SHIJIA PAN

Contact Information

University of California
SE2 Room 274
5200 N Lake Rd, Merced
CA, 95343, USA

Voice: (412)354-1876
E-mail: span24@ucmerced.edu
Lab Website: www.pans-lab.com
Google Scholar ID: oauqR3wAAAAJ

Areas of Interests

Cyber-physical sensing systems;
Internet-of-Things (IoT);
Vibration/acoustic-based sensing;
Ubiquitous computing;
Continual and multimodal learning for IoT

Academic Positions

University of California, Merced, Merced, CA, USA — **September, 2019 - present**
Assistant Professor
Computer Science and Engineering

Carnegie Mellon University, Pittsburgh, PA, USA — **July, 2018 - June, 2019**
Postdoctoral Research Associate
ECE and CEE Joint Appointment

Intelligent Fabric LLC, Pleasanton, CA, USA — **July, 2018 - February, 2020**
Research Advisor

Education

Carnegie Mellon University, Moffett Field, CA, 94043, USA

Ph.D. Electronic and Computer Engineering — **August, 2012 - May, 2018**
- Advisors: Professor Pei Zhang (ECE), Professor Hae Young Noh (CEE)
- Thesis title: Indoor human information acquisition from physical vibrations.

University of Science and Technology of China, Hefei, Anhui P.R.China

B.Eng Computer Science — **September, 2007 - July, 2012**
- Exchange scholar at CMU in 2010
- Exchange student at HK PolyU in 2009

Selected Honors and Awards

IPSN 2022 Best Poster Award	**2022**
Ubicomp 2nd Nurse Care Activity Recognition Challenge Best Paper Award	**2020**
2019 Best Journal Paper Award (by ASME SHM/NDE Technical Committee)	**2020**
IoTDI 2020 Best Paper Award	**2020**
BuildSys 2019 Best Demo Award	**2019**
IPSN 2019 Best Poster Award	**2019**
N2Women Young Researcher Fellowship	**2018**
Rising Stars in EECS	**2018**
BuildSys 2017 Audience Choice Award	**2017**
SenSys 2017 Doctoral Colloquium Best Presentation Award	**2017**
SenSys 2016 Best Poster Award	**2016**
IPSN 2015 Best Poster Award	**2015**
Nick G. Vlahakis Graduate Fellowship	**2013**
N2Women Student Fellowship	**2012**
UbiComp 2011 Best Demo Award	**2011**
Google Anita Borg Scholarship (China)	**2011**

Student Travel Grants: SenSys (2012, 2017), HotMobile (2015, 2018), CPS Week (2015, 2018)

Selected Research Projects

Sense for Less: Physics-Informed Cyber-Physical Sensing Augmentation **2019-**
University of California, Merced
My role: PI
This project presents a transdisciplinary framework to assess and adapt cyber-physical systems (CPS) and Internet-of-Things (IoT) systems in real-world deployments, aiming to systematically enhance their information inference accuracy and reduce the required resources (cost, labor, labeling, data). For CPS/IoT systems relying on real-world sensor data to realize decision making, sensing (data acquisition) quality directly affects the information representative as well as the model accuracy in various applications. We combine physical and data-driven knowledge to design metrics and methods to assess the acquired sensor data quality for particular sensing tasks. The task-oriented sensing quality assessments are used for:

- Collaboratively sensing system adaptation to optimize data quality by adapting the deployment configuration and to reduce resources needed.
- Enable easy installation and maintenance of the smart systems and large scale deployments through shared context observe by multimodal systems.
- Fair dataset quality comparison for system performance evaluation and datasets sharing.

Continual Cross-modal Learning for IoT Systems **2019-**
University of California, Merced
My role: PI
The heterogeneity of cyber-physical systems brings challenges and opportunities for various applications. Our goal is to explore new methods to combine the complementary characteristics of multiple sensing modalities, especially between infrastructural and mobile sensing, for accurate fine-grained learning with limited (labeled) data.

- **Application 1**: Elderly In-home Long-term Monitoring.
  Monitoring older adults' walking patterns and analyzing their fall risk is essential for fall prevention. Prior technologies such as computer vision or audio sensing raise privacy issues for long-term home monitoring scenarios. We look into an alternative solution through structural (e.g., floor) vibration (infrastructural sensing) and wearables (mobile sensing). By utilizing their complementary sensing properties and shared context, we can obtain high-fidelity data for older adults' information learning and modeling.
- **Application 2**: Autonomous Retail.
  We utilize the complementary characteristics of multiple sensing modalities including computer vision, weight, and location information of the items to achieve accurate autonomous retail and store inventory management.

Indoor Human Information Acquisition from Physical Vibration **2013-2019**
Carnegie Mellon University
Advisors: Professor Pei Zhang, Professor Hae Young Noh
My role: initiating and leading the project
A smart building's ability to gather information about its occupants (number, location, identity, etc.) is essential to the new generation of smart building applications, such as energy management, space management, etc. Our system utilizes measurements of structural vibrations to sense indoor pedestrian information. A number of challenges appear when exploring human-induced structural vibration, and I focus on **combining physical and data-driven knowledge** to guide sensing and learning. To be more specific, I explore the following aspects:

- **Sensing System** Obtaining high fidelity vibration signals for human information learning is challenging due to the rapid change of human footstep locations. Utilizing the model of human movement in a space to predict the optimal hardware setting for human vibration sensing allows us to obtain high resolution and low distortion human-induced vibration signals.
- **Signal Characterization** Humans interact with structures in various ways which may induce different types of waves (e.g., impact, friction). Understanding the wave properties allows us

to extract the signal characteristics accurately.

- **Information Learning/Inferring** Human-centric sensing and learning face a challenge in getting labeled data for different sensing conditions. However, the data distribution change is correlated with physical phenomena that can be measured. Utilizing transfer learning iteratively guided by these physical measurements allows high prediction accuracy through each iteration while covering a large range of data distribution changes.

Grants

Gift from AiFi Inc. ($80,000, Sole-PI). **2022-2023**

Academic Senate Faculty Research Grants Program ($10,000, Co-PI). **2022-2023**
"Smart Kiosk for Raising Awareness of Recycling in the UC Merced Community".

