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Weed Detection for Precision Agriculture: A Comprehensive Review

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Abstract: Growing crops and rearing animals to produce food, clothes, and other everyday necessities is known as agriculture. Unwanted plants that grow where they are not needed typically in gardens, among crops, or on farmland are called weeds. They can lower crop yields and make farming more difficult by competing with crops and other plants for resources like water, nutrients, sunlight, and space. Precision agriculture is a clever agricultural method that helps farmers grow crops more effectively by utilizing contemporary equipment and technology. It all comes down to treating each section of the field with the appropriate quantity of water, fertilizer, or care rather than treating the entire field in the same way. For both efficient weed control and sustainable wheat production, accurate weed detection is essential. Weed detection is a critical task in precision agriculture, enabling targeted intervention and reducing herbicide use. Convolutional Neural Networks (CNNs), a type of deep learning algorithm, have demonstrated significant potential in automating this procedure. Recent studies on the use of deep learning methods for weed identification in different crops are reviewed in this publication. We analyze commonly used CNN architectures, including YOLO, R-CNN, and others, along with image acquisition methods, datasets, and performance metrics. The review highlights the advancements, challenges, and future directions in deep learning-based weed detection, providing valuable insights for researchers and practitioners in the field of precision agriculture.

Keywords: Agriculture, Convolutional neural networks (CNNs), Crops, Deep learning, Image processing, Weeds



