北京大学前沿计算研究中心
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学术报告

# Indoor Human Information Acquisition from Physical Vibrations


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**Abstract:** The number of everyday smart devices (e.g., Samsung SmartThings, Nest, Notion) is projected to grow to the billions in the coming decade. The Cyber-Physical Systems or Internet of Things systems that consist of these devices are used to obtain human information for various smart building applications. From the system perspective, my research focuses on non-intrusive indoor human information acquisition through ambient structural vibration, which is referred to as 'structures as sensors'. People's interaction with structures in the ambient environment (e.g., floor, table, door) induces those structures to vibrate. By capturing and analyzing the vibration response of structures, we can indirectly infer information about the people and their actions that cause it. However, due to the complexity of the physical world, sensing data distributions can change significantly under different sensing conditions. Therefore, from the data perspective, accurate information learning through a pure data-driven approach requires a large amount of labeled data, which is costly and difficult to obtain in real-world applications. My research addresses these challenges by combining physical and data-driven knowledges and iteratively expanding the labeled dataset. With insights into the relationship between changes of sensing data distributions and measurable physical attributes, the iterative algorithm guides the expansion order by measured physical attributes to ensure a high learning accuracy in each iteration.


**Biography:** Dr. Shijia Pan is a postdoctoral researcher at Carnegie Mellon University. She received her Bachelor's degree in Computer Science and Technology from the University of Science and Technology of China and her Ph.D. degree in Electrical and Computer Engineering at Carnegie Mellon University. Her research interests include cyber-physical systems, Internet-of-Things (IoT), and ubiquitous computing. She worked in multiple disciplines and focused on indoor human information acquisition through ambient sensing. She has published in both top-tier Computer Science ACM/IEEE conferences (IPSN, UbiComp) and high-impact Civil Engineering journals (Journal of Sound and Vibration, Frontiers Built Environment). She is the recipient of numerous awards and fellowships, including Rising Stars in EECS, Nick G. Vlahakis Graduate Fellowship, Google Anita Borg Scholarship, Best Poster Awards (SenSys, IPSN), Best Demo Award (Ubicomp), Best Presentation Award (SenSys Doctoral Colloquium), and Audience Choice Award (BuildSys) from ACM/IEEE conferences.

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