

## **FACULTY MENTOR**

Yip, Michael

## **PROJECT TITLE**

Snake robot for colonoscopy

## **PROJECT DESCRIPTION**

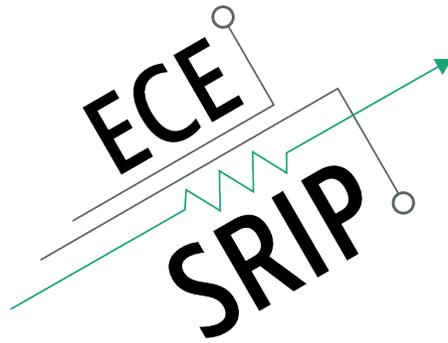
This project involves the development and demonstration of the control of a snake robot in a constrained channel environment, and the development of an integrated camera head with structured light and irrigation for use in an endoscopic robot. The development of a miniature color depth camera, generation of 3D images, and use of those images for reconstructing an environment using SLAM is proposed. Project will culminate in live demonstration of 3D map generation and snake robot movement.

## **INTERNS NEEDED**

1 MS on control and 1 MS on camera hardware and software development, 1 BS for aiding in camera hardware/software development

## **PREREQUISITES**

Computer vision class with high GPA, Embedded design experience, Significant proficiency in C++, ROS experience



## **FACULTY MENTOR**

Yip, Michael

## **PROJECT TITLE**

Reinforcement Learning in OpenAI Gym

## **PROJECT DESCRIPTION**

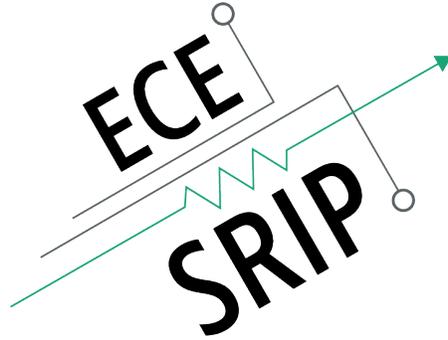
Two tasks will be proposed. First is inverse reinforcement learning problem in Open AI gym, and solve for simple continuous control problems given an expert controller (e.g. LQG). Propose and apply improvements to convergence towards the inverse solution using model-based methods. Second is mixed continuous and discrete space RL. Definition of the problem, mixed tabular/network structure on solving a representative problem. Project will culminate in testing of methods over all reasonable OpenAI gym environments.

## **INTERNS NEEDED**

4 BS and/or MS students, depending on experience

## **PREREQUISITES**

Graduate courses in machine learning (at least one in Deep Neural Networks), some experience with OpenAI and Reinforcement Learning.



### **FACULTY MENTOR**

Yip, Michael

### **PROJECT TITLE**

Automating Robotic Surgery

### **PROJECT DESCRIPTION**

Convert images of a surgical scene (i.e. cricothyrotomy) to actions for a robotic tool (i.e. needle puncture to the larynx) to take to complete a task (i.e. creating hole to put in breathing tube). Involves recognizing 3D landmarks, comparing to some model behavior, and providing recommended object paths. Be able to withstand variations in the scene lighting, debris, etc. and anatomical conditions and create reliable punctures reliably.

### **INTERNS NEEDED**

2 MS students

### **PREREQUISITES**

Graduate computer vision and robotics class with high GPA, proficiency in both Python and OpenCV.