



Semi-Supervised Weed Detection using YOLOv8

**Leveraging Pseudo-Labeling for
Improved Performance**

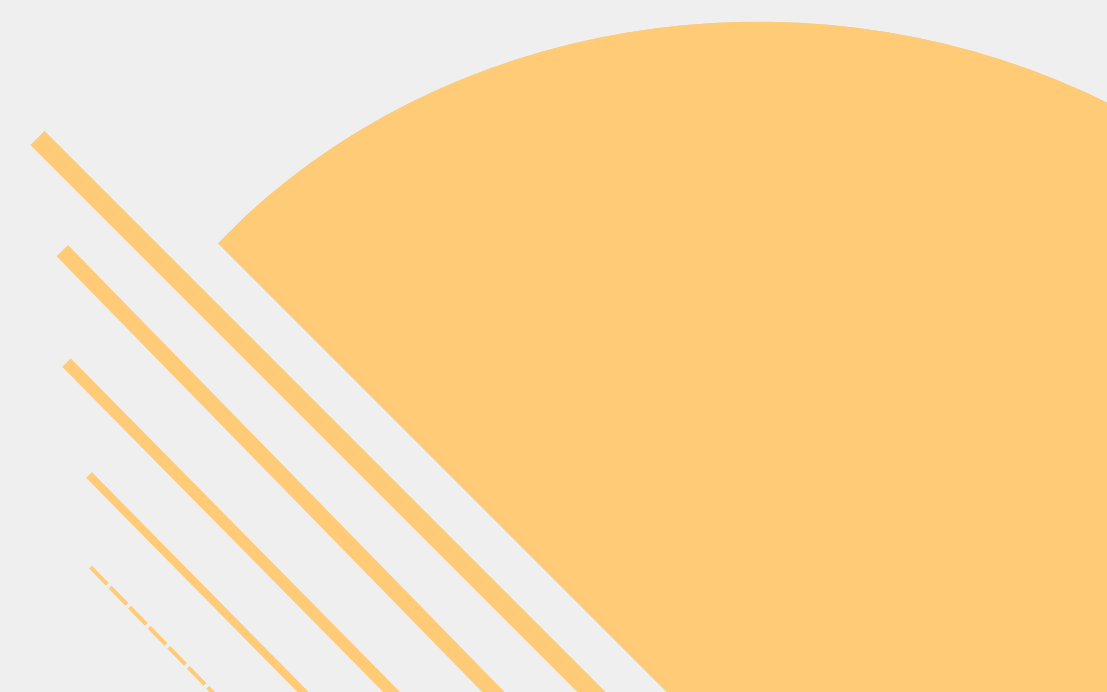






INTRODUCTION



- **Weed detection in agriculture is critical for yield optimization.**
- **Fully labeled datasets are expensive and time-consuming to create.**
- **We use a semi-supervised approach combining labeled and unlabeled data.**
- **Our method involves pseudo-labeling for better model performance.**





*Hey! There's no
need to worry.
Let's break it
down step by
step*



DATASET AND PREPROCESSING

Let's begin by examining the dataset given and how we process it

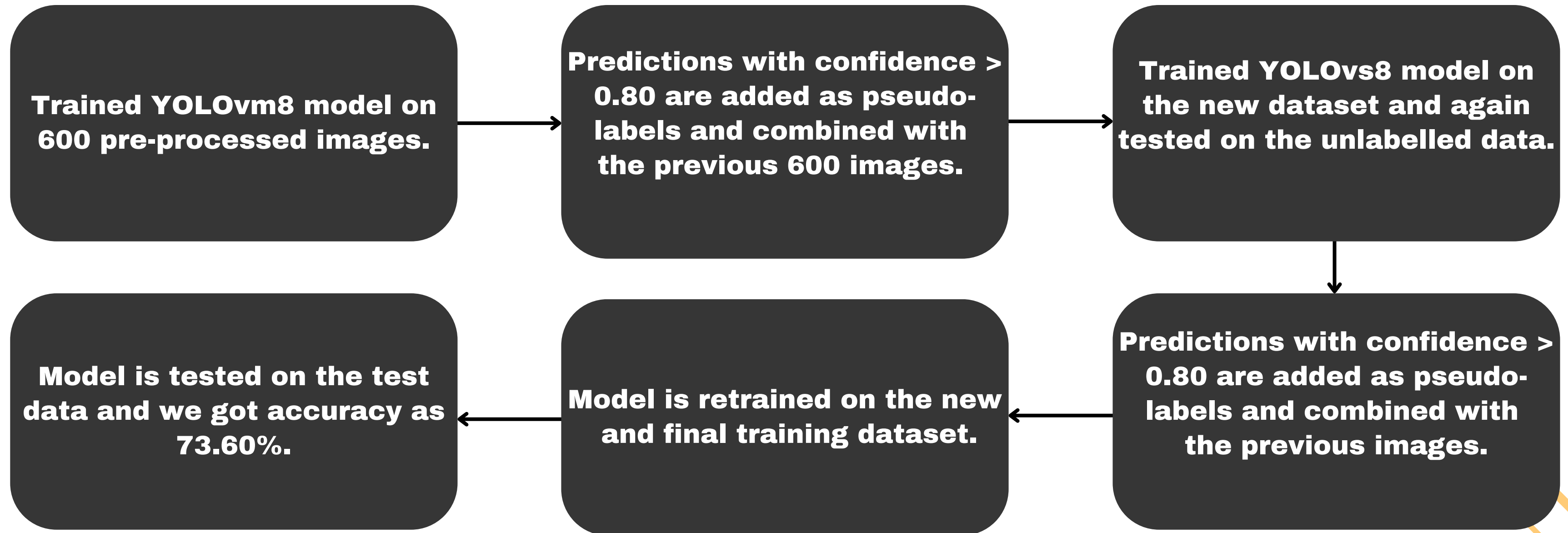
- **Initial labeled dataset: 200 images**
 - **Later augmented to 600**
 - **Unlabeled dataset: 1000 images.**
 - **Data augmentation using Albumentations.**
 - **Flips, rotations, brightness contrast adjustments.**
 - **Preprocessing for YOLOv8 training.**
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BASELINE YOLOV8 MODEL


