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Advancements in Agricultural Technology: A Comprehensive Review of Machine Learning and Deep Learning Approaches for Crop Management and Disease Detection

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Abstract: *Traditional agricultural practices often lack personalized guidance for farmers, which leads to poor crop choices, wasteful fertiliser use, and inadequate disease control. As a result, sustainability and productivity decline. In order to address these issues, this review examines the developments in agricultural technology, with a focus on the fusion of deep learning and machine learning techniques. We look at techniques like ensemble modelling, which optimises crop selection and fertiliser consumption depending on soil properties, and advanced image processing methods, which use leaf images to diagnose plant diseases accurately. Our goal in conducting this study is to provide light on how agricultural technology is developing and how it affects contemporary farming methods. We emphasise the major trends, approaches, and developments in the field of agricultural technology by examining a variety of research papers covering many elements of the subject. Our thorough analysis highlights the potential of deep learning and machine learning techniques to transform agricultural disease diagnosis, fertiliser selection, and crop management. With this investigation, we hope to add to the current conversation about using technology to solve the urgent problems facing the agriculture industry and, in the process, open the door for more effective and sustainable farming methods in the future.*

Keywords: Crop management, Machine Learning, Deep Learning, Soil-crop management, Disease detection

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