FACULTY MENTOR
Khoshabeh, Ramsin

PROJECT TITLE
PiB: Learning Python

PROJECT DESCRIPTION
The goal of Project in a Box as an organization, and thus the purpose of each PiB, is to teach hands-on development skills to engineering students. This PiB is a set of independent programs that strengthen the student's programming skills through Python, utilizing Python libraries that show how to make useful tools. Assume that students have taken ECE 15, and thus understand basic programming ideas such as loops and types, and focus on providing opportunities to practice and develop programming skills (e.g. researching a function you don't know, reading documentation, writing understandable code). For example, one program may be a web crawler utilizing the beautifulsoup library.

INTERNS NEEDED
1-2 students at BS level, but MS is preferred
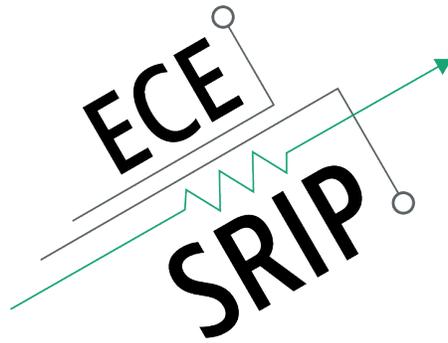
PREREQUISITES
Proficient in Python
Confidence in programming concepts and best practices
Strong technical writing
Familiar with other languages (to point out differences and similarities)
Familiar with a Python GUI framework (Tkinkter, PyQT, etc.)
Teaching/tutoring experience

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PROJECT TITLE
PIB: Augmented Reality

PROJECT DESCRIPTION
The goal of Project in a Box as an organization, and thus the purpose of each PiB, is to teach hands-on development skills to engineering students. This PiB will introduce students to augmented reality and how to make augmented reality applications. Preferably, it is a camera/screen that recognizes an image and creates a moving picture animation from it, like pictures in Harry Potter, and does not use mobile phones. However, the theme can play to the developer's creativity and knowledge base.

INTERNS NEEDED
3-4 students at BS level, but MS is preferred
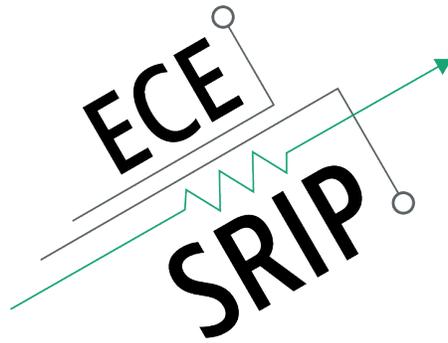
PREREQUISITES
Experience with augmented reality tools
Strong technical writing
Prototyping skills, such as Arduino, soldering, and breadboarding
Confidence that they can create an AR device
Proficiency with 3D modelling

FACULTY MENTOR
Khoshabeh, Ramsin

PROJECT TITLE
PiB: Android App Development

PROJECT DESCRIPTION
The goal of Project in a Box as an organization, and thus the purpose of each PiB, is to teach hands-on development skills to engineering students. This PiB is an IoT project that teaches students how to create an Android App that interfaces with a physical device. The physical device should tell the user something about the environment, allow them to control the environment, or both, through the app. Emphasis should be placed on skills that would empower the student to create their own apps in the future. The theme is left open to the developer's creativity, though examples are an app that alerts the user when their pet's food bowl is empty and remotely refilling it, or a network of sensors that detect when a room is occupied and displays which study areas are empty in the app.

INTERNS NEEDED
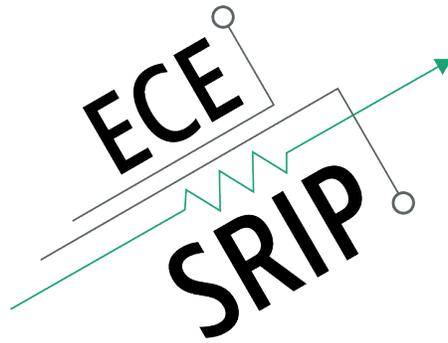3-4 students at BS level, but MS is preferred

PREREQUISITES
Able to use Android Studio or other tools to build Android applications
Confidence in programming concepts and best practices
Strong technical writing
Prototyping skills, such as Arduino, soldering, and breadboarding
Knowledge of Design Pattern

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PROJECT TITLE
PiB: Artificial Intelligence

PROJECT DESCRIPTION
Using some hardware (e.g. Arduino or Raspberry Pi - Raspberry Pi, develop a game (e.g. Tic-Tac-Toe, Connect Four, Checkers, Chess, etc.) where a Human player can versus a Computer player. The student will create a visual representation of the game using hardware (e.g. LEDs, actuators, etc.) and implement the game logic using a programming language (e.g. Python or C/C++). The student will use data structures to interface with the game logic and hardware. The student will implement an algorithm that will be the Computer player's artificial intelligence. The Human player must be able to interact with the game through hardware (e.g. buttons) or through the microcontroller hardware (e.g. inputting commands/moves via some CLI).

