


Chapter 7

Crop Prediction for Smart Agriculture Using Ensemble of Classifiers

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ABSTRACT

Nowadays due to the advancement in technology, smart agriculture is in the evolving stage. Agricultural farmers worldwide commonly utilize the process of cultivating and harvesting crops to produce food and fiber. Therefore, crop prediction is vital for smart agriculture and the proposed approach involves utilizing all the necessary resources to facilitate crop growth and maintenance. Crop cultivation used to be carried out based on farmers' actual experience. For farmers and agricultural decision-makers to make prompt and accurate judgments that will impact the caliber of agricultural harvests, advanced tools are required. A prediction has been supplanted by machine learning techniques as a result. To anticipate agricultural yield, the authors provide a prediction system based on an ensemble of machine learning classifiers. Also, they discovered that an ensemble technique provided more accurate prediction than using the currently available categorization algorithms.

1 INTRODUCTION

Most nations' economies rely on the agriculture industry, which is vital for ensuring food security and livelihood. Despite its importance, the industry faces several

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obstacles such as climate change, pests, diseases, and erratic weather patterns that adversely impact crop yields and food production (Fenu & Mallocci, 2019), (Pant et al., 2021). Precise and dependable crop prediction is critical in addressing these challenges and safeguarding food security. Predicting crops involves evaluating the projected yield for each season by considering factors such as soil type and weather conditions (Kalimuthu et al., 2020).

Historically, predicting crop yields has been accomplished through manual means, which are slow, ineffective, and vulnerable to mistakes. However, due to the availability of substantial data and technological advancements, machine learning (ML) has become a promising alternative for precise and efficient crop prediction (Van Klompenburg et al., 2020). ML algorithms can examine vast amounts of information, recognize patterns, and provide precise predictions (Nischitha et al., 2020). Numerous investigations have been conducted to design ML-based models for crop prediction, utilizing various techniques such as neural networks, decision trees, support vector machines, and Bayesian networks (Gupta et al., 2021).

Ensemble techniques have become increasingly popular for enhancing the precision and stability of ML models in recent times (Kumar et al., 2015), (Rajak et al., 2017). For more accurate predictions than single models, ensemble approaches combine multiple models. Ensemble techniques can compensate for the shortcomings of individual models and deliver more durable and dependable predictions by using multiple models (Dharani et al., 2021).

The primary focus of this study is crop prediction for smart agriculture using an ensemble technique that combines best-performing ML algorithms such as Decision Tree, Logistic Regression, Random Forest, Gaussian Naïve Bayes, and K-Nearest Neighbour. These algorithms were chosen based on their popularity, simplicity, and effectiveness in classification tasks (Reddy & Kumar, 2021). The objective of this study is to develop a dependable and precise ML-based model for crop prediction utilizing an ensemble technique. The model is trained and assessed on a dataset comprising past crop yields and weather data for a particular region. The model's precision is evaluated utilizing metrics like accuracy, ROC, and F1 score. The outcomes of this study are compared to other research studies in crop prediction using ML.

This chapter addresses the significant concern of dependable and accurate crop prediction by utilizing an ensemble technique that merges five ML algorithms. The research makes a valuable contribution to the area of agriculture and ML by presenting an effective and precise strategy for crop prediction that has the potential to significantly improve crop yields and food production. The results of this study have the potential to guide policymakers, farmers, and stakeholders in making

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