

## DEPARTMENT OF COMPUTER SCIENCE

### PhD Degree Oral Presentation

PhD Candidate:	Mr. Hao LI
Date	August 23, 2021 (Monday)
Time:	2:00 pm – 4:00 pm (35 mins presentation and 15 mins Q & A)
Venue:	Zoom ID: 946 7052 2801 (The password and direct link will only be provided to registrants)
Registration:	<a href="https://bit.ly/sem-zm">https://bit.ly/sem-zm</a> (Deadline: 6:00 pm, August 22, 2021)

### *Towards Low-cost and Real-time Mobile Sensing*

#### Abstract

With the increasing popularity of sensor-equipped smartphones, mobile sensing nowadays emerges as a promising direction. Mobile sensing applications analyze the collected signal data from the surroundings and thus understand the physical environment. Various applications have been developed through this new paradigm, such as mobile location estimation, audio recognition, and argument reality. However, many practical issues need to be addressed when deploying mobile sensing applications in real-world scenarios. In this thesis, we investigate three practical problems related to mobile sensing applications and design customized frameworks and methods to provide low-cost and real-time mobile sensing services, particularly in the area of mobile location sensing.

First, we investigate the high data collection cost problem in WiFi fingerprint-based mobile location sensing. We propose a general framework with a low-cost offline data collection while maintaining high localization accuracy. In particular, we reduce the number of reference points to obtain a sparse fingerprint. Our framework adopts the clustering method to reduce the adverse effects when applying regression-based approaches on the sparse fingerprint. The proposed framework can provide high localization accuracy through extensive experiments on the campus.

Second, we study the heterogeneous mobile devices problem in passive mobile location sensing systems. We propose a customized localization approach that automatically infers a signal-strength-to-distance function for every device on the fly and simultaneously estimates its location with the Expectation-Maximum algorithm. A real-world pilot test at an exhibition center is conducted, and heterogeneous mobile devices can be localized and tracked accurately.

Third, we present a mobile deep learning inference framework to schedule multiple DNN jobs with real-time requirements for deep mobile sensing tasks. Considering characteristics of DNN workloads, we design the framework with mobile GPU/CPU collaboration by DNN offloading and CPU offloading. The proposed framework can better utilize all computational resources on mobile phones. We evaluate our system on the mobile platform by extending TensorFlow Lite. The evaluation results indicate that our framework can support real-time deep mobile sensing tasks.

**\*\*\* ALL INTERESTED ARE WELCOME \*\*\***