IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

ISO 3297:2007 Certified ⁜ Impact Factor 7.918 ⁜ Vol. 12, Issue 2, February 2023

DOI: 10.17148/IJARCCE.2023.12221

Krishi Vikas : A Survey on Smart Agricultural Techniques

Chetana Srinivas[1] , Neha M Jain[2], Nikhitha A R[3], Pooja R[4], Prakruthi V P[5]

Associate Professor, Department Of Computer Science And Engineering, East West Institute Of Technology Bangalore,India[1]

Department Of Computer Science And Engineering, East West Institute Of Technology Bangalore, India[2-5]

Abstract: Agriculture and related industries contribute greatly to the Indian economy. One of our goals is to make our Indian farmers more aware of the variety of E farming features that can be of great use to them. Food security is seriously threatened by crop diseases, but due to a lack of the essential infrastructure in many places throughout the world, early detection of these diseases is still challenging. The ability to diagnose sickness using a smartphone has been made conceivable by recent a breakthrough in computer vision enabled by deep learning and rising smartphone adoption worldwide. Using a public dataset of larger images of sick and healthy plant leaves taken under controlled conditions, we train a deep convolutional neural network to recognise several crop species and diseases . Overall a quick way to get there is to use the technique of training deep learning models using progressively sizable and freely available image datasets to massively worldwide illness diagnosis in smartphone-aided cropping. A web application built with Python and Machine Learning and packed with capabilities is used to support the E-Agro sector.

Keywords: Agriculture, Farming, Crops, Climate, Deep Learning, Neural network, Image Processing.

I. INTRODUCTION

The foundation of the Indian economy is agriculture, which is crucial to the growth of the economy in India. Due to the fact that farmers account for the largest share of our country's GDP, the agricultural society is the main focus of this app.

This programme gives farmers access to this information in real time, introducing them to the most suited crops to be planted as well as fertiliser recommendations and plant disease detection, thereby assisting them in increasing productivity while minimising loss .

Renting Tools : At the moment, farmers must travel great distances to borrow all of their basic necessities, which is a laborious and inefficient task. In light of the predicted positive effects on society, smart digital agriculture is consequently ranked as the most important technology opportunity in the most recent Global Opportunity report.

Through Krishi Vikas, farmers can rent equipment like an ox plough, a spade, an axe, a rake, a sickle, and more. Additionally, agricultural subsidies are required because the Indian economy is heavily dependent on the farming industry and because a major portion of farmers' investments go toward purchasing equipment.

Climate: Small changes in temperature and rainfall have significant effects on the quality of crops. This application helps in detecting suitable weather for appropriate crops and helps the farmer to take precautionary measures in case of heavy rainfall, cyclone or drought conditions thereby increasing the productions of yield.

Expert Assistance: This includes contact details of specialists and experts in the field of agriculture. The farmer can share his/her valuable feedback through a dialog box provided in the form of comments or suggestions. Farmers in remote villages are majorly benefitted through this feature as they need not head towards cities for many problems every time.

There have been many different methodologies previously researched and implemented , and each method had its benefits and drawbacks. The motivation for doing the literature survey is to have a deep and clear understanding of the existing methodologies and learn from the imperfection of the various research papers.

International Journal of Advanced Research in Computer and Communication Engineering
ISO 3297:2007 Certified ⁜ Impact Factor 7.918 ⁜ Vol. 12, Issue 2, February 2023
DOI: 10.17148/IJARCCE.2023.12221

II. LITERATURE SURVEY

A. Recommendation of Crop, Fertilizers and Crop Disease Detection System

The method aids farmers in making well-informed decisions regarding what crop to cultivate, effective fertilizer use, and crop disease prediction based on leaf textual similarity.
Crop yield predictions can be made using information and communication technology (ICT). Crop yield can also be forecasted via data mining. By analyzing prior data, recommendations for a better crop with a higher yield could be made for the farmer.

B. Plant Disease Detection and Classification by Deep Learning-A Review

This review paper details the development of deep learning technology in recent years as it relates to the detection of agricultural leaf diseases.
The current trends and difficulties for the identification of plant leaf ailments utilising deep learning and cutting-edge image processing methods are outlined in this research.
Multiple illnesses on the same leaf could be identified with this approach, and the data can also be improved by segmenting the leaf image into numerous sub-images.

