A LITERATURE REVIEW STUDY ON: DEVELOPMENT OF MAIZE SEED CLASSIFICATION AND RECOGNITION PREDICTION SYSTEM USING MACHINE LEARNING FOR HIGH YIELD MAIZE PRODUCTION

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ABSTRACT
In the current research, the importance of maize seed identification and its varieties are appropriately studied. The machine vision was used to quickly employ methods for checking the seed quality, which helps for better yield. The proposed methods central aspect helps integrate the machine vision with ML methods to analyse different parameters such as color, shape, and texture. Typically, ML techniques are used to capture the various details such as seed quality, pruning, fertilizer application, and environmental and genetic analysis to increase the yield of maize in agriculture. Eventually, it is important to find an effective integration of ML methods in the identification of maize seeds in the agriculture field, which helps the farmers to procure better yield and minimize the loss. Healthy maize seeds are essential for better yield, and various detection methods are utilized in research to find the best one in agriculture. However, most of the techniques are manual, expensive, and time-consuming, which makes the process difficult. The proposed techniques that have been utilized in the study have the possibility to present accurate results that help in identifying similar maize varieties.
Therefore, different parameters are used in the process in order to identify the maize seeds and their varieties to procure efficient results compared to the existing techniques.
Keywords: Maize seed, Deep convolutional neural network, Convolutional neural network, Long short-term memory, Machine learning

Introduction

One of the primary crops in the food business is maize, which is subject to abiotic stress such as drought stress, which has a considerable impact on development and reduces production at significant development levels. As a result, different stress levels have different negative impacts, particularly on the production and growth of maize. The levels of drought stress in maize require varying amounts of watering in the interim. In order to minimize water use, provide a steady and high-yield crop like maize, early prediction and monitoring of drought stress accuracy are therefore regarded crucial. The traditional approaches to measuring the intensity of a system's drought stress rely solely on soil moisture sensors, which are inefficient and only effective over small, indirect areas. Additionally, maize plants develop a number of physiological defense mechanisms to lessen the effects of drought stress on a phenotypic series of alterations, including leaf color and texture, plant dwarfing, and a decrease in leaf extension rate. Deep convolutional neural networks (DCNN) have also been used to categories and identify maize drought stress.

Additionally, the investigation made use of the most recent commercial and scholarly functional breakthroughs in the FMIS - Farm Management Information System. The studies that have hitherto been conducted mostly focused on crop output and farm managers who had decision-making authority. The majority of study focuses on supply chain digitalization combined with smart agricultural practices at the farm level. In fact, farmers have historically been hesitant to launch, especially in medium and small agri-food firms. Additionally, a variety of DL - Deep Learning techniques have been used in the studies, including CNN - Convolutional Neural Network, which has improved adaptability, generalization, and self-learning capabilities and produces better results in face recognition, object detection, and image classification.

Additionally, a number of techniques have been used to forecast variety, and morphological identification was limited by morphological traits, environmental variables, and human interference, which has an impact on the cost or testing time that limits the accuracy of identification. As a result, biochemical identification enables seed recognition with a variety of genetic traits; yet, it can occasionally be difficult to forecast the types. On the other

hand, molecular identification by DNA markers provides advantages for genetic stability and is suited to many environmental circumstances.

However, it is difficult to apply the majority of current detection techniques in the seed processing industry. Therefore, it is important to develop quick, effective, and non-destructive techniques for classifying and identifying the many varieties of maize seeds. Due to its dependability, speed, and accuracy, DL and machine vision have been merged by numerous researchers. But as seed consumption and variety increase, there are more demands placed on these studies, and the use of earlier studies has decreased. As a result, many seed variants are used in deep CNN classifications of various agricultural goods.

Objectives of the study

A literature review is a comprehensive overview of all the knowledge available on a specific topic, ranging from early research to current developments. It serves several purposes:

- To study literature review related to the development of maize seed classification and recognition prediction systems using machine learning techniques for high-yield maize production.
- To study literature review on identify the different machine learning techniques and algorithms utilized for maize seed classification and recognition prediction in the literature.
- To study literature review on explore the various features extracted from maize seeds, such as texture, color, and shape, to aid in the classification and recognition prediction process.
- To provide insights and recommendations for future research on the development of more accurate and efficient maize seed classification and recognition prediction systems for high-yield maize production.

Literature Review

A literature review is a comprehensive overview of all the knowledge available on a specific topic, ranging fromearly research to current developments. It serves several purposes-

Huang, He, Zhu and Qin (2016) Multidimensional scaling and PCA - Principle Component Analysis were utilized in order to minimize and transform the classification features for solving dimension disaster risk and formulate the classification approach for maize seeds. The LS-SVM (least squares-support vector machine) features has been integrated and utilized.

Huang ,Fan, Sun , Shen, and Suo (2019) the main focus of the study was to utilize effective transfer learning and CNN - convolutional neural network techniques to predict the maize seeds defect appearance. The transfer learning and CNN has been utilized for quality classification of maize seeds. The visualization technology has been used to acquire the feature map of CNN network with the heat map to describe the inference results probability distribution.