Academic Senate Faculty Research Grants Program ($10,000, Sole-PI). **2021-2022**
"TeethVib: Detecting Teeth Ill-Fitting Through Mouth-Guard Vibration Sensing".

CITRIS Seed Funding Program Award ($60,000, Co-PI). **2020-2022**
"Data-Driven Fall Prevention Intervention for Older Adults".

Journal Publication

Note: primarily advised students are underlined

[J19] Tanmay Srivastava, Prerna Khanna, **Shijia Pan**, Phuc Nguyen, Shubham Jain. "MuteIt: Jaw Motion Based Unvoiced Command Recognition Using Earable". In Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT) 6, no. 3 (2022): 39.

[J18] Shubham Rohal, Yue Zhang, Carlos Ruiz, **Shijia Pan**. "AutoLoc: Autonomous Sensor Location Configuration via Cross-Modal Sensing". Frontiers in Big Data, 5:835949 (2022)

[J17] Yue Zhang, Zhizhang Hu, Susu Xu, **Shijia Pan**. "AutoQual: Task-Oriented Structural Vibration Sensing Quality Assessment Leveraging Co-Located Mobile Sensing Context." CCF Transactions on Pervasive Computing and Interaction. Accepted 2021/06.

[J16] Mostafa Mirshekari, Jonathon Fagert, **Shijia Pan**, Pei Zhang, Hae Young Noh. "Obstruction-Invariant Occupant Localization Using Footstep-Induced Structural Vibrations." Mechanical Systems and Signal Processing. Accepted 2020/11.

[J15] Jonathon Fagert, Mostafa Mirshekari, **Shijia Pan**, Linda Lowes, Megan Iammarino, Pei Zhang, Haeyoung Noh. Structure- and "Sampling-Adaptive Gait Balance Symmetry Estimation Using Footstep Induced Structural Floor Vibrations." Journal of Engineering Mechanics, Accepted 2020/10.

[J14] Joao Diogo Falcao, Carlos Ruiz, **Shijia Pan**, Hae Young Noh, Pei Zhang. "FAIM: Vision and Weight Sensing Fusion Framework for Autonomous Inventory Monitoring in Convenience Stores". Frontiers in Built Environment, section Structural Sensing, Accepted 2020/09.

[J13] **Shijia Pan**, Mario Berges, Juleen Rodakowski, Pei Zhang, Hae Young Noh. "Fine-grained Activity of Daily Living (ADL) Recognition through Heterogeneous Sensing Systems with Complementary Spatiotemporal Characteristics". Frontiers in Built Environment, section Structural Sensing, Accepted 2020/09.

[M12] Pei Zhang, **Shijia Pan**, Mostafa Mirshekari, Jonathon Fagert and Haeyoung Noh, "Structures as Sensors: Indirect Sensing for Inferring Users and Environments" in Computer, vol. 52, no. 10, pp. 84-88, 2019.

[J11] Mostafa Mirshekari, Jonathon Fagert, **Shijia Pan**, Pei Zhang and Hae Young Noh. "Step-

Level Occupant Detection across Different Structures through Footstep-Induced Floor Vibration using Model Transfer." Journal of Engineering Mechanics 146, no. 3 (2020): 04019137.
Impact factor 2.264. Received the 2019 Best Journal Paper Award by the ASME SHM/NDE Technical Committee.

[J10] Xinlei Chen, Yu Wang, Jiayou He, **Shijia Pan**, Yong Li, Pei Zhang. "CAP: Context-aware App Usage Prediction with Heterogeneous Graph Embedding." In Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT) 2019.

[J9] Ji Jia, Chengtian Xu, **Shijia Pan**, Stephen Xia, Peter Wei, Hae Young Noh, Pei Zhang, and Xiaofan Jiang. "Conductive Thread-Based Textile Sensor for Continuous Perspiration Level Monitoring." Sensors, 18(11), 3775.
Impact factor 2.475.

[J8] **Shijia Pan**, Mostafa Mirshekari, Jonathon Fagert, Carlos Ruiz, Hae Young Noh, and Pei Zhang. "Area Occupancy Counting through Sparse Ambient Structural Vibration Sensing." IEEE Pervasive Computing Special Issue - IoT Communication.

[J7] Carlos Ruiz, **Shijia Pan**, Adeola Bannis, Xinlei Chen, Carlee Joe-Wong, Hae Young Noh, Pei Zhang. "IDrone: Robust Drone Identification through Motion Actuation Feedback. " In Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT) 2018.

[J6] Jun Han, **Shijia Pan**, Manal Kumar Sinha, Hae Young Noh, Pei Zhang and Patrick Tague. "Smart Home Occupant Identification via Sensor Fusion Across On-Object Devices. " Fast-tracked at ACM Transactions on Sensor Networks (TOSN) - Special Issue on Systems for Smart and Efficient Built Environments, 2018.
Impact factor 2.313.

[J5] Mostafa Mirshekari, **Shijia Pan**, Jonathon Fagert, Eve Schooler, Pei Zhang and Hae Young Noh. "Occupant Localization using Footstep-Induced Structural Vibration." Mechanical Systems and Signal Processing 112 (2018): 77-97.
Impact factor 3.99.

[J4] **Shijia Pan**, Mostafa Mirshekari, Jonathon Fagert, Ceferino Gabriel Ramirez, Albert Jin Chung, Chih Chi Hu, John Paul Shen, Pei Zhang, and Hae Young Noh. "Characterizing human activity induced impulse and slip-pulse excitations through structural vibration." Journal of Sound and Vibration 414 (2018): 61-80.
Impact factor 2.593.

[J3] Xinlei Chen, Aveek Purohit, **Shijia Pan**, Carlos Ruiz, Jun Han, Zheng Sun, Frank Mokaya, Patrick Tague and Pei Zhang. "Design Experiences in Minimalistic Flying Sensor Node Platform through SensorFly." Transactions on Sensor Networks (TOSN), vol. 13, no. 4 (2017).
Impact factor 2.313.

[J2] **Shijia Pan**, Tong Yu, Mostafa Mirshekari, Jonathon Fagert, Amelie Bonde, Ole J. Mengshoel, Hae Young Noh, and Pei Zhang. "FootprintID: Indoor Pedestrian Identification through Ambient Structural Vibration Sensing." In Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT) 1, no. 3 (2017): 89.
Acceptance rate = 23.9%

[J1] **Shijia Pan**, Susu Xu, Mostafa Mirshekari, Pei Zhang, and Hae Young Noh. "Collaboratively Adaptive Vibration Sensing System for High Fidelity Monitoring of Structural Responses Induced by Pedestrians." Frontiers in Built Environment 3 (2017): 28.

