

## Faculty of Engineering

### Summer Research Program 2021-2022

Project Title: Robotic Grasping of Household objects using Deep Learning

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### Objective

Robot manipulators are traditionally used for “top-down” grasps, which simplifies the problem of choosing an x,y, and orientation of the robot gripper, but adds constraints on how the objects can be grasped. Our recent review paper on robotic grasping has shown the feasibility of generating 6 Degrees of Freedom (DoF) using state-of-the-art deep learning methods. This project aims to develop a 6-DoF grasping approach based on deep learning. Existing approaches utilise a binary signal as the ground truth label (grasping attempt was successful or not), which is rather a low-resolution signal. In this project, we will experiment with using other quality metrics for a grasping attempt, such as the displacement of the target object during physical interaction (smaller movement is better), or the noise that the object makes (less noise is better).



### Project Details

A UR5 robot will be utilised for this project. This robot will be equipped with a 2-finger robotic gripper. An RGB-D camera will be attached to the robotic arm and the point cloud data will be used as input to the neural network.

The project would consist of 4 stages:

- 1) Autonomously controlling the robotic arm and the fingers
- 2) Real-world data collection from grasping trials
- 3) Training a convolutional neural network that will output the robot wrist pose as well as the robotic hand joint configurations
- 4) Evaluation of the approach by grasping various singulated objects from a table surface.

### Prerequisites

- Strong programming skills in Python
- Interest in publishing the results of research in a scientific journal
- Experience with training deep neural networks is a plus
- Hands-on experience with robots is a plus