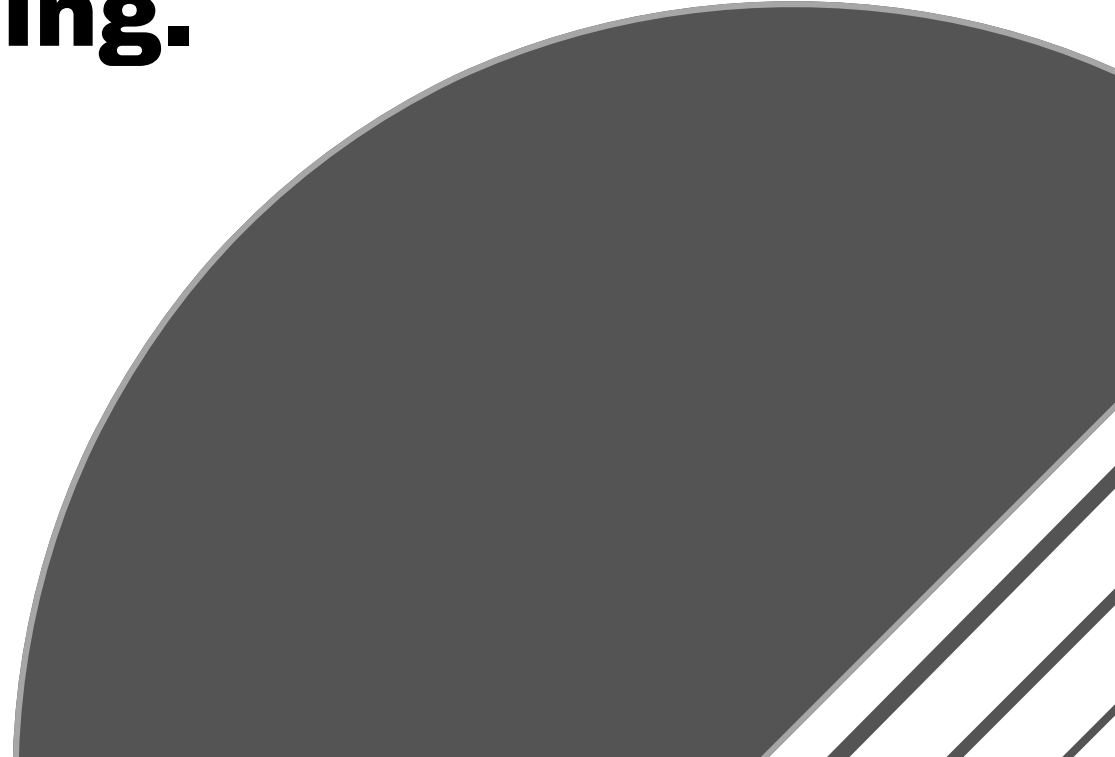
- **Used augmentation to improve generalization.**
 - **Trained on 600 labelled images.**
 - **Achieved initial evaluation score of 0.73.**
 - **Next step: Leverage unlabelled data with semi-supervised learning.**
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PSEUDO-LABELING STRATEGY





EVALUATION AND PERFORMANCE

- **Performance metrics:**
 - - **Mean Average Precision (mAP)**
 - - **Precision and Recall**
 - **Metric for evaluation: $0.5 * (F1\text{-Score}) + 0.5 * (mAP@[.5:.95])$**
 - **Iterative improvement using pseudo-labelling.**
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CONCLUSION AND FUTURE WORK

- **Semi-supervised learning effectively improves weed detection.**
- **Pseudo-labeling and FixMatch help utilize unlabeled data.**

Future work:

- **Fine-tuning confidence thresholds.**
- **Exploring more augmentation strategies.**

Deploying model in real-world settings.



The background features several decorative geometric elements. In the top-left corner, there is a large yellow semi-circle and a series of parallel yellow lines of varying lengths. In the top-right corner, there are two semi-circles, one yellow and one dark blue. In the bottom-left corner, there are three semi-circles in red, green, and dark blue. In the bottom-right corner, there are four semi-circles in yellow, red, green, and dark blue, arranged in a 2x2 grid pattern.

**THANK
YOU**