INTERNS NEEDED
3-4 students at BS level, but MS is preferred
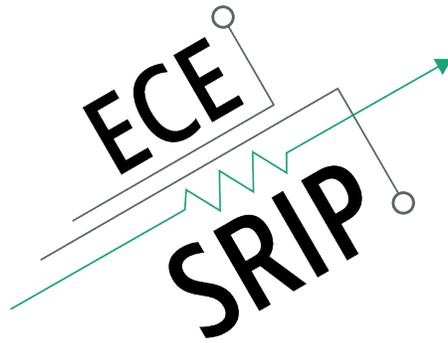
PREREQUISITES
Familiar with C/C++ and/or Python
Comfortable with Data Structures and algorithms
Knowledge of basic sensors/actuators
Multiplexing
Experienced with Arduino, Raspberry Pi, or another microcontroller

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PROJECT TITLE
Intelligent Whiteboard Capture with ML

PROJECT DESCRIPTION
We propose an exciting new project that will have real industry utility! In this project, you will work to develop a functioning whiteboard capture device. Utilizing a camera-based solution, you will work to develop a computer vision algorithm that will isolate the region-of-interest and identify the content written by the instructor, while segmenting and removing the professor from of the captured content. There is a large amount of potential for novel ideas in the areas of machine learning and vision with this project. These skills are highly sought after in industry, so it is a great opportunity for any students who are motivated to tackle a challenging problem!

INTERNS NEEDED
3-4 (preferably MS, but BS is ok)

PREREQUISITES
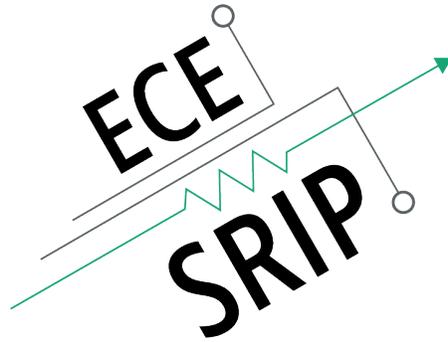Skills needed:
Basic programming experience
Strong passion and drive and a creative mind
Familiarity with OpenCV (or other vision/machine learning frameworks) is a plus

Skills you will sharpen:
Machine Learning fundamentals
Image/Video processing

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Khoshabeh, Ramsin

PROJECT TITLE
Intelligent Whiteboard Capture API

PROJECT DESCRIPTION
In this project, students will be able to develop their software and web development skills by building an API interface to a commercial whiteboard capture solution, the SmartMarker from eBeam. The goal will be to take the output captured by SmartMarker in a desktop client, and provide a browser-accessible interface. This will allow content captured from a whiteboard and stored in the local application to be dynamically integrated into a web site. The project will give the students exposure to web servers, developing in the cloud, and a slew of modern tools that are actively used in industry.

INTERNS NEEDED
3-4 (preferably MS, but BS is ok)

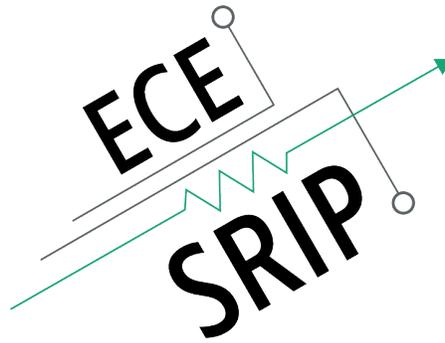## PREREQUISITES
Skills needed:
Basic programming skills
Familiarity with web development and APIs is a plus

Skills you will sharpen:
Interfacing with commercial hardware
Building production-ready software
Browser/web integration

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Khoshabeh, Ramsin

PROJECT TITLE
PIB: iOS App Development

PROJECT DESCRIPTION
The goal of Project in a Box as an organization, and thus the purpose of each PiB, is to teach hands-on development skills to engineering students. This PiB is an IoT project that teaches students how to create an iOS App that interfaces with a physical device. The physical device should tell the user something about the environment, allow them to control the environment, or both, through the app. Emphasis should be placed on skills that would empower the student to create their own apps in the future. The theme is left open to the developer's creativity, though examples are an app that allows the user to monitor the state of their garden and remotely care for plants, or being alerted when their pet's food bowl is empty and remotely refilling it.

INTERNS NEEDED
3-4 students at BS level, but MS is preferred

PREREQUISITES
Able to use xCode or other tools to build iOS applications
Confidence in programming concepts and best practices
Strong technical writing
Prototyping skills, such as Arduino, soldering, and breadboarding
Knowledge of data structures