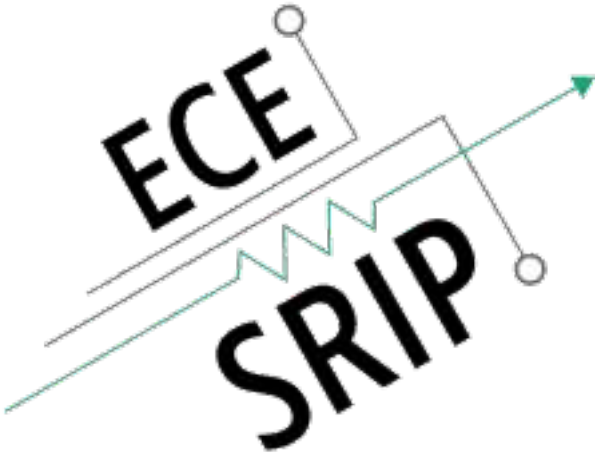


FACULTY MENTOR
Xinyu Zhang

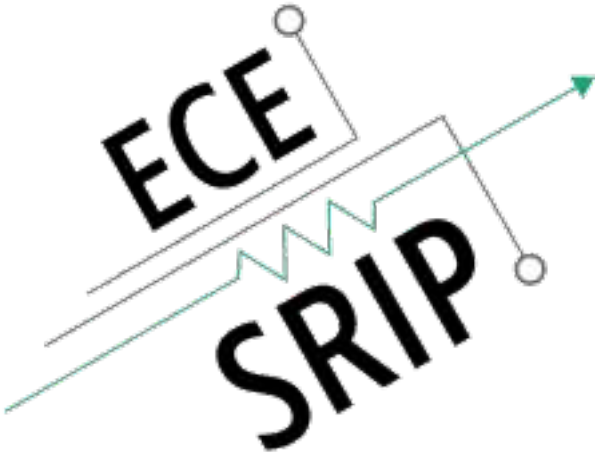
PROJECT TITLE
A Programmable Millimeter-Wave Massive MIMO Radio for 5G Communications and Sensing

PROJECT DESCRIPTION
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 exploration of such new 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 can accommodate both remote and in-person students.

INTERNS NEEDED
3 Students

PREREQUISITES
1. Experiences in FPGA programming OR RF hardware design
2. Experiences in signal processing



FACULTY MENTOR
Xinyu Zhang

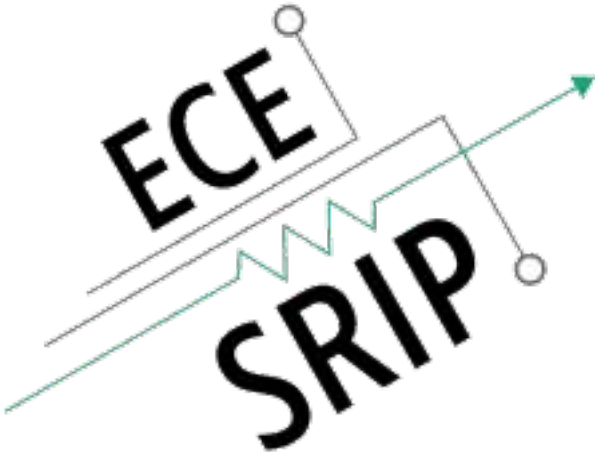
PROJECT TITLE
Intelligent Reflectors for 5G Range Expansion

PROJECT DESCRIPTION
Description: Next generation wireless networks embrace millimeter-wave (mmWave) technology for its high capacity. Yet, mmWave radios bear a fundamental coverage limitation due to the high directionality and propagation artifacts. In this project, we explore an economical paradigm based on 3D printing technology for mmWave coverage expansion. We will design a fully passive metasurface which can reshape and resteer mmWave beams to anomalous directions to illuminate the coverage blind spots.

This project will be in person.

INTERNS NEEDED
2 Students

PREREQUISITES
1. Experience with signal processing



FACULTY MENTOR
Xinyu Zhang

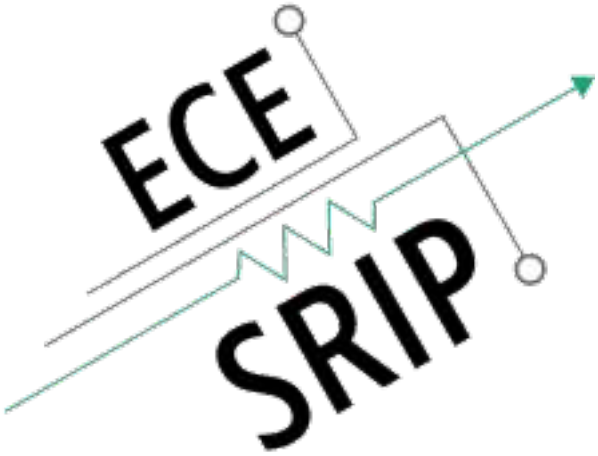
PROJECT TITLE
An Interactive Video Platform to Augment Remote Learning

PROJECT DESCRIPTION
Description: The objective of this project is to explore an augmented cognition framework which tightly synthesizes AI and human (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
1. Experience with high level programming language such as Javascript and Python
2. Experience with machine learning



FACULTY MENTOR
Xinyu Zhang

PROJECT TITLE
Sensing Everyday Activities Using WiFi: A Machine Learning Based Framework

PROJECT DESCRIPTION
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 condition and often impinge on people's privacy. In this project, we propose to reuse WiFi radios as a wireless sensor to remotely track people's activities. The basic observation is that 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. This project will involve substantial amount of data collection, machine-learning model design and implementation.

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

INTERNS NEEDED
2 Students

PREREQUISITES
1. Experiences in machine learning
2. Experiences in high-level language, such as Python