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Adaptive Automated Crops and Weed Segmentation Using AI

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Abstract: *Weed management is a major challenge in agriculture as weeds compete with crops for nutrients, light, and water, resulting in significant yield losses. Traditional weed removal methods are inefficient and often lead to excessive pesticide usage, affecting both the environment and crop quality. This work proposes an Adaptive Automated Crop and Weed Image Segmentation system using AI with multi-language support. This project aims to overcome this limitation by developing an Adaptive Automated Image Segmentation system powered by artificial intelligence. The core of this system is a deep learning model, based on a U-Net architecture, which is designed to perform precise pixel-wise segmentation. A key innovation is the integration of adaptive learning techniques, enabling the model to continuously fine-tune its parameters when encountering new types of imagery, thereby significantly improving its generalization and accuracy without requiring complete retraining. The entire workflow—from image preprocessing and segmentation to result visualization—is automated into a single, efficient pipeline. Furthermore, the project includes the development of an interactive user interface. This dashboard allows users to easily upload images, visualize segmented outputs, and provide corrective feedback, which is then used to further adapt and refine the model for specific use cases.*

Keywords: Artificial Intelligence in Agriculture, Smart Farming, Image Segmentation

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