C. Smart Agriculture Using Deep Learning Technologies: A Survey

This study examined the most significant advancements and issues that have been resolved in the current research and published articles on deep learning techniques in agriculture over the last 5 yrs. Additionally, internet of things (IOT) continuously monitors agricultural factors and uses that data to input the deep learning system for the purpose of analysis. Furthermore, on analyzing various researches with relation to the focused agricultural area, the issues resolved, the deep learning model utilised, the dataset used for implementation, the framework used for implementation, the data pretreatment and augmentation method, and the correctness of the results.

D. Crop Guidance and Farmer's Friend – Smart Farming using Machine Learning

This system is constructed in a manner that it can monitor the humidity, temperature, and environmental changes at a particular location.Farmers time and effort are reduced by this programme, which also helps them obtain the current market price for various harvests, fertilisers, and veggies without having to go to the market.Through this application, the farmers will be provided with the data (value, climate, and most modern rural technology).The farmers benefit greatly from this software, which also keeps them informed. It provides a means of support for practically the whole population, boosting national GDP and creating jobs.

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

Monitoring in this system offers automatic data gathering for a number of factors, containing information about the crops, such as leaf area and plant height, as well as information about the soil, such as moisture and chemical composition.We name some of the major data problems and talk about them, like imbalance of class, data brevity, and excessive dimensionality.We also research how these data problems affect various machine learning strategies in the field of agri-business environment.The misapplication of machine learning assessment methodologies is one of the main mistakes in the machine learning and agricultural study that we identify in the final section.

III. COMPARATIVE ANALYSIS OF METHODOLOGIES

After going through the research papers and getting a deep understanding of various methodologies proposed, we have comprehended the advantages and limitations of different approaches. The detailed statistics of our comparative study are shown in Table I.

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

ISO 3297:2007 Certified ⁜ Impact Factor 7.918 ⁜ Vol. 12, Issue 2, February 2023

DOI: 10.17148/IJARCCE.2023.12221

METHODOLOGIES	ADVANTAGES	LIMITATIONS
KNN,DECISION TREE,CNN,RANDOM -FOREST [1]	-PREDICTS THE TYPE OF CROP DISEASE BASED ON TEXTUAL SIMILARITY OF LEAVES.	-A SMALL CHANGE IN THE DATA RESULTS IN A BIG CHANGE IN THE STRUCTURE, WHICH LEADS TO INSTABILITY. -TRAINING THE DECISION TREE MODEL REQUIRES MUCH MORE TIME.
DEEP LEARNING ALGORITHMS[2]	-THERE COULD BE MANY DISEASES ON THE SAME LEAF	-THE SYSTEM HAS SOME INADEQUACIES. - THE MODEL HAS POOR ROBUSTNESS
HYBRID MODEL OF CNN AND SVM [3]	-OFFERS GOOD GENERALIZATION PERFORMANCE	-REQUIRES MANY DATASETS TO PERFORM WELL.
MACHINE LEARNING ALGORITHMS [4]	THE SYSTEM HELPS FARMERS AND KEEPS THEM UPDATED.	-THE SYSTEM PROVIDES LESS ACCURACY.
MACHINE LEARNING ALGORITHMS [5]	-AUTOMATIC DATA GATHERING OF MANY PARAMETERS IS PROVIDED BY MONITORING.	A WIDE RANGE OF MEASURES ARE USED TO EVALUATE CATEGORIZATION ACCURACY.

TABLE I : COMPARATIVE ANALYSIS OF METHODOLOGIES

IV. MACHINE LEARNING MODELS

Machine learning is a crucial instrument for aiding crop expectations, offering guidance on how to enhance plants and what to perform during the plant growth phase. The various features are subjected to the following algorithms:

A. Decision Tree

Within the levels of the tree structure, decision trees provide trait or fallback models .Build decision trees iteratively by dividing the dataset into manageable subsets. handles a variety of literal and mathematical data.

B. Naive Bayes

Create a classifier using Naive Bayes. That is, a model that, whenever the class labels are selected from a finite set, assigns a label described as a vector of unfavourable cases and entity values. Remember that a specific characteristic's value is unrelated to the alternative characteristic's real value given the class variable.

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

ISO 3297:2007 Certified ⁜ Impact Factor 7.918 ⁜ Vol. 12, Issue 2, February 2023

DOI: 10.17148/IJARCCE.2023.12221

C. Support Vector Machine

SVMs incorporate a portion of the training parameters in their decision function, which further reduces their memory usage (called guiding vectors).