Altuntaş, Cömert , Kocamaz (2019) Doubled-haploid is considered as a significant method in maize breeding, genetic programs, and modern-crop enhancement to maximize the breeding efficiency. Nevertheless, the breeding process is more difficult and expensive when choosing haploid seeds. This study focuses on this issue and treats it as a computer vision task that provides a quick, low-cost model for choosing maize seeds. The CNN methods are utilized to automatically identify diploid and haploid maize seeds via a transfer learning technique with ResNet, GoogLeNet, WGNet, and AlexNet.

Veeramani, Raymond and Chanda (2017) the current research focused on identifying the corn seeds shape, embryo pose, and phenotypic expression that captured in the camera. Moreover, the ML-classifiers utilizes features based on texture, morphology, and color. DeepSort-based CNN used in the realistic settings in maize production.

Altuntaş, Kocamaz, CÖMERT,Cengiz,& Esmeray,(2018) the main focus of this research to find out the maize breeding in homozygosity and time. The main process in this technique was the haploid seeds selection. Therefore, this automation process will enhance the success rate and minimize the time and labor. DH - Doubled Haploid technique has been utilized in maize breeding.

Javanmardi,Hassan, Martynenko (2020) the high-level (CNN-extracted) and low-level (texture, morphology, and color) corn seeds features utilized for classification. Moreover, CNN was implemented as a feature extractor especially in the classification process with the 9 varieties of corn seeds. Deep-CNN has been utilized as a generic feature extractor were classified with the ANN - Artificial Neural Network, quadratic SVM, SVM -

Support Vector Machine, bagged tree, boosted tree, LDA - linear discriminant analysis, and weighted k-nearest-neighbor.

Ren , Liu, Zhang , Liu 1 , Xi 1 , Kang 3 , Li 1,2 and Zhang 1,2(2020) the effectiveness of the various strategies has been assessed in the current study's crop classification process. Using sentinel-2 images, it was easy to distinguish the seed maize from other crops. The 4-classification algorithms includes KNN, SVC, LSTM, and RF has been utilized in the study and among these LSTM was considered as an effective method.
Chipindu, Mupangwa, Mtsilizah, Nyagumbo, & Zaman-Allah,(2020)In the current research, different techniques are used to classify and predict the maize kernal abortion among the total images of 66 and remaining images for performance testing. The techniques such as Binary ML techniques, including k-NN, CART - classification tree, AdaBoost, SVM, LR - Logistic Regression, and deep CNN, have been utilized in the detection and classification of maize kernel abortion.

García-Santillán, Montalvo & Pajares, (2017) identifying straight and curved crop rows in gathered images that are captured at the crop's initial stage in maize fields. This sequence categorizes into three phases: image segmentation, Initial stage identification, and crop row prediction. The DAGP - Detection by Accumulation of Green pixels has been utilized for predicting straight, curved crop rows. The performance has been studied through quantitative analysis and the techniques utilized. Further, Standard Hough Transform has been used to predict straight crop rows.

Dönmez,(2020) the technique used for maize Seeds classification as diploid and haploid utilizing pre-trained CNN. Therefore, 3000 diploid & haploid seeds dataset has been used in the experimentation. Further, the maize seed classification was processed computer-aided with the deep features acquired using the pre-trained CNN method. Eventually, these can be applied to different agricultural products, The categorization of maize seeds as diploid and haploid uses pre-trained CNN and classifier-based techniques including SVM, k-nearest neighbour, and DT - Decision Tree methods.

Zhao,C.,Quan, Liu, R., Wang, Feng & Sin2020) This study focuses on electromagnetic vibration application exploration and DL-technology in the prediction of maize kernel. Using color images as input data and emphasizing on the quality concerns while identifying the maize kernels, the Faster R-CNN model has been utilized to choose maize kernels.

Research Gap
In this literature review study identified the research gap is lack of comparative analysis & Most of the reviewed studies utilize different machine learning techniques to classify and recognize maize seeds. However, there is a lack of comparative analysis among the various methods, which can help identify the most effective approach for high yield maize production. Limited focused on specific seed characteristics Some of the studies focus on specific seed characteristics, such as haploid and diploid seeds or maize kernel abortion, but do not address other essential features that can affect maize production.

Inadequate consideration of practical implementation While the reviewed studies show promising results in maize seed classification and recognition, there is a lack of consideration for practical implementation of these techniques in real-world settings, such as on farms and in seed production facilities. Limited exploration of novel machine learning techniques Although the reviewed studies utilize various machine learning techniques, there is a lack of exploration of novel techniques, such as deep reinforcement learning or transfer learning, which can enhance the accuracy and efficiency of maize seed classification and recognition systems.

Conclusion
This literature review study demonstrates the importance and effectiveness of developing accurate and efficient classification approaches for maize seeds, which can be useful in various agricultural applications such as seed sorting and quality control. The use of advanced techniques such as deep learning and computer vision can significantly improve the accuracy and efficiency of seed classification, and potentially reduce the cost and time required for manual classification. The literature review indicates that machine learning algorithms such as CNN and SVM are effective in seed classification and recognition.

The literature review suggests that there is a gap in research on the use of machine learning for seed classification and recognition in maize production. The proposed system can accurately classify and recognize maize seeds based on their quality, size, and other characteristics, which can help farmers select the best seeds for planting and improve the overall yield. Overall, the proposed system has the potential to revolutionize maize

production by providing accurate and efficient seed selection, which can lead to higher yields and profits for farmers.

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