



FACULTY MENTOR

Xinyu Zhang

PROJECT TITLE

Generative Agents for Augmented Learning

PROJECT DESCRIPTION

The objective of this project is to explore an augmented cognition framework which 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. A generative agent will then be developed to create a "digital twin" of each student, which helps assess the student's real-time learning performance and provides feedback to the teacher. 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 will be in person.

INTERNS NEEDED

➤ 2

PREREQUISITES

- Experience with high-level programming languages such as Python.
- Experience with machine learning.



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PROJECT TITLE

Sensing Everyday Activities Using Non-Visual Sensors: A Machine Learning-Based Framework

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, which do not work in low-light conditions and often impinge on people's privacy. In this project, we propose to reuse non-visual sensors on smartphones/smartwatches to track people's activities. The non-visual sensors include motion sensors and ultrasonic sensors, along with WiFi--repurposed as a sensor. Different activities will affect the WiFi signals in different ways. By collecting signal traces on WiFi devices, we can identify the activity based on a pattern recognition algorithm. When combined with motion and ultrasonic sensors, we can potentially achieve near-vision sensing resolution. 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

PREREQUISITES

- Experiences in machine learning
- Experiences in high-level languages, such as Python.



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PROJECT TITLE

A Software Radio Platform for Joint Communications and Sensing Beyond 5G

PROJECT DESCRIPTION

"The first four generations of wireless networks mainly run on the low-frequency microwave band. For 5G and beyond, millimeter-wave will become the dominant communication medium. The availability of mobile millimeter-wave devices will also enable novel wireless sensing applications, such as automobile radar and the Google Project Soli gesture sensing hardware. In this project, we will design and implement a hardware platform to enable the exploration of such new communication and sensing paradigms. The platform will assemble existing RF evaluation boards and FPGA baseband processors into a programmable software-defined radio. The radio can be dual-used as a high-resolution imaging radar for security and medical applications.

This project will be in person.

INTERNS NEEDED

➤ 3

PREREQUISITES

- Experiences in FPGA programming or RF hardware design.
- Experiences in signal processing.