FULLY PEER REVIEWED PUBLICATION

Note: primarily advised students are underlined

[C20] Hamid Rajabi, Zhizhang Hu, Xianzhong Ding, Shijia Pan, Wan Du, and Alberto Cerpa. "MODES: M ulti-sensor o ccupancy d ata-driven e stimation s ystem for smart buildings." In Proceedings of the Thirteenth ACM International Conference on Future Energy Systems, pp. 228-239. 2022.

[C19] Zhizhang Hu, Yue Zhang, Tong Yu, Shijia Pan. "VMA: Domain Variance- and Modality-Aware Model Transfer for Fine-Grained Occupant Activity Recognition". In Proceedings of the 21th ACM/IEEE International Conference on Information Processing in Sensor Networks (IPSN 2022).
Acceptance rate = 30%

[C18] **Shijia Pan**, Dong Yoon Lee, Jun Ho Lee, and Phuc Nguyen. "TeethVib: Monitoring Teeth Functional Occlusion Through Retainer Vibration Sensing." Accepted by the IEEE/ACM international conference on Connected Health: Applications, Systems and Engineering Technologies (CHASE 2021).
Acceptance rate = 41%

[C17] Gang Wang, **Shijia Pan**, and Susu Xu. "Decoupling the Unfairness Propagation Chain in Crowd Sensing and Learning Systems for Spatio-temporal Urban Monitoring." Accepted by the 8th ACM International Conference on Systems for Built Environments (BuildSys'21).
Acceptance rate = 26%

[C16] Amelie Bonde, Jesse Codling, Kanittha Naruethep, Yiwen Dong, Wachirawich Siripaktanakon, Sripong Ariyadech, Akkarit Sangpetch, Orathai Sangpetch, **Shijia Pan**, Hae Young Noh, Pei Zhang. "PigNet: Failure-Tolerant Pig Activity Monitoring System Using Structural Vibration." In Proceedings of the 20th ACM/IEEE International Conference on Information Processing in Sensor Networks (IPSN 2021).
Acceptance rate = 25%

[W15] Prerna Khanna, Tanmay Srivastava, **Shijia Pan**, Shubham Jain, and VP Nguyen. "JawSense: Recognizing Unvoiced Sound using a Low-cost Ear-worn System." In Proceedings of the 22nd International Workshop on Mobile Computing Systems and Applications, pp. 44-49. 2021.
Acceptance rate = 36%

[C14] Amelie Bonde, **Shijia Pan**, Mostafa Mirshekari, Carlos Ruiz, Hae Young Noh, and Pei Zhang. "OAC: Overlapping Office Activity Classification through IoT-Sensed Structural Vibration." In 2020 IEEE/ACM Fifth International Conference on Internet-of-Things Design and Implementation (IoTDI), pp. 216-222. IEEE, 2020.
Acceptance rate = 35%

[C13] Carlos Ruiz, **Shijia Pan**, Adeola Bannis, Ming-Po Chang, Hae Young Noh, and Pei Zhang. "IDIoT: Towards Ubiquitous Identification of IoT Devices through Visual and Inertial Orientation Matching During Human Activity." In 2020 IEEE/ACM Fifth International Conference on Internet-of-Things Design and Implementation (IoTDI), pp. 40-52. IEEE, 2020.
Acceptance rate = 35%, the Best Paper Award

[C12] **Shijia Pan**, Mario Berges, Juleen Rodakowski, Pei Zhang, and Hae Young Noh. "Fine-Grained Activities of Daily Living Recognition through Structural Vibration and Electrical Sensing." In the Proceeding of the 6th ACM International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation (BuildSys' 19), November, 2019.
Acceptance rate = 30%

[C11] Carlos Ruiz, Joao Falcao, **Shijia Pan**, Hae Young Noh, and Pei Zhang. "AIM3S: Autonomous Inventory Monitoring through Multi-Modal Sensing for Cashier-Less Convenience Stores." In the Proceeding of the 6th ACM International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation (BuildSys' 19), November, 2019.
Acceptance rate = 30%

[C10] Jun Han, Albert Chung, Manal Kumar Sinha, Madhumitha Harishankar, **Shijia Pan**, Hae Young Noh, Pei Zhang, and Patrick Tague. "Do You Feel What I Hear? Enabling Autonomous IoT Device Pairing using Different Sensor Types." In the Proceedings of the IEEE Symposium on Security & Privacy, May 2018.
Acceptance rate = 11.5%

[W9] **Shijia Pan**, Carlos Ruiz, Jun Han, Adeola Bannis, Patrick Tague, Hae Young Noh and Pei Zhang. "UniverSense: IoT Device Pairing through Heterogeneous Sensing Signals." In Proceedings of the 16th International Workshop on Mobile Computing Systems and Applications. ACM, 2018.
Acceptance rate = 29.2%

[W8] Amelie Bonde, **Shijia Pan**, Zhenhua Jia, Yanyong Zhang, Hae Young Noh and Pei Zhang. "VRRM: Vehicular Vibration-based Heart RR-Interval Monitoring System." In Proceedings of the 16th International Workshop on Mobile Computing Systems and Applications, ACM, 2018.
Acceptance rate = 29.2%

[C7] Jun Han, **Shijia Pan**, Manal Kumar Sinha, Hae Young Noh, Pei Zhang and Patrick Tague. "SenseTribute: Smart Home Occupant Identification via Fusion Across On-Object Sensing Devices." In Proceedings of the 4th ACM International Conference on Systems for Energy-Efficient Built Environments (BuildSys 2017).
Acceptance rate = 31.3%, Audience's Choice Award

[C6] **Shijia Pan**, Ceferino Gabriel Ramirez, Mostafa Mirshekari, Jonathon Fagert, Albert Jin Chung, Chih Chi Hu, John Paul Shen, Hae Young Noh, and Pei Zhang. "SurfaceVibe: vibration-based tap & swipe tracking on ubiquitous surfaces." In Proceedings of the 16th ACM/IEEE International Conference on Information Processing in Sensor Networks (IPSN 2017), pp. 197-208. 2017.
Acceptance rate = 18.3%

