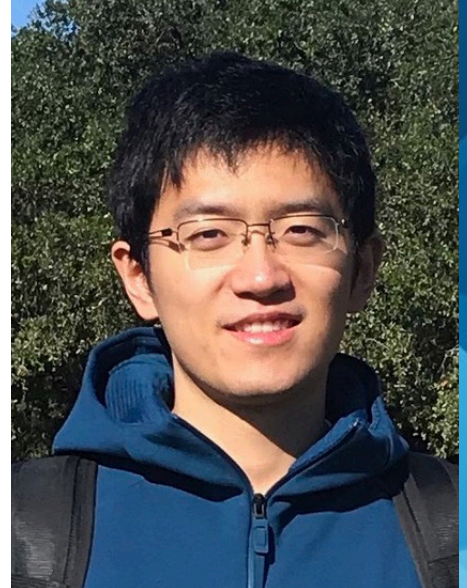# Dissertation Defense

Dongyao Chen

Towards Seamless Human-Mobility Interaction

Wednesday, December 4, 2019
3:00 pm – 5:00 pm
3901 Beyster Bldg.

ABSTRACT: As the mobility ecosystem, such as vehicles and road infrastructure, is undergoing a rapid revolution, it is essential to enhance the interactions between humans and mobility systems. Seamless human-mobility interactions can enable widespread use of engaging applications -— a crucial feature for driving safety and efficiency.

The ever-increasing penetration rate of ubiquitous computing devices, such as smartphones and wearables, have distinct advantages in achieving this goal. Although prior work has attempted to adapt ubiquitous sensors for mobility applications, such as navigation apps, they are often for special purposes and risk-prone. The root cause of these limitations is the scarce sensing modality and limited computational power supported by ubiquitous computing devices.

This thesis tackles the above challenges by demonstrating that using novel sensing techniques and machine learning, one can conduct an in-depth analysis of each driver's steering maneuvers (left/right turns and lane-changes) with the unprecedented accessibility and versatility. The thesis first shows how ubiquitous sensors can be used to detect steering maneuvers regardless of the disturbances in device usage. Next, by focusing on the turning maneuver, we can characterize drivers' driving patterns as a quantifiable metric. Then, the thesis demonstrates that the microscopic analyses of crowdsourced ubiquitous sensory data can infer critical macroscopic context information, such as the risk at road intersections. Finally, the thesis uses ubiquitous sensors to profile a driver's behavioral pattern at a large scale, which is shown to be fundamental for analyzing and even improving the driver's behavior.

Chair: Prof. Kang G. Shin