Huatao Xu

Postdoctoral Researcher

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I am a postdoctoral researcher at The Hong Kong University of Science and Technology, working with Prof. Mo Li. I obtained my Ph.D. degree from Nanyang Technological University, supervised by Prof. Mo Li and co-supervised by Assoc. Prof. Rui Tan. I am broadly interested in ubiquitous computing, especially in related fields of building wearable-based or wireless-based sensing interfaces to bridge gaps between computing resources and human's daily lives. My current research focuses on wearable-based sensing, including human activity recognition, localization, authentication, etc.

Education

Nanyang Technological Univseristy (NTU) — *Singapore, Singapore*
Ph.D. of Computer Science — ***Jan. 2021 - Mar. 2024***

Shanghai Jiao Tong University (SJTU) — *Shanghai, China*
Master of Software Engineering — ***Sept. 2017 - Mar. 2020***

Nanjing University (NJU) — *Nanjing, China*
Bachelor of Software Engineering — ***Sept. 2013 - Jun. 2017***

Publications

AutoLife: Automatic Life Journaling with Smartphones and LLMs
Huatao Xu, Panrong Tong, Mo Li, Mani Srivastava
[Submitted]
AutoLife is an automatic life journaling system that inputs low-cost sensor data (without photos or audio) from smartphones and can automatically generate comprehensive life journals for users.

ContrastSense: Domain-invariant Contrastive Learning for In-the-wild Wearable Sensing
Gaole Dai, **Huatao Xu**, Hyungjun Yoon, Mo Li, Rui Tan, Sung-Ju Lee
ACM IMWUT (UbiComp) 2025 (CCF-A)
A domain-invariant contrastive learning scheme for a realistic wearable sensing scenario where domain shifts and class label scarcity are presented simultaneously.

Penetrative AI: Making LLMs Comprehend the Physical World
Huatao Xu, Liying Han, Qirui Yang, Mo Li, Mani Srivastava
ACL Findings 2024 (CCF-A)
A new concept to make large language models interact with the physical world by IoT sensors and actuators.

Practically Adopting Human Activity Recognition
Huatao Xu, Pengfei Zhou, Rui Tan, Mo Li
ACM MobiCom 2023 (CCF-A)
A practical human activity recognition for mobile devices that address data heterogeneity with realistic overhead.

Facilitating Radar-Based Gesture Recognition With Self-Supervised Learning
Zhiyao Sheng, **Huatao Xu**, Qian Zhang, Dong Wang
IEEE SECON 2022 (CCF-B)
A representation learning framework for radar sensing applications with self-supervised learning techniques.

LIMU-BERT: Unleashing the Potential of Unlabeled Data for IMU Sensing Applications
Huatao Xu, Pengfei Zhou, Rui Tan, Mo Li, Guobin Shen
ACM SenSys 2021 (CCF-B, Best Paper Runner-up), GetMobile Research Highlight 2022
A BERT-Like self-supervised representation learning model for IMU sensing applications.

FaHo: Deep Learning Enhanced Holographic Localization for RFID tags
Huatao Xu, Dong Wang, Run Zhao, Qian Zhang
ACM SenSys 2019 (CCF-B)
A hologram and deep learning fusion position estimation method for RFID tags.

AdaRF: Adaptive RFID-based Indoor Localization Using Deep Learning Enhanced Holography
Huatao Xu, Dong Wang, Run Zhao, Qian Zhang
ACM IMWUT (UbiComp) 2019 (CCF-A)
An RFID-based localization system that creates adaptive localization models for different environments.

PEC: Synthetic Aperture RFID Localization with Aperture Position Error Compensation
Run Zhao, Dong Wang, Qian Zhang, Haonan Chen, **Huatao Xu**
IEEE SECON 2019 (CCF-B)
An accurate synthetic aperture RFID localization system considering aperture position error compensation.

PRMS: Phase and RSSI based Localization System for Tagged Objects on Multilayer with a Single Antenna
Huatao Xu, Run Zhao, Qian Zhang, Dong Wang
ACM MSWiM 2018 (CCF-C)
A localization method that locates RFID tags in 3D space with a single antenna.

Projects

Penetrative AI ***2023-Present***
- The Penetrative AI project explores combining Large Language Models (LLMs) with IoT technology, enabling LLMs to understand and interact with the physical world.
- Related publications: Penetrative AI (HotMobile).

General Learning Framework for IMU Sensing Applications ***2021-Present***
- A mobile sensing project that builds effective and general sensing models for IMU applications with low system overhead.
- Related publications: UniHAR (MobiCom), LIMU-BERT (SenSys).

RFID-based Deep Learning Enhanced Holographic Localization System ***2018-2021***
- An RFID localization project that estimates accurate positions of RFID tags with deep learning techniques.
- Related publications: FaHo (SenSys), AdaRF (IMWUT), PEC (SECON).

Student Work Traceability Display System ***2018-2019***
- A platform for primary school students to share videos of the processes of making handmade products.

RFID Sensing Platform ***2017-2019***
- An extensible C# program that collects and displays low level RFID signals profiles reported from ImpinJ reader using LLRP protocol.

Experience

Alibaba (Eleme) *Shanghai, China*
Algorithm Engineer Intern ***Apr. 2020 - Dec. 2020***
- Design effective models to sense couriers' physical states with smartphones, including location and activity type.

Nanjing Yikemi (Start-up company) *Nanjing, China*
Software Engineer Intern ***Jan. 2017 - Jun. 2017***
- Develop websites for a course platform and a document-sharing platform, which are both entrepreneurial projects.

Honor & Award

2024 **CCDS Outstanding PhD Thesis Award**, **NTU**
2024 **Student Travel Grant**, **HotMobile**
2022 **Research Highlight**, **GetMobile**
2021 **Best Paper Runner-up**, **ACM SenSys**
2021 **Silver Medal (40/1170, top 4%)**, **Kaggle Indoor Location & Navigation Competition**
2020 **Shanghai Outstanding Graduate Student**, **SJTU**
2019 **China National Scholarship**, **SJTU**
Highest national wide scholarship for postgraduate students in China
2017-2019 **First-class Scholarship**, **SJTU**
2017 **Nanjing University Inspirational Scholarship**, **NJU**

Service

Registration chair for MobiCom'25
Invited reviewer for IMWUT'25, TKDE'24, IMWUT'24, TOSN'23, TMC'23
TPC member FMSys