[W5] **Shijia Pan**, Ningning Wang, Yuqiu Qian, Irem Velibeyoglu, Hae Young Noh, and Pei Zhang. "Indoor person identification through footstep induced structural vibration." In Proceedings of the 16th International Workshop on Mobile Computing Systems and Applications. ACM, 2015.
Acceptance rate = 28.8%

[C4] Aveek Purohit, Zheng Sun, **Shijia Pan**, and Pei Zhang. "Sugartrail: Indoor navigation in retail environments without surveys and maps." In Proceedings of the 10th Annual IEEE Communications Society Conference on Sensor, Mesh and Ad Hoc Communications and Networks (SECON), 2013 , pp. 300-308. IEEE, 2013.
Acceptance rate = 29.5%

[C3] Zheng Sun, **Shijia Pan**, Yu-Chi Su, and Pei Zhang. "Headio: zero-configured heading acquisition for indoor mobile devices through multimodal context sensing." In Proceedings of the 2013 ACM international joint conference on Pervasive and ubiquitous computing (Ubicomp 2013), pp. 33-42. ACM, 2013.
Acceptance rate = 23.4%

[W2] Zheng Sun, Aveek Purohit, **Shijia Pan**, Frank Mokaya, Raja Bose, and Pei Zhang. "Polaris: getting accurate indoor orientations for mobile devices using ubiquitous visual patterns on ceilings." In Proceedings of the Twelfth Workshop on Mobile Computing Systems & Applications, p. 14.

ACM, 2012.
Acceptance rate = 21.6%

[C1] Zheng Sun, Aveek Purohit, Kaifei Chen, **Shijia Pan**, Trevor Pering, and Pei Zhang. "PANDAA: physical arrangement detection of networked devices through ambient-sound awareness." In Proceedings of the 13th international conference on Ubiquitous computing (Ubicomp 2011), pp. 425-434. ACM, 2011.
Acceptance rate = 16.6%

Conference and Workshop Publication

Note: primarily advised students are underlined

[W24] Shubham Rohal, Shreya Shriram, V. P. Nguyen, and Shijia Pan. "FinePose: Fine-Grained Postural Muscle Profiling via Haptic Vibration Signals." In Proceedings of the 2022 Workshop on Body-centric Computing Systems, pp. 19-24. 2022.

[W23] Zhizhang Hu, Yue Zhang, **Shijia Pan**. "Footstep-Induced Floor Vibration Dataset: Reusability and Transferability Analysis". In Proceedings of the 19th ACM Conference on Embedded Networked Sensor Systems, pp. 546-551. 2021. (DATA '21).

[W22] Tong Yu, Yue Zhang, Zhizhang Hu, Susu Xu, **Shijia Pan**. "Vibration-Based Indoor Human Sensing Quality Reinforcement via Thompson Sampling." In Proceedings of the 1st ACM Workshop on Cyber-Physical Human Sensing, part of CPS-IoT Week 2021. (Invited Paper)

[W21] **Shijia Pan**, and Phuc Nguyen. "Opportunities in the Cross-Scale Collaborative Human Sensing of'Developing'Device-Free and Wearable Systems." In Proceedings of the 2nd ACM Workshop on Device-Free Human Sensing, pp. 16-21. 2020.

[W20] Zhizhang Hu, Tong Yu, Yue Zhang, **Shijia Pan**. "Fine-grained Activities Recognition with Coarse-grained Labeled Multi-modal Data." In the 2nd Workshop on Continual and Multimodal Learning for Internet of Things, September 2020.

[W19] Lixing He, Carlos Ruiz, Mostafa Mirshekari, **Shijia Pan**. "SCSV2: Physics-informed Self-Configuration Sensing through Vision and Vibration Context Modeling." In the 3rd Workshop on Combining Physical and Data-Driven Knowledge in Ubiquitous Computing, September 2020.

[W18] Yiwen Dong, Jingxiao Liu, Yitao Gao, Sulagna Sarkar, Zhizhang Hu, Jonathon Fagert, **Shijia Pan**, Pei Zhang, Hae Young Noh, Mostafa Mirshekari. "A Window-Based Sequence-to-One Approach with Dynamic Voting for Nurse Care Activity Recognition Using Acceleration-Based Wearable Sensor." In the 2nd Nurse Care Activity Recognition Challenge, as part of the Ubicomp 2020.
Best Paper Award

[arXiv17] Madhumitha Harishankar, Jun Han, Sai Vineeth Kalluru Srinivas, Faisal Alqarni, Shi Su, **Shijia Pan**, Hae Young Noh, Pei Zhang, Marco Gruteser, and Patrick Tague. "LaNet: Realtime Lane Identification by Learning Road SurfaceCharacteristics from Accelerometer Data." arXiv preprint arXiv:2004.02822 (2020).

[W16] Yue Zhang, Lin Zhang, Hae Young Noh, Pei Zhang, and **Shijia Pan**. "A Signal Quality Assessment Metrics for Vibration-based Human Sensing Data Acquisition." In the 2nd Workshop on Data Acquisition to Analysis. November 10, 2019, New York, NY, USA.

[W15] Laixi Shi, Mostafa Mirshekari, Jonathon Fagert, Yuejie Chi, Hae Young Noh, Pei Zhang, and **Shijia Pan**. "Device-free Multiple People Localization through Floor Vibration." In the 1st ACM International Workshop on Device-Free Human Sensing, November 10, 2019, New York, NY, USA.

[W14] Zhizhang Hu, Emre Sezgin, Simon Lin, Pei Zhang, Hae Young Noh, and **Shijia Pan**. "Device-free Sleep Stage Recognition through Bed Frame Vibration Sensing." In the 1st ACM International Workshop on Device-Free Human Sensing, November 10, 2019, New York, NY, USA.

[W13] Carlos Ruiz, **Shijia Pan**, Hae Young Noh, and Pei Zhang. "WhereWear: Calibration-free Wearable Device Identification through Ambient Sensing." In The 5th ACM Workshop on Wearable Systems and Applications (WearSys19), June 21, 2019, Seoul, Republic of Korea.
Invited paper.

