



FACULTY MENTOR

Karcher Morris

PROJECT TITLE

Engineering Tools for Imagination

PROJECT DESCRIPTION

In this research project, you will get to work in the area of engineering education, circuit board design, creating and testing new PCBs, and developing pedagogical projects that use the boards. This project is part of the Envision MakerStudio's Tools for Imagination program.

One major aspect of Tools for Imagination is to provide users with dedicated platforms to help them design a wide variety of engaging projects in electrical and computer engineering. Think Arduino, but then redesigned for more specific applications, allowing users to explore possibilities in electronics, IoT, human-computer interaction, networking, wireless communication, and much more.

Currently, the Tools for Imagination portfolio includes the following: the ESP32 Dev Board (a microcontroller with 40 pinouts and WiFi / BLE), the VU Meter Shield (a shield for the Dev Board that displays audio levels in the environment), the Motion Board (a platform for controlling motors and servos), the Touchscreen Designer (for the creation of wireless touchscreen interfaces), and BLamp (a Bluetooth speaker platform). With these tools, any maker can create any number of projects that are both practical and educational.

The goal of this project is for you to expand this portfolio, improve existing designs, extend project reach/accessibility, and create new Tools for Imagination. You will develop tools to help others learn to use these boards, such as projects and step-by-step tutorials. You will also need to conceptualize and create new systems similar to the ones currently in the portfolio from the ground up, design the associated PCBs, build them, and test them. Building from prior work and the engineering education literature, you will have a significant impact on the ECE and EnVision project community.

This project will be in person.



PREREQUISITES

Experience with hands-on projects is necessary. A strong interest in engineering educational initiatives is also important. PCB design and assembly experiences are additionally helpful.



PROJECT TITLE

Medical Device Engineering and Translation

PROJECT DESCRIPTION

Two research projects:

(a) Surgeon Ergonomics & Education (w/ UCSD Dept. of Surgery)

- The primary goal of this research project is to further improve a wearable inertial measurement system that captures neck motion and analyzes the motion data to improve a surgeon's ergonomic performance. This project addresses the growing need of surgeons to assess their ergonomic performance throughout a long and straining surgery so that they may adjust their posture, environment, and habits accordingly. Throughout the project it will be important to work with and take feedback from surgeons. Project emphasis will be made on real-time data processing and visualization using Swift (no background necessary), and further post processing using Python, so that surgeons can better interpret their ergonomic performance.

(b) Soft Robotic Dilator PCB Design, Manufacturing and Testing (w/ Moores Cancer Center)

- Soft robotic principles can be applied to solve important medical challenges. Dilators can be used to treat stenosis after radiation therapy of cervical cancer patients. A soft robotic dilator can significantly increase patient compliance and be further implemented as a diagnostic tool, to go beyond its already proven therapeutic properties. Printed circuit boards, organizing microcontrollers, sensors and actuators, can improve the quality of product design and lead to a more commercially viable product. This research project requires interest in translating medical devices from bench to bedside and working with an interdisciplinary team of diverse engineers and clinicians.

This project will be in person.

PREREQUISITES

The ideal candidate(s) will show strong interest in working on medical devices at large and be open to solving both software and hardware challenges. Experience in Python data visualization and/or PCB design using Kicad are preferred qualifications. Swift experience is also useful, but not expected.