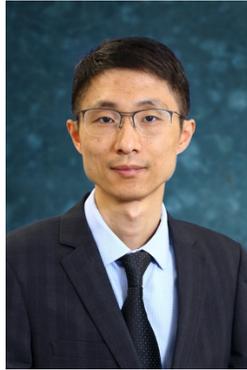**Tackling the Challenges of Machine Learning for Mobile Health Systems**

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The prominence of mobile devices and recent breakthroughs in machine learning have enabled an emerging class of new mobile health systems which hold the promise of transforming today's reactive healthcare practice to proactive, individualized care and wellbeing. However, the current mainstream machine learning approaches are largely supervised and must be trained by a large amount of labelled high-quality data. Moreover, personal health data collected by on-device sensors cannot be uploaded or shared with other devices due to privacy concerns. These challenges have significantly hindered the performance and utility of mobile health systems in real-world settings.

In this talk, I will first discuss new mobile systems that exploit human physiological models and innovative use of sensing modalities to achieve highly robust sensing performance without requiring extensive training. I will describe RunBuddy - the first smartphone-based system for monitoring continuous running rhythm and improving exercise efficiency. Based on this result, we also develop BreathCoach, a smart and unobtrusive system using smartwatch and smartphone-based VR for in-home RSA-BT (Respiratory Sinus Arrhythmia biofeedback-based Breathing Training), which is a common cardiorespiratory intervention to diseases such as asthma and an effective exercise to reduce anxiety.

In the second part of this talk, I will discuss a new approach for home activity recognition via federated learning. I will present several new sensing and federated learning algorithms that enable mobile devices to collaboratively improve the accuracy of home activity sensing without sharing any sensor data, preserving user privacy.

Lastly, I will describe a new project on employing machine learning technologies for advancing digital biomarkers for Alzheimer's Disease. Comprising experts in Internet of Things, AI, nursing, psychiatry, Alzheimer's Disease and dementia, our multi-disciplinary team aims to develop privacy-preserving machine learning technologies that utilize off-the-shelf smart devices to identify biomarkers for Alzheimer's disease.

Bio:
Guoliang Xing is currently a Professor of Information Engineering at The Chinese University of Hong Kong. His research interests include Internet of Things (IoT), Smart Health, Cyber-Physical Systems, security, and wireless networking. He received the B.S. and M.S degrees from Xi'an Jiao Tong University,

China, in 1998 and 2001, the D.Sc. degree from Washington University in St. Louis, in 2006. He received two Best Paper Awards and six Best Paper Nominations at first-tier conferences including ICNP, IPSN, and IoTDI. Several mobile health technologies developed in his lab won Best App Awards at the MobiCom conference and were successfully transferred to the industry. He received the NSF CAREER Award in 2010 and the Withrow Distinguished Faculty Award from Michigan State University in 2014. He is a Fellow of IEEE.