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Machine Learning in Precision Agriculture: A Survey on Trends, Applications and Evaluations Over Two Decades

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Abstract: *Precision agriculture represents the new age of conventional agriculture. This is made possible by the advancement of various modern technologies such as the internet of things. The unparalleled potential for data collection and analytics has resulted in an increase in multi-disciplinary research within machine learning and agriculture. However, the application of machine learning techniques to agriculture seems to be out of step with core machine learning research. This gap is further exacerbated by the inherent challenges associated with agricultural data. In this work, we conduct a systematic review of a large body of academic literature published between 2000 and 2022, on the application of machine learning techniques to agriculture. We identify and discuss some of the key data issues such as class imbalance, data sparsity and high dimensionality. Further, we study the impact of these data issues on various machine learning approaches within the context of agriculture. Finally, we identify some of the common pitfalls in the machine learning and agriculture research including the misapplication of machine learning evaluation techniques. Tothis end, this survey presents a holistic view on the state of affairs in the cross-domain of machine learning and agriculture and proposes some suitable mitigation strategies to address these challenges*

Keywords: Agriculture, digital farming, intelligent agriculture, machine learning, precision agriculture, precision farming

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