Faculty of Engineering
Summer Research Program 2019-2020

Project Title: Robotic Manipulation: Learning from Humans
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Objective
There are more than 2 million robotic manipulators in the world, and almost all are stationed in factory floors. These robots manipulate industrial objects with known shapes and sizes. In the future, we expect robots with arms to be in our homes to do household tasks such as cleaning, and object delivery. For such applications, the robots would need to be able to manipulate daily objects with high precision. The objective of this project is to enable robots to be able to grasp a variety of objects from human expertise. Human teachers will provide demonstrations to the robot and the robot will replicate the task. The project is about developing machine learning algorithms to enable the robot to learn new behaviors in an intuitive and practical way.

Project Details
We have a UR5 robot from Universal Robots in our lab (shown in figure). We will target contact-rich applications. For example, can the robot learn how to write text on a whiteboard? We will have people demonstrate writing individual letters on a whiteboard (showing the robot by holding its hand or with joystick). We will use End-to-End deep learning to learn the mapping from sensory input (eye-in-hand camera image, wrist force/torque) to the output robot motion (end-effector velocity).

Prerequisites

- Strong programming skills are required (Python or C++ preferred). Exposure to Linux is a plus.
- Interest in publishing the research in a scientific conference