



FACULTY MENTOR

Xinyu Zhang

PROJECT TITLE

A Millimeter-Wave MIMO Software Radio for Joint Communications and Sensing in 6G

PROJECT DESCRIPTION

Millimeter-wave joint communication and sensing will be a cornerstone technology for wireless systems beyond 5G. The wide availability of mobile millimeter-wave devices will enable ultra-high-speed wireless communication. Meanwhile, such devices can be repurposed for novel wireless sensing applications, such as high-resolution wireless imaging and gesture sensing. In this project, we will design and implement a hardware platform to enable the exploration of new joint communication and sensing paradigms. The platform will assemble existing RF chips and FPGA baseband processors into a programmable radio. The radio can be dual-used as a high-resolution imaging radar for security medical applications.

This project will be in person.

INTERNS NEEDED

3 Students

PREREQUISITES

- Experiences in FPGA programming OR RF hardware design
- Experiences in signal processing



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PROJECT TITLE

Life Logging Using Multi-Modal Sensor Fusion

PROJECT DESCRIPTION

Knowledge about what a person does across the day is a critical input for many ubiquitous computing applications, such as life logging, elderly care, in-home patient care, etc. To obtain such information, existing approaches use either specialized on-body sensors, which are intrusive and cumbersome to maintain, or cameras that do not work in low-light conditions and often impinge on people's privacy. In this project, we propose to reuse a smartwatch as a sensor hub to track people's activities based on a multi-modal deep sensor fusion framework. More specifically, we combine the ultrasound and motion sensor on a smartwatch to recognize people's activities of daily living in a privacy-preserving manner. This project will involve a substantial amount of data collection, machine-learning model design, and implementation.

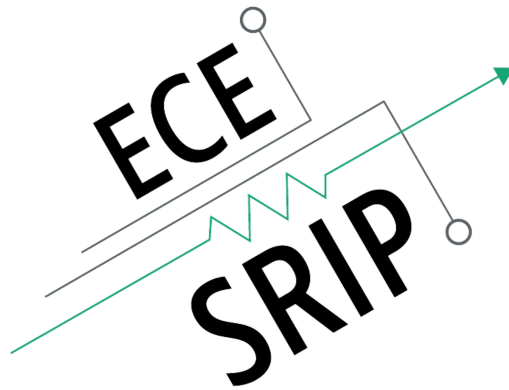
This project will be in person.

INTERNS NEEDED

2 Students

PREREQUISITES

- Experiences in machine learning
- Experiences in a high-level language, such as Python



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PROJECT TITLE

An Interactive Video Platform to Augment Remote Learning

PROJECT DESCRIPTION

The objective of this project is to explore an augmented cognition framework that tightly synthesizes AI and humans (both instructors and students) in a closed loop to enhance the effectiveness of online learning. The high-level idea is to leverage ubiquitous mobile sensors to tap into the students' focus zones and cognitive states in real time. This platform will enhance the current video-based remote learning platforms such as Zoom and make them as interactive as in-person classes.

This project can accommodate both remote and in-person students.

INTERNS NEEDED

3 Students

PREREQUISITES

- Experience with high-level programming languages such as javascript and python
- OR experience with machine learning