[W12] Amelie Bonde, **Shijia Pan**, Orathai Sangpetch, Akkarit Sangpetch, Woranun Woramontri, and Pei Zhang. "Structural vibration sensing to evaluate animal activity on a pig farm." In the 1st Workshop on Data Acquisition to Analysis. pp. 25-26. 2018.

[W11] Yue Zhang, **Shijia Pan**, Jonathon Fagert, Mostafa Mirshekari, Hae Young Noh, Pei Zhang, and Lin Zhang. "Occupant Activity Level Estimation Using Floor Vibration." In Proceedings of the 2018 ACM International Joint Conference and 2018 International Symposium on Pervasive and Ubiquitous Computing and Wearable Computers, pp. 1355-1363. ACM, 2018.

[W10] Tong Yu*, **Shijia Pan***, Susu Xu, Mostafa Mishakeri, Jonathon Fagert, Xinlei Chen, Haeyoung Noh, Pei Zhang and Ole J. Mengshoel. "ILPC: Iterative Learning using Physical Constraints in Real-world Sensing Data." AAAI Workshop SmartIoT 2018.
*equal contribution among authors

[W9] Jonathon Fagert, Mostafa Mirshekari, **Shijia Pan**, Pei Zhang, and Hae Young Noh. "Monitoring Hand-Washing Practices using Structural Vibrations." In Proceedings of the 11th International Workshop on Structural Health Monitoring, Stanford University, Stanford, CA, USA, September 2017.

[C8] Jonathon Fagert, Mostafa Mirshekari, **Shijia Pan**, Pei Zhang, and Hae Young Noh. "Characterizing Left-Right Gait Balance Using Footstep-Induced Structural Vibrations." In SPIE Smart Structures and Materials+ Nondestructive Evaluation and Health Monitoring, pp. 1016819-1016819. International Society for Optics and Photonics, Portland, Oregon, United States, March 2017.

[W7] Ji Jia, Chengtian Xu, **Shijia Pan**, Stephen Xia, Peter Wei, Hae Young Noh, Pei Zhang, and Xiaofan Jiang. "Moisture Based Perspiration Level Estimation." Ubicomp Workshop CPD 2018.

[W6] Xinlei Chen, Xiangxiang Xu, Xinyu Liu, **Shijia Pan**, Jiayou He, Hae Young Noh, Lin Zhang, Pei Zhang. "PGA: Physics Guided and Adaptive Approach for Mobile Fine-Grained Air Pollution Estimation." Ubicomp Workshop CPD 2018.

[C5] **Shijia Pan**, Mostafa Mirshekari, Pei Zhang, and Hae Young Noh. "Occupant traffic estimation through structural vibration sensing." SPIE Smart Structures and Materials+ Nondestructive Evaluation and Health Monitoring (2016): 980306-980306.

[C4] Mostafa Mirshekari, **Shijia Pan**, Pei Zhang, and Hae Young Noh. "Characterizing wave propagation to improve indoor step-level person localization using floor vibration." SPIE Smart Structures and Materials+ Nondestructive Evaluation and Health Monitoring (2016): 980305-980305.

[C3] Lam, Mike, Mostafa Mirshekari, **Shijia Pan**, Pei Zhang, and Hae Young Noh. "Robust occupant detection through step-induced floor vibration by incorporating structural characteristics." In Dynamics of Coupled Structures, Volume 4, pp. 357-367. Springer International Publishing, 2016.

[C2] **Shijia Pan**, Amelie Bonde, Jie Jing, Lin Zhang, Pei Zhang, and Hae Young Noh. "BOES: building occupancy estimation system using sparse ambient vibration monitoring." SPIE Smart Structures

and Materials+ Nondestructive Evaluation and Health Monitoring (2014): 90611O-90611O.

[W1] **Shijia Pan**, An Chen, and Pei Zhang. "Securitas: user identification through RGB-NIR camera pair on mobile devices." In Proceedings of the Third ACM workshop on Security and privacy in smartphones & mobile devices, pp. 99-104. ACM, 2013.

Selected Poster/ Demo/ Abstract/ Talk

[P18] Tanmay Srivastava, Prerna Khanna, Shijia Pan, Phuc Nguyen, and Shubham Jain. "Leveraging earables for unvoiced command recognition." In Proceedings of the 20th Annual International Conference on Mobile Systems, Applications and Services, pp. 622-623. 2022.

[P17] Shreya Shriram, Shubham Rohal, Zhizhang Hu, Yue Zhang, Phuc Nguyen, and Shijia Pan. "Sedentary Posture Muscle Monitoring via Active Vibratory Sensing." In 2022 21st ACM/IEEE International Conference on Information Processing in Sensor Networks (IPSN), pp. 531-532. IEEE, 2022.

[P16] Dong Yoon Lee, Zhizhang Hu, Quan Do, Phuc Nguyen, and Shijia Pan. "Demo Abstract: Real-Time Teeth Functional Occlusion Monitoring via In-Mouth Vibration Sensing." In 2022 21st ACM/IEEE International Conference on Information Processing in Sensor Networks (IPSN), pp. 505-506. IEEE, 2022.

[P15] Zhizhang Hu, Yue Zhang, **Shijia Pan**. "Poster Abstract: Vibration-based Indoor Occupant Gait Monitoring with Robot Vacuum Cleaners." In the 6th ACM/IEEE Conference on Internet of Things Design and Implementation (IoTDI 2021, part of CPS-IoT Week 2021).

[P14] Yue Zhang, Susu Xu, Laixi Shi, **Shijia Pan**. "Poster: Using Mobile Sensing to Enable the Signal Quality Assessment for Infrastructure Sensing Systems." In the 21st Annual International Workshop on Mobile Computing Systems and Applications (ACM HotMobile 2020).

[P13] Laixi Shi, Yue Zhang, **Shijia Pan**, Yuejie Chi. "Poster: Data Quality-Informed Multiple Occupant Localization using Floor Vibration Sensing." In the 21st Annual International Workshop on Mobile Computing Systems and Applications (ACM HotMobile 2020).

