**Crop and Weed Detection System: Reducing Pesticide Waste and Enhancing Crop Production**

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The agricultural industry faces significant challenges due to the presence of weeds, which compete with crops for essential resources such as nutrients, water, and land. This competition results in decreased crop productivity and inhibits the optimal growth of desired crops. To control weeds, farmers often resort to the use of pesticides. However, the indiscriminate application of pesticides can lead to adverse effects, such as the contamination of crops and potential health risks for humans. Therefore, there is a need for a more targeted approach to weed control in agriculture.

The aim of this research is to develop a system that can accurately detect and differentiate between crop plants and weeds in agricultural fields. By doing so, the system will enable targeted pesticide application exclusively to weeds, minimizing the mixing problem with crops and reducing the waste of pesticides. This paper presents the data preparation steps, including dataset collection, cleaning, image processing, data augmentation, and manual labeling. Additionally, it addresses the problem of weed interference in agriculture and emphasizes the importance of developing a system that can effectively mitigate the negative impacts of weeds and pesticides.

# Abstract

This paper focuses on the development of a crop and weed detection system to reduce pesticide waste and enhance crop production. The dataset used in this study contains 1300 images of sesame crops and different types of weeds, with each image labeled in YOLO format. The data preparation process involved collecting 589 images, cleaning the dataset to remove irrelevant or misleading data, resizing the images to a manageable size, and augmenting the dataset using data augmentation techniques. Manual labeling of the images was conducted by drawing bounding boxes to differentiate between crops and weeds. The paper addresses the problem of weed interference in agriculture, highlighting the negative impact on crop productivity and the potential risks associated with pesticide use. The aim of the study is to develop a system that can accurately detect and differentiate between crops and weeds, allowing targeted pesticide application exclusively to weeds, thereby reducing the mixing problem with crops and minimizing pesticide waste.

# Data Preparation

In this section, we discuss the process of collecting and cleaning the dataset. It involves capturing photos of crops and weeds, followed by dataset cleaning to ensure data quality. The resulting dataset comprises 546 images after the cleaning process.

## Work Done

### Dataset Collection.

The dataset used in this study consists of 589 images captured from agricultural fields, including photos of both crops and different types of weeds. These images serve as the foundation for training the crop and weed detection system.

### Dataset Cleaning.

Once the dataset was collected, a crucial step was to clean and refine it. Dataset cleaning is essential to ensure that only relevant and accurate data is used for training the detection model. In this step, any images that were deemed irrelevant or potentially misleading were removed from the dataset. By eliminating low-quality or misleading images, the cleaning process helps enhance the performance of the detection model. After the cleaning process, the dataset was refined, resulting in a reduced dataset containing 546 images.

## Next week plan

### Data Augmentation.

### Image Processing.

### Manual Labelling.

# Challenges/Hurdles

## To learn and understand what the dataset wants to convey.

The dataset contains 1300 images of sesame crops and different types of weed. Each picture is provided with YOLO label mentioning <label><x><y><width><height>. These labels helps to identify the bounding box for the crop and crop contained in bounding box is weed or not.

## To understand how the YOLO algorithms and conventions work.

YOLO (You Only Look Once) is an algorithm that uses neural networks to provide real-time object detection. It employs convolutional neural networks (CNN) to detect objects in real-time. As the name suggests, the algorithm requires only a single forward propagation through a neural network to detect objects. This means that prediction in the entire image is done in a single algorithm run1. The YOLO algorithm detects and recognizes various objects in a picture (in real-time) and provides the class probabilities of the detected images

## To prepare a basic roadmap of how I will go on about this project.

The current roadmap I developed for next week would be to use libraries like OpenCV to identify the image and make bounding box for each labelled crop. This would give me complete insights which algorithm to adapt for this problem.

## Gathering all relevant material from the internet.

Most of the time use google and chatGPT to find relevant materials on internet.