-PAD 2021</i>	2021
<i>Summa Cum Laude, University of Mississippi (UM)</i>	2019
<i>International Undergraduate Student Scholarship, UM</i>	2017 - 2019
<i>National Scholarship for Exchange Student</i>	2016
<i>National Scholarship, Ministry of Education of the People's Republic of China</i>	2015
<i>Outstanding Freshmen, North China University of Technology</i>	2014

PUBLICATIONS

- [C.4] SignQuery: A Natural User Interface and Search Engine for Sign Language with Wearable Sensors
Hao Zhou, Taiting Lu, Kristina McKinnie, Joseph Palagano, Kenneth DeHaan, Mahanth Gowda
ACM MobiCom, 2023
- [C.3] One Ring to Rule Them All: An Open Source Smartring Platform for Finger Motion Analytics and Healthcare Applications
Hao Zhou*, Taiting Lu*, Yilin Liu, Shijia Zhang, Runze Liu, Mahanth Gowda
IEEE/ACM IoTDI, 2023
- [J.2] I am an Earphone and I can Hear my Users Face: 3D Facial Reconstruction using Smart Earphones
Shijia Zhang, Taiting Lu, **Hao Zhou**, Yilin Liu, Runze Liu, Mahanth Gowda
ACM Transactions on Internet of Things, 2023
- [J.1] Learning on the Rings: Self-Supervised 3D Finger Motion Tracking using Wearable Sensors
Hao Zhou*, Taiting Lu*, Yilin Liu, Shijia Zhang, Mahanth Gowda
ACM IMWUT/UbiComp 2022
- [C.2] DACHash: A Dynamic, Cache-Aware and Concurrent Hash Table on GPUs
Hao Zhou, David Troendle, Byunghyun Jang
IEEE SBAC-PAD 2021, (**Best Paper Award**)
- [C.1] Exploring Faster RCNN for Fabric Defect Detection
Hao Zhou, Byunghyun Jang, Yixin Chen, David Troendle
IEEE AI4I 2020

RESEARCH EXPERIENCE

Graduate Research Assistant,
The Pennsylvania State University
Advisor: Dr. Mahanth Gowda

September 2021 - Present
State College, PA, USA

- Sign Language Search Engines with Wearables
 - ⇒ Propose a system, *SignQuery*, to capture queries (signs in form of IMU signals) by Deaf users, and retrieve relevant documents from an online sign video database with diverse topics.
 - ⇒ Accessibility is greatly improved for Deaf users by having them search as hearing people on search engines such as Google, Bing, and Baidu.
- 3D Facial Expression Tracking with Smart Earphones
 - ⇒ Propose a system, *EarFace*, to continuously track facial expressions with acoustics.
 - ⇒ Leverage *FLAME* to render a realistic 3D face from 2D landmarks.
- Finger Motion Analytics and Healthcare Application using Smartrings
 - ⇒ Propose a system, *OmniRing*, to analyze finger motion and monitor health conditions.
 - ⇒ Harvest virtual IMU data from online videos to reduce the training overhead from the effort of collecting real IMU data; Inter-finger relation is learned based on the use of Transformer architectures to reduce the number of rings required.
 - ⇒ PPG sensor is incorporated for estimating health conditions such as heart rates.
- Finger Motion Tracking Aided by Self-supervised Learning
 - ⇒ Propose a system, *ssLOTR* that leverages the anatomical constraints of finger motions and deep learning modules to track 3D finger motion.
 - ⇒ Design a contrastive learning framework along with data augmentation techniques to learn better representations for IMU signals, by which only 15% labeled IMU data is necessary to achieve similar accuracy with its supervised counterpart.
 - ⇒ Conduct a systematic user study to demonstrate *ssLOTR* is robust to environments, sensor positions, etc., enabling a number of applications in augmented and virtual reality, sign language recognition, rehabilitation healthcare, sports analytic, etc., with the promise of ubiquitous finger motion tracking.

Graduate Research Assistant,
The University of Mississippi
Advisor: Dr. Byunghyun Jang

September 2019 - May 2021
Oxford, MS, USA

- Develop a Concurrent Data Structure (Hash Table) on GPU
 - ⇒ Optimize hash table performance by considering memory access pattern and thread divergence.
 - ⇒ Utilize warp synchronization to minimize thread divergence.
 - ⇒ Leverage fast cache for data re-usage.
- One class model for solving fabric defect detection
 - ⇒ Utilize Gabor filters
 - ⇒ Leverage Variational Autoencoder to reduce the dimension of Gabor features.
 - ⇒ Nearest Neighbor density estimation for detection.
- Optimized Faster Region-Based Convolutional Neural Network(Faster RCNN) for fabric defect detection
 - ⇒ Studied how Faster RCNN works as a two-stage object detector.
 - ⇒ Analyzed performance of Faster RCNN on fabric images.

Undergraduate Research Assistant,
The University of Mississippi
Advisor: Dr. H. Conrad Cunningham

September 2017 - September 2018
Oxford, MS, USA

- Develop a tool that extends the Markdown source format to enable the specification of more accessible interactive and multimedia features. This work potentially enhances the ability of authors and publishers to produce broadly accessible documents.

WORK EXPERIENCE

Graduate Teaching Assistant

The Pennsylvania State University

State College, PA, USA

CMPEN 462: Wireless Communication Systems and Security, Spring 2022

- Helped students understand the concepts in linear algebra, wireless communications, and state-of-the-art systems in wireless sensing, mobile computing, etc.
- Assisted students in a distance estimation project where acoustics signals are leveraged.

Undergraduate Teaching Assistant

September 2018 - September 2019

The University of Mississippi

Oxford, MS, USA

- Tutored students taking computer science courses (e.g., Java, C/C++, and Data Structure) in their assignments and projects
- Assisted instructor in grading students' programming assignments for Organization of Programming Languages

PROFESSIONAL SERVICE

Invited Reviewer for IMWUT

2023

Invited Reviewer for Journal of Intelligent Manufacturing

2022

Student Volunteer @ MobiQuitous '22

2022