[D12] Carlos Ruiz, Joao Falcao, **Shijia Pan**, Hae Young Noh, and Pei Zhang. "Demo Abstract: Autonomous Inventory Monitoring through Multi-Modal Sensing (AIM3S) for Cashier-Less Stores." In the Proceeding of the 6th ACM International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation (BuildSys' 19), November, 2019.
Best Demo Award

[T11] Jonathon Fagert, Mostafa Mirshekari, **Shijia Pan**, Pei Zhang, and Hae Young Noh. "Vibration source characterization for human gait health monitoring using footstep-induced floor vibrations." Engineering Mechanics Institute (EMI) Conference 2019, 18 - 21 June 2019, Caltech.

[P10] Jonathon Fagert, Mostafa Mirshekari, **Shijia Pan**, Pei Zhang, and Hae Young Noh. "Poster Abstract: Gait Health Monitoring through Footstep-Induced Floor Vibrations." ACM IPSN 2019, Montreal, April 2019.
Best Poster Award

[A9] **Shijia Pan**, Mostafa Mirshekari, Jonathon Fagert, Pei Zhang, Hae Young Noh. (2018). "Collaborative Sensor Grouping for Indoor Human Sensing through Structural Characterization." The 7th World Conference on Structural Control and Monitoring (WCSCM), 2018, Qingdao, China.

[T8] Mostafa Mirshekari, Jonathon Fagert, **Shijia Pan**, Pei Zhang, Hae Young Noh. (2018). "Human Health Tracking through Gait-Induced Floor Vibrations Across Different Structures." 2018 ASCE Engineering Mechanics Institute Conference, Boston, MA.

Best Student Paper Award (from Dynamics Committee)

[A7] **Shijia Pan**. "Structure as Sensors: Learning Indoor Human Information from Physical Vibrations." ACM SenSys 2017 Doctoral Colloquium, Delft, Netherlands, November 2017.
Best Presentation Award

[P6] **Shijia Pan**, Kent Lyons, Mostafa Mirshekari, Hae Young Noh, and Pei Zhang. "Poster Abstract: Multiple Pedestrian Tracking through Ambient Structural Vibration Sensing." ACM SenSys 2016, Stanford, CA, USA, November 2016.
Best Poster Award

[P5] Mostafa Mirshekari, **Shijia Pan**, Adeola Bannis, YPM Lam, Pei Zhang, Hae Young Noh. "Step-level person localization through sparse sensing of structural vibration." ACM IPSN 2015, Seattle, April 2015.
Best Poster Award

[P4] Adeola Bannis, **Shijia Pan**, and Pei Zhang. "Towards Targeted Gestures: Adding Directional Context to Gestures Using Doppler Effect." ACM Ubicomp 2014, Seattle, USA, September 2014

[D3] **Shijia Pan**, Yulai Shen, Zheng Sun, Priya Mahaja, Lin Zhang and Pei Zhang. "Demo Abstract: Saving Energy in Smart Commercial Buildings through Social Gaming." ACM Ubicomp 2013, Zurich, Switzerland, September 2013.

[D2] **Shijia Pan**, Bo Liu, Lin Zhang, and Pei Zhang. "Demo Abstract: iCEnergy: Augmented Reality Display for Intuitive Energy Monitoring." SenSys 2012, Toronto, Canada, November, 2012.

[D1] Zheng Sun, Aveek Purohit, Kaifei Chen, **Shijia Pan**, Trevor Pering, and Pei Zhang. "Demo Abstract: PANDAA: Physical Arrangement Detection of Networked Devices through Ambient-Sound Awareness." ACM Ubicomp 2011, Beijing, China, September 2011.
Best Demo Award

Patents

[2] ZHANG Pei, NOH Hae Young, **PAN Shijia**, WANG Ningning, BONDE Amelie, and MIRSHEKARI Moustafa. Indoor identification of individuals through footstep induced structural vibration. U.S. Patent App. 15/544,928.

[1] CHEN Mei An, **PAN Shijia**. Feature identification using an RGB-NIR camera pair. US Patent App. 14/168,267.

Invited Seminars and Keynotes

[35] Physical Knowledge-Informed Learning Adaptation for Vibration-Based Internet-of-Things
TBSI Introduction to Transfer Learning **June, 2022**

[34] Sense for Less: Physical Knowledge-Informed Adaptation for Vibration-Based Internet-of-Things
Columbia University Embedded AI ELEN E6908 **April, 2022**

[33] Sense for Less: Physical-Informed Learning for Vibration-Based Occupant Sensing.
Alibaba Seminar **Feb, 2022**

[32] Sense for Less: Physics-Informed Adaptive Cyber-Physical Systems for Vibration-Based Human Monitoring.
CITRIS Exchange Seminar **Sept, 2021**

[31] Sense for Less: Physical Informed Adaptive Cyber-Physical Systems for Device-Free Human

Monitoring.
Stony Brook University **March, 2021**

[30] Sense for Less: Physical Informed Adaptive Cyber-Physical Systems for Device-Free Human Monitoring.
University of Texas at Arlington **Feb, 2021**

[29] Keynote: Sense for Less: Physics-Informed Adaptive Cyber-Physical Systems for Device-Free Human Monitoring.
The 2nd Workshop on Device Free Human Sensing **Nov, 2020**

[28] Sense for Less: Physics-Informed Adaptive Cyber-Physical Systems for Device-Free Human Monitoring.
Florida International University **Oct, 2020**

[27] IoT Device Pairing through Heterogeneous Sensing Signals.
Standard Cognition, San Francisco, CA, USA **Oct, 2019**

[26] Indoor Human Information Acquisition from Physical Vibrations.
FEAST, Merced, CA, USA **Oct, 2019**

[25] Indoor Human Information Acquisition from Physical Vibrations.
University of Oxford, Oxford, UK **Sept, 2019**

[24] Vibration Based Tap & Swipe Tracking on Ubiquitous Surfaces: Combining physical and data-driven knowledge in signal characterization.
CMKL University, Thailand **Aug, 2019**

[23] Indoor Human Information Acquisition from Physical Vibrations: a case study for cyber-physical systems.
CMKL University, Thailand **Aug, 2019**

[22] Indoor Human Information Acquisition from Physical Vibrations.
CMKL University, Thailand **June, 2019**

[21] Indoor Human Information Acquisition from Physical Vibrations.
University of Pittsburgh, USA **March, 2019**

[20] Indoor Human Information Acquisition from Physical Vibrations.
University of California, Merced, USA **March, 2019**

