Yang Liu

Curriculum Vitae

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M/F: Female
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Education

2020–Now **Postdoc, Computer Science**, *City University of Hong Kong*, Hong Kong.
Supervisor: Dr. Zhenjiang Li

2016–2020 **Ph.D., Computer Science**, *City University of Hong Kong*, Hong Kong.
Supervisor: Dr. Zhenjiang Li

2012–2016 **B.E., Software Engineering**, *Xi'an JiaoTong University*, Shaanxi.

Research Interests

I am focusing on developing intelligent mobile and wearable sensing technologies for IoT systems with signal processing and AI techniques to enable applications of smart health and HCI. I am also interested in cyber security and privacy, where I mainly concerns privacy leakage issues in mobile and wearable sensing, and adversarial attacks in Cyber-Physical Systems (CPS).

Publications

IMWUT'21 **Yang Liu**, Chengdong Lin, Zhenjiang Li. "WR-Hand: Wearable Armband can Track User's Hand", ACM IMWUT journal, February 2021 round, (UbiComp 2021).

TMC'20 **Yang Liu**, Zhenjiang Li. "aLeak: Context-Free Side-Channel from Your Smart Watch Leaks Your Typing Privacy", IEEE Transactions on Mobile Computing, 2020.

TOSN'19 **Yang Liu**, Yonghang Jiang, Zhenjiang Li, Jianping Wang. "Rulers on Our Arms: Waving to Measure Object Size through Contactless Sensing", ACM Transactions on Sensor Networks, 2019.

MobiSys'19 **Yang Liu**, Zhenjiang Li, Zhidan Liu, Kaishun Wu. "Real-time Arm Skeleton Tracking and Gesture Inference Tolerant to Missing Wearable Sensors", ACM MobiSys, 2019.

INFOCOM'18 **Yang Liu**, Zhenjiang Li. "aLeak: Privacy Leakage through Context-Free Wearable Side-Channel", IEEE INFOCOM, 2018.

MobiSys WKSHP'19 **Yang Liu**, Chengdong Lin, Zhenjiang Li, Zhidan Liu, Kaishun Wu. "Poster: When Wearable Sensing Meets Arm Tracking", ACM MobiSys WKSHPS, 2019.

INFOCOM WKSHP'18 **Yang Liu**, Zhenjiang Li. "Poster Abstract: Context-Free Wearable Side-Channel Leaks Your Typing Privacy", IEEE INFOCOM WKSHPS, 2018.

IoT-J'20 Jiao Li, **Yang Liu**, Tao Chen, Zhen Xiao, Zhenjiang Li, Jianping Wang. "Adversarial Attacks and Defenses on Cyber-Physical Systems: A Survey", IEEE Internet of Things Journal, 2020.

ICDCS'20 Zhen Xiao, Tao Chen, **Yang Liu**, Zhenjiang Li. "Mobile Phones Know Your Keystrokes through the Sounds from Finger's Tapping on the Screen", IEEE ICDCS, 2020.

TON'19 Kang Yang, Tianzhang Xing, **Yang Liu**, Zhenjiang Li, Xiaoqing Gong, Xiaojiang Chen, Dingyi Fang. "cDeepArch: A Compact Deep Neural Network Architecture for Mobile Sensing", IEEE/ACM Transactions on Networking, 2019.

SECON'18 Kang Yang, Xiaoqing Gong, **Yang Liu**, Zhenjiang Li, Tianzhang Xing, Xiaojiang Chen, Dingyi Fang. "cDeepArch: A Compact Deep Neural Network Architecture for Mobile Sensing", IEEE SECON, 2018.

Research Projects

2019–Now **Hand Pose Tracking with a Commercial Wearable Armband**.

We have enabled a wearable-based system that can track the 3D hand pose (14 hand skeleton points) over time with a commercial armband worn on user's forearm. We have addressed a challenge using a visualized DNN that the armband collects mixed Electromyography (EMG) signals from multiple forearm muscles, while prior bio-medical models are built on the isolated EMG signals from different muscles. Then, we have placed the constructed hand pose in a global coordinate system by fusing the IMUs data, provided a general plug-and-play version for new users through combining with an adversarial network, and compensated for the position difference in how users wear their armbands through signal analysis.

