CPS843 - Project Proposal

Project Overview:
The build-up of improper waste disposal has negatively impacted our environment long-term. This is why there is a need for an object detection system that can differentiate between garbage, recycling and compost. Our project will initially create this system so that the computer can tell the user where the item scanned belongs. Eventually, this project should be automated, where all pieces of waste can be put into one bin, then the camera scans these pieces and a mechanism filters them into their respective bins.

Project Objectives:
- Develop a Python-based disposal identification tool.
- Research and learn from lectures strategies and methodologies relevant to the development of the disposal identification tool.
- Use computer vision to detect and identify an object. Then classify it to be disposed of as recycling, garbage and compost.

Potential Challenges:
A significant challenge that may be encountered during the development of an Object Detection system differentiating between garbage, recycling, and compost may be the difficulty of detecting an object's composition. For example, if the system detects black plastic cutlery and decides whether it is garbage, recycling, or compost, it may classify the cutlery as garbage. Another challenge will be getting the computer to learn from the new data it is scanning every time, so, if a mistake occurs it will not happen again.

Technology Stack:
Physically, this project will consist of a few low-cost pieces of hardware. We will use a small microcontroller like a Raspberry Pi paired with a camera module. This portion will be responsible for capturing and controlling the visuals. In terms of software, python will be used to process the video feed from the camera. Packages like OpenCV and TensorFlow will be used to process the images and train the machine-learning model to detect different forms of waste. Our datasets will be taken from reliable sources like Kaggle.

Project Summary:
The goal of this project is to address the issue of improper waste management by developing a Python-based object detection system. The system uses computer vision to first identify, and then organize the waste as either garbage, recycling or compost. Key technologies include Raspberry Pi, with a camera module which feeds the visual input, and software like OpenCV and TensorFlow for image processing. Some challenges include correctly scanning complex objects and also guaranteeing the system can improve its accuracy by learning from its mistakes