北京大学高能效计算与应用中心学术报告

Invited Talk, Center for Energy-Efficient Computing and Applications

SENSING + INTERACTION ON AND AROUND THE BODY

Prof. Cheng Zhang

Computer Science Ph.D. Georgia Tech

Assistant Professor, Cornell University

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理科五号楼410会议室

ABSTRACT: Wearables are a significant part of the new generation of computing. Compared with more traditional computers (e.g., laptop, smartphones), wearable devices are more readily available for immediate use, but significantly smaller in size, creating new opportunities and challenges for on-body sensing and interaction. My holistic research approach (from problem understanding to invention to implementation and evaluation) investigates how to effectively exchange information between humans, their environment, and wearables. My Ph.D. thesis focuses on novel wearable input using on-body sensing through various high-level interaction gestures, low-level input events, and a redesign of the interaction. In this talk, I will highlight three projects. The first is a wearable ring that allows the user to input over 40 unistroke gestures (including text and numbers). It also shows how to overcome a limited training set size, a common challenge in applying machine learning techniques to real systems, through an understanding of the characteristics of data and algorithms. The second project demonstrates how to combine a strong, yet incomplete, understanding of on-body signal propagation physics with machine learning to create a novel yet practical sensing and interaction techniques. The third project is an active acoustic sensing technique that enables a user to interact with wearable devices in the surrounding 3D space through continuous high-resolution tracking of finger's absolute 3D position. It demonstrates how to solve a technical interaction challenge through a deep understanding of signal propagation. I will also share my vision on future opportunities for on-body sensing and interaction, especially in high-impact areas, such as health, activity recognition, AR/VR, and more futuristic interaction paradigms between humans and the increasingly connected environment.

BIOGRAPHY: Cheng Zhang is a tenure-track Assistant Professor in Information Science at Cornell University (Starting July, 2018). He received his Ph.D. in Computer Science in the School of Interactive Computing (IC) at Georgia Institute of Technology, advised by Gregory Abowd (IC) and Omer Inan (ECE). His research focuses on enabling the seamless exchange of information among humans, computers, and the environment, with a particular emphasis on the interface between humans and wearable technology. His Ph.D. thesis presents 10 different novel input techniques for wearables, some leveraging commodity devices while others incorporate new hardware. His work blends an understanding of signal propagation on and around the body with, when necessary, appropriate machine learning techniques. His work has resulted in over a dozen publications in top-tier conferences and journals in the field of Human-Computer Interaction and Ubiquitous Computing (including two best paper awards), as well as over 6 pending U.S. and international patents. His work has attracted the attention of various media outlets, including Sohu, Sina, Tencent, CnBlog, Huanqiu, ScienceDaily, DigitalTrends, ZDNet, New Scientist, RT, TechRadar, Phys.org, Yahoo News, Business Insider, and MSN News. The work that leverages commodity devices has resulted in significant commercial impact, including adoption of tap input on commodity smartphones by Atlanta startup AgVoice, and licensing by Canadian startup ProximityHCI to improve the smartwatch interaction experience.