2018–2019 **Real-time Arm Tracking and Gesture Inference via Sparse Wearable Sensors**.

A wearable system was proposed to achieve real-time 3D arm skeleton tracking with a smart watch only and reliable gesture inference tolerant to missing wearable sensors. We have addressed two challenges. First, the skeleton of each arm is determined by the locations of the elbow and wrist, whereas a smart watch only senses a single point from the wrist. The potential solution space is huge, which challenges the accurate and real-time arm skeleton tracking. Here, we implemented arm tracking using the kinematic theory of human arm and the HMM algorithm, and then we proposed two acceleration algorithms to enable real-time tracking. Second, some wearable devices may be missing. Yet the learning tools for gesture inference typically have static network structures, which requires nontrivial network adaptation to match the input's varying availability and ensure reliable gesture inference. We here proposed an attention-based mechanism to achieve dynamic network adjustment.

2017–2018 **Privacy Leakage through Context-Free Wearable Side-Channel**.

We revisited a crucial privacy problem: could the sensitive information, like passwords, frequently typed on mobile devices be inferred through the motion sensors of wearable device on user's wrist, e.g., smart watch? Existing works have achieved the initial success under certain context-aware conditions, such as 1) the horizontal keypad plane, 2) the known keyboard size, 3) and/or the last keystroke on a fixed "enter" button. Taking one step further, we unveiled and fully demonstrated the further risks of typing privacy leakage in much more generalized context-free scenarios without any above context-aware conditions.

2016–2017 **Object Size Estimation with Wearable Sensing and Crowdsourcing**.

We proposed a mobile system, which turned our wearable or mobile device into a ruler. It can estimate the size of objects that could be large in size and not directly touchable by the user. Such a design can enable a rich set of applications that count on the size information of surrounding environments/objects. We proposed several sensing techniques to purely utilize the motion sensors on the device for object size measure and also integrated with the crowdsourcing feature for both performance improvement and result sharing.

Honors

2021 **Outstanding Doctoral Thesis Award**, *ACM SIGBED China*.
2018–2019 **Institutional Research Tuition Scholarship**, *CityU*.
2018–2019 **Outstanding Academic Performance Award**, *CityU*.
2019 **Student Travel Grant Award**, *ACM MobiSys*.
2018 **Best-in-Session Presentation Award**, *IEEE INFOCOM*.
2018 **Student Travel Grant Award**, *IEEE INFOCOM*.
2017–2018 **Outstanding Academic Performance Award**, *CityU*.
2017 **Outstanding Poster Award**, *CityU*.
2014–2015 **Excellent Student**, *XJTU*.
2014–2015 **SiYuan Scholarship**, *XJTU*.
2013–2014 **Excellent Student**, *XJTU*.
2013–2014 **Fuji Xerox Scholarship (China)**, *XJTU*.
2012–2013 **SiYuan Scholarship**, *XJTU*.

Presentations and Talks

Conference Presentation — WR-Hand: Wearable Armband can Track User's Hand, ACM UbiComp, September 2021, Virtual Event.

Conference Presentation — Real-time Arm Skeleton Tracking and Gesture Inference Tolerant to Missing Wearable Sensors, ACM MobiSys, June 2019, Seoul, South Korea.

Conference Presentation — cDeepArch: A Compact Deep Neural Network Architecture for Mobile Sensing, IEEE SECON, June 2018, Hong Kong, China.

Conference Presentation — aLeak: Privacy Leakage through Context-Free Wearable Side-Channel, April 2018, Honolulu, HI, USA.

Professional Activities

Review — IEEE Transactions on Mobile Computing, IEEE ICPADS 2021

TPC Member — EAI Qshine 2020

Conference Organizers — Web Co-Chairs, IEEE ICPADS 2021