Faculty of Engineering
Summer Research Program 2022-2023

Project Title: Robotic food manipulation

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Objective

If the robots could manipulate food items, they could cook for us. This project explores how robots can use utensils to manipulate food items. Our recent review on robotics grasping showed that rigid objects are utilized much more often than deformable objects such as food. This project focuses on how the robot can learn from humans how to pick up food from a plate.
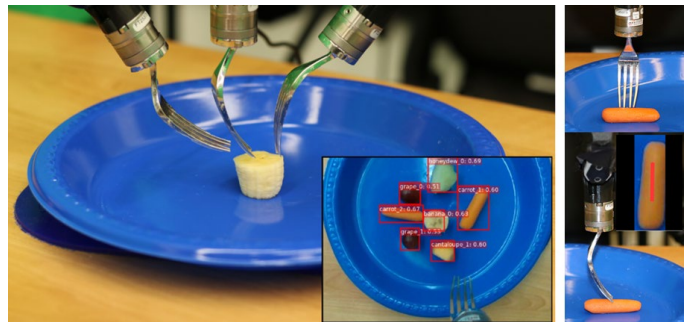
Project Details

The task is to learn how to pick up food from these human demonstrations. We will first develop a controller that can handle physical contact with the food, plate, or environment. This compliant motion would allow the robot to interact with food objects. We will either utilise a publicly available dataset on robotic food manipulation, such as the dataset here, or collect our own dataset of examples of humans manipulating food with utensils. The focus will be on the machine learning part of the project, on how to learn from demonstrations. We will experiment with ML techniques such as deep imitation learning and deep reinforcement learning, with vision and force/torque sensing as inputs and successful picking of the food as the reward. Depending on the outcome of the initial experiments, we can either use a regular fork and spoon, or design utensils that are better suited for the robot to use.

Prerequisites
- Strong programming skills in Python or C++
- Exposure to machine learning, in particular, deep learning from vision data
- Experience with Linux and Robot Operating System (ROS) is a plus
- Prior experience with controller development is a plus