D. Random Forest Algorithm

Algorithm for random forests divides the network into character systems and use the identifying network intruders using the Clustered Random Forest (CRF) technique enables them to make a positive comment on communications that have already begun within the network. We look at each node in the network and create a log file that the suggested approach uses as input

$$\text{Gini Index} = 1 - 2\ ii{=}1\ nn \sum (PPii)$$

E. ADA Boost

When fitting a collection of training data with variable weights, it is utilised as an ensemble approach. Predicting the initial data set is the first step, and each observation is given equal weight. H(x) = sign (αt ht(x)) ht(x)is the result of the weak classifier for the input x is ht(x)αt =0.5 * ln ((1 — Error rate)/Error rate)

F. Neural Network

A computer model called a neural network has a specific factors that can be altered in network architecture to carry out a particular task.

G. Datasets

On the Kaggle website, data for crop and fertilizer prediction is gathered. Seven characteristics—N_2, P_4, K, Thermal reading, Dampness, Rain, and Moisture content—as well as 22 different crops are included as labels. The input collection of data includes of about 3 thousand data points for various soil moisture levels and PH values for crops (such as rice, maize, oranges, and moth beans). We can forecast the NPK values based on the content of moisture and pH provided to suggest appropriate crops, and by using the value of NPK and type of crop, enables us to forecast the appropriate fertilizers.

The dataset for the disease prediction module is considered from the website named Kaggle, and the system uses the image of the sick leaf as input to forecast the treatment for the condition. 2000 diverse photos of healthy and diseased plant leaves, including those from tomatoes, potatoes, bell peppers, and other plants, make up the input dataset.

H. Evaluation Matrix:

1. Precision: Accurately identifying the quantity of positive predictions is known as precision.

$$Precision = \frac{TruePositive}{TruePositive + FalsePositive}$$

2. Recall: The confusion matrix yields all favourable results.

$$\text{Recall} = \frac{\text{True Positives}}{\text{True Positives + False Negatives}}$$

3.Accuracy: Accuracy is the degree to which a measurement is near to its actual value

International Journal of Advanced Research in Computer and Communication Engineering
ISO 3297:2007 Certified ⁜ Impact Factor 7.918 ⁜ Vol. 12, Issue 2, February 2023
DOI: 10.17148/IJARCCE.2023.12221

$$\text{Accuracy} = \frac{\text{True Positives + True Negatives}}{\text{True Positives + True Negatives + False Positives + False Negatives}}$$

V. CONCLUSION

The comparison of several algorithms of machine learning enables us to determine which is most appropriate for the forecast of crops and detection of plant disease and fertilizers which will increase the yield. Hence this project makes farming simpler by giving farmers the right advice regarding irrigation, fertilizers, weather, soil quality, and alternative crops and seeds, as well as by suggesting them.

In this paper, we examined current research initiatives concerning the application of deep learning methods in farming throughout the last few years. Important contributions that have been published as well as difficulties that have been resolved were discussed. We took into account technical information through datasets utilized, deep learning models, the environment of work, data pretreatment, augmentation of data approaches, the outcomes shown in reference articles when conducting this survey. This report provides detailed information about the proposed system and the problems faced by the existing systems while attempting to experiment with deep learning and apply it to address various categorization or prediction challenges in agriculture as well as issues with computer vision, analysis of image and data in general.

REFERENCES

[1] Tanvi Daware, Pratiksha Ramteke, Uzma Shaikh, and Smita Bharne, “Crop Guidance and Farmer’s Friend – Smart Farming using Machine Learning”, ITM Web of Conferences 44, 03021 (2022) ICACC-2022

[2] LILI LI, Shujuan Zhang, and Bin Wang, “Plant disease detection and classification by deep learning” –A review,IEEE-2021

[3] Sarah Condram, Michael Bewong, MD Zahidul islam, Lancelot Maphosa, and Lihong Zheng,“Machine learning in precision agriculture: A survey on trends , applications and evaluations over two decades”, IEEE-2022.

[4] V. R. V. S. S. T. Sooraj Krishna, Sreevijay, “Farmer friend”, IEEE, 10, pp. 9–19 (2021)

[5] G. A. Anirudha Vachaspati Vempati, “Agricultural problems and technology-based sustainable solutions”, IEEE, 5, pp. 6–13 (2020)

[6] S. N. Uke1 , Prafulla Mahajan2 , Swapnali Chougule3 , Vaishnavi Palekar4 , Kaivalya Kashikar, “Recommendation of Crop ,Fertilizers and Crop Disease Detection System”, IJRASET,-2021