[19] Indoor Human Information Acquisition from Physical Vibrations.
University of Michigan, USA **March, 2019**

[18] Vibration Based Tap & Swipe Tracking on Ubiquitous Surfaces: Combining physical and data-driven knowledge in signal characterization.
ELEN E6908, Topics in Electrical and Computer Engineering. TPC: Cyber-Physical Systems
Guest Lecture, Columbia University **Feb, 2019**

[17] Vibration Based Tap & Swipe Tracking on Ubiquitous Surfaces: Combining physical and data-driven knowledge in signal characterization.
12-761, Sensing and Data Mining for Smart Structures and Systems
Guest Lecture, Carnegie Mellon University **Feb, 2019**

[16] Indoor Human Information Acquisition from Physical Vibrations.
ETH (video conference) **Feb, 2019**

[15] Indoor Human Information Acquisition from Physical Vibrations.
Pennsylvania State University, PA, USA **Nov, 2018**

[14] Indoor Human Information Acquisition from Physical Vibrations.
Tsinghua University, Beijing, China **Nov, 2018**

[13] Indoor Human Information Acquisition from Physical Vibrations.
Peking University, Beijing, China **Nov, 2018**

[12] Indoor Human Information Acquisition from Physical Vibrations.
University of New South Wales, Sydney, Australia **Nov, 2018**

[11] Indoor Human Information Acquisition from Physical Vibrations.
Princeton University, Princeton, New Jersey, USA **Sept, 2018**

[10] Indoor Human Information Acquisition from Physical Vibrations.
University of California, Merced, USA **Sept, 2018**

[9] Indoor Space Usage Monitoring using Structural Vibrations
Google, Sunnyvale, USA **August, 2018**

[8] Physics Guided and Adaptive Approach for Mobile Fine-Grained Environmental Monitoring
Urban Environmental Sustainability in a Smart and Connected World, USA **August, 2018**

[7] Indoor Human Information Acquisition from Physical Vibrations.
Tsinghua-UC Berkeley Shenzhen Institute, Shenzhen, China **July, 2018**

[6] Calibration-Free Occupant Localization using Structural Vibration through Locally Adaptive Multilateration.
7WCSCM, Qingdao, China **July, 2018**

[5] Indoor Human Information Acquisition from Physical Vibrations.
University of California, Santa Cruz, USA **April, 2018**

[4] Indoor Human Information Acquisition from Physical Vibrations.
Samsung Research America, Mountain View, USA **April, 2018**

[3] Indoor Human Information Acquisition from Physical Vibrations.
Singapore Management University, Singapore **March, 2018**

[2] Indoor Human Information Acquisition from Physical Vibrations.
National University of Singapore, Singapore **March, 2018**

[1] Structures as Sensors: Indoor Human Monitoring Through Ambient Vibration Sensing.
AiFi Inc., California, USA **Nov, 2017**

PhD Students

Zhizhang Hu, UC Merced EECS	2020 fall-
Shubham Rohal, UC Merced EECS	2021 summer-
Yue Zhang, UC Merced EECS	2021 fall-

Supervised Students

Dong Yong Lee, UC Irvine (undergraduate)	2020 fall -
Shreya Shriram, UC Merced (undergraduate)	2021 summer - 2022 spring
Abdias Tellez Benitez, UC Merced (undergraduate)	2021 fall, 2022 summer
Asiyah Awais, UC Berkeley (undergraduate)	2022 summer
Brandon Kieng, UC Merced (undergraduate)	2022 summer
Winston Iskandar, Mira Costa High School (high school junior)	2022 summer
Charison Gill-Branion, UC Merced (undergraduate)	2022 spring
Ronald Chitauro, Carnegie Mellon University (graduate)	2021 summer
Francisco Lira, UC Merced (undergraduate)	2021 summer
Melody Hu, KIPP San Jose Collegiate (high school junior)	2021 summer
Yue Zhang, UC Merced EECS (J-1 exchange scholar)	2019 fall - 2021 summer
Shubham Rohal, UC Merced EECS (graduate)	2020 fall - 2021 spring
Rahul Sidramappa Hoskeri, UC Merced EECS (graduate)	2020 summer - 2021 spring
Nikhil Pitta, Monta Vista High School (high school senior)	2020 summer
Anthony Sainez, UC Merced (undergraduate)	2020 summer
Lixing He, UESTC/UC Berkeley (exchange undergraduate)	2020 spring
Laixi Shi, Carnegie Mellon University (graduate)	2019 spring - 2020 spring
Zhizhang Hu, Carnegie Mellon University (graduate)	2019 spring - 2020 spring
Di An, UC Merced EECS (graduate)	2019 fall
Jothi Prasanna Shanmuga Sundaram, UC Merced EECS (graduate)	2019 fall

Teaching Experience

CSE 160 Computer Networks **S21, S22, F22**

Instructor, Merced, CA, USA
Course Description: This course introduces the basics of networking, ranging from sending bits over wires to the Web and distributed computing. It is focused on the protocols and design aspects of the Internet. The goal of the course is to give students an appreciation of the fundamental challenges of networking, design strategies of proven value, and common implementation technologies.

EECS 283 Advanced Topics on Intelligent Systems **S20, F20, F21**

Instructor/Designer, Merced, CA, USA
Course Description: Intelligent systems have become an important part of our everyday life. Smart devices and systems become more and more pervasive. The development of intelligent systems rely on multidisciplinary research, which include and not limited to artificial intelligence, machine learning, communication and networks, robotics, security, and signal processing. This class will review the state-of-the-art in intelligent systems and help students prepare for research in intelligent systems.

Mobile Hardware for Software Engineers **F13, F16, F17**

Teaching Assistant, Pittsburgh, PA/Moffett Field, CA USA
Course Instructor: Prof. Pei Zhang
Course Description: This is a project-based course that is designed to enhance students ability to analyze mobile hardware capabilities and restrictions. The course covers the elements of embedded systems development as well as mobile topics such as power management, machine-to-machine communication, and wireless protocols.
My Role:

- 1-2 lectures per semester highlighting current research in cyber-physical systems
- I managed 10-16 groups per semester; guiding them through the development and completion of their course projects
- I assisted the students with their understanding of the problem definition, hardware capabilities/limitation analysis, as well as system development
- I provided bi-weekly feedback on their project progress reports

Industrial Research Experience

Technicolor Research, Los Altos, CA, USA **May, 2016 - August, 2016**
Research Intern
Manager/Mentor: Dr. Kent Lyons
Project Leader: structural vibration sensing for multiple occupants monitoring project, the corresponding publication [P6] is selected as the Best Poster Award in 2016 SenSys.

Qualcomm Technologies, Inc., San Diego, CA, USA **May, 2014 - August, 2014**
Interim Engineering Intern
Manager/Mentor: Dr. An Mei Chen

Qualcomm Technologies, Inc., San Diego, CA, USA **May, 2013 - August, 2013**
Interim Engineering Intern
Manager/Mentor: Dr. An Mei Chen

Microsoft Research Asia, Beijing, P.R.China **March, 2011 - August, 2011**
Research Intern
Advisor: Dr. Jacky Shen

Professional Services

Steering/Advising Committee
2022: 4th CML-IoT, 5th DATA, 5th CPD
2021: 4th DATA
2020: 3rd DATA, 2nd DFHS

Technical Program Committee Chair/Organizer
2022: BuildSys
2021: 3rd CML-IoT, 4th CPD, Mini-Symposia: Physics-Informed Machine Learning for Smart City
2020: 3rd CPD, 2nd CML-IoT, AiFiAutoCheckout Competition
2019: 2nd DATA, 1st DFHS, 2nd CPD, 1st CML-IoT
2018: 1st DATA, 1st CPD

Technical Program Committee Member
2023: CHASE, IPSN
2022: AAAI, CHASE, ENSsys, IEEE MASS, IJCAI, IPSN, EWSN, SECON, SenSys
2021: AAAI, BigCom, BuildSys, CHASE, DCOSS, EarComp, EWSN PhD Forum, ICDCS, IEEE MASS, IJCAI, IPSN, SECON, SenSys, UIST
2020: AAAI, BigCom, BuildSys, DCOSS, ENSsys, HotMobile, ICCPS, IJCAI, SECON, SenSys, Wi-DroIT
2019: AAAI, BuildSys, ENSsys, ICII, IEEE MASS, IJCAI
2018: ENSsys

Editor Services

Frontiers in Structural Sensing, Control and Asset Management	**Associate Editor**
Frontiers in Data Mining and Management	**Guest Associate Editor**
Frontiers in Big Data	**Guest Associate Editor**
CCF Transactions on Pervasive Computing and Interaction	**Guest Editor**
Sensors Special Issue on Human Motion Monitoring and Modeling	**Guest Editor**
Sensors Journal	**Topics Board Editor**

Journal Reviewer

ACM IMWUT, Ubicomp	**2017-2022**
ACM Transactions on Sensor Networks	**2018-2022**
IEEE Internet of Things Journal	**2019-2021**
Pervasive and Mobile Computing	**2018-2020**
ACM Transactions on Cyber Physical Systems	**2020**

ACM Transactions on Computing for Healthcare	**2020**
ACM Transactions on Internet of Things	**2020**
IEEE Computer Architecture Letter	**2020**
IEEE/ACM Transactions on Networking	**2018-2020**
IEEE Journal of Biomedical and Health Informatics	**2019**
IEEE Access	**2019**
Journal of Vibration and Control	**2019**
Journal of Engineering Mechanics	**2019**
IEEE Transactions on Services Computing	**2019**
Sensor Journal	**2018-2019**
Engineering Science and Technology, an International Journal	**2018**
IEEE Transactions on Mobile Computing	**2016**
IEEE Computer Magazine	**2016**

Proposal Reviewer

National Science Foundation Review Panel	**2020**
MIPS proposals	**2019**

PhD Thesis Committee Member

Jeremiah Reagan (UC Merced)	
Yuxin Tian (UC Merced)	
Lorenzo Booth (UC Merced)	
Gulnar Rakhmetulla (UC Merced)	**July, 2022**
Wenqian Dong (UC Merced)	**Spring, 2022**
Amelie Bonde (Carnegie Mellon University)	**Nov, 2021**
Carlos Ruiz (Carnegie Mellon University)	**Nov, 2019**

PhD Thesis Reviewer

Miao He (Tsinghua University)	**May, 2020**

Panelist/Judge

MobiSys 2022 N2Women Panel	**June, 2022**
CPHS 2022 Panel "Wireless technologies for human-machine interaction"	**April, 2022**
DATA 2021 Panel "Data Acquisition, Analysis and Reuse for AI + IoT Applications"	**Nov, 2021**
CMU ECE Panel "Women in Academia: Yes We Can"	**Apr, 2021**
CS4Me Hackthon by the Computing Alliance of Hispanic-Serving Institutions	**March, 2021**
EWSN 2021 PhD Forum	**Feb, 2021**
Junior Faculty/Researcher Panel at HotMobile 2020	**March, 2020**
Doctoral Colloquium at Ubicomp/ISWC 2019	**Sept, 2019**

Conference Session Chair

SenSys 2020 Session 8: Staying Healthy [Human Activity & Health]	**Nov, 2020**
SECON 2020 Session 2: Sensing and AR	**June, 2020**
HotMobile 2020 Session 2: Mobile Sensing and Analytics	**March, 2020**
BuildSys 2019 Session II: Thermal Comfort	**Nov, 2019**

Conference Organizing Committee

Community Engagement Chair: MobiSys 2021
Diversity Co-Chair: Ubicomp/ISWC 2021
Post/Demo Chair: BuildSys 2021
PhD Forum Chair: SenSys 2020-2021
Student Travel Grant Chair: BuildSys 2020, MobiSys 2020
Publicity Chair: EWSN 2021, CHASE 2020, CPS-IoTWeek 2019-2020, SenSys 2018-2019, IPSN 2019
Community Engagement Chair: MobiSys 2021

Social Media Chair: IPSN 2021-2022, BuildSys 2019, SenSys 2016

N2Women Events

MobiSys 2022 (panelist), Portland, USA	**June, 2022**
Ubicomp 2021 (mentor), virtual	**September, 2021**
SenSys 2019 (mentor), New York, USA	**November, 2019**
SenSys 2018 (organizer), Shenzhen, China	**November, 2018**
SenSys 2012 (organizer), Toronto, Canada	**November, 2012**