Journal of Positive School Psychology http://journalppw.com
2022, Vol. 6, No. 4, 8874 – 8879

# Enhancing Crop Productivity using Machine Learning

**[1]K. Ezhilarasi, [2]M. Rajeswari, [3]L. kiruba shankar, [4]S.Dharun**

*[1]Department of Information Technology , Kcg college of Technology, Chennai, India, ezhilarasi.it@gmail.com*
*[2]Department of information Technology, Kcg college of technology, Chennai, India, rajie2105@gmail.com*
*[3]Department of Information Technology Kcg college of Technology, Chennai, India, kirubashankar15ak@gmail.com*
*[4]Department of Information Technology Kcg college of Technology, Chennai, India, dharun646@gmail.com*

## Abstract

Amid mounting concerns about food security and climate change, the agriculture industry has begun to incorporate artificial intelligence (AI) into its operations. While there are numerous potential AI benefits, there is a lack of understanding of the goals that drive AI adoption and its consequences. This study tries to close the gap by looking at the fundamental themes surrounding AI in agriculture via the prism of dynamic capabilities. We do text mining of news stories from 2014 to 2019 in Asia, Africa, Europe, and North America using centered resonance analysis to see how AI is addressing major farming concerns. The findings reveal that AI is being used largely to boost productivity and efficiency, with labor shortages and environmental sustainability The results show active AI adoption in North America and Europe, as well as expanding initiatives in Asia and Africa, at the regional level.

**Keywords**: Machine learning, Deep learning, Crop prediction, Disease identification, Fertilizer prediction.

## 1. INTRODUCTION

One of the goals of agricultural production is to achieve maximum crop yield at the lowest possible cost. Early detection and control of problems with crop yield indicators can aid in increasing output and profit. Large-scale meteorological phenomena can have a substantial impact on agricultural production by changing regional weather patterns. Crop managers could use predictions to reduce losses in the event of unfavorable weather. Furthermore, these forecasts could be used to maximize crop prediction when favorable growing circumstances are present. Crop yield prediction, particularly for strategic plants like wheat, corn, and rice, has always been a fascinating research topic for agro meteorologists, as it is crucial for national and international economic planning. Aside from cultivator genetics, dry farming crop production is influenced by a variety of factors such as the effect of pests, diseases, and weeds, as well as the management and control of quality during the growing season, are all heavily influenced by climatic occurrences. As a result, it's a system that uses meteorological data to make more precise predictions. There are numerous yield prediction models available today, with the majority of them falling into one of two categories: statistical models and crop simulation models (e.g. CERES). Machine learning algorithms like the Random forest method, naive bayes, and decision trees have recently demonstrated to be more effective in solving the problem. Models based on complicated natural systems with many inputs can be made easier and more accurate by using them. It was attempted to construct a variety of

agricultural yield prediction models using machine learning .

## II. RELATED WORKS

The paper "Efficient Crop Yield Prediction victimization Machine Learning Algorithms" by Arun Kumar & et al. is used to combine past weather data from multiple weather stations in order to estimate future atmospheric conditions[1]. "Rainfall forecast victimization Machine Learning Techniques," by Aakash Parmar and Mithila Sompura. The categorizing of crop yields was done according to batch victimization in this study. Artificial neural networks aided in the increase in yield productivity. It will also describe the many types of productivity. The original crop production and predicted cost are calculated using regression[2].Ganesan proposed to use pc vision and a fuzzy-based segmentation technology to diagnose plant leaf diseases first. The diseased section of the plant leaf from the input image is also extracted using image segmentation. Color space segmentation is also used to identify the color of the fruit or the color of the diseased area [3]. H. Sabrol and K. Satish present a study in which five different tomato diseases are classified: tomato blight, bacterial canker, Septoria spot, and tomato leaf curl. Color, texture, and form of plant leaves are used to classify them. Each tomato plant is photographed, both healthy and diseased. After segmentation, the disentangled alternatives are fed into the classification tree. The classification accuracy is obtained as ninety seven.3% is obtained with these six varieties of tomato pictures [4]. K.K.Singh is developing a collaborative platform for disease identification that is cloud-based. It is expected to be used by farmers for greater hindrance purposes[5]. Petrilli has described a smartphone that is mostly based on disease diagnosis applications. The same has been done with color social control[6-7]. The data used to forecast the weather in order to predict agricultural yields. "Prediction of Crop Yield Victimization Machine Learning," Sachee Nene and Priya. N. cited the MLR methodology for studying crops as well as the call tree algorithm for categorizing over 350 pieces of data. It divides soil types into three categories: land, organic, and inorganic[8].Santanu Koley, Shivnath Ghosh "Victimization of Machine Learning for Soil Fertility and Plant Nutrient Management Neural Networks with Back Propagation "[9], for crop prediction and judging the effects of temperature change, suggested a semi-constant quantity variation of a deep neural network model. "Groundnut Prediction Victimization Machine Learning Techniques," by Iran's Vinita Shah and Prachi Shah [10]. A Drug Recommendation System for Multi-Disease in Health Care Using Machine Learning." method generates appropriate recommendations for individuals suffering from cardiac, fever, obese, optical, and ophthalmic diseases. For patient suggestions, supervised machine learning Random Forest, Decision Tree, and K-nearest neighbors were utilized[12]. Sathyanarayanan D.Krishnamurthy,M."Efficient intelligent generic recommendation knowledge graph in education domain using association rule mining and machine learning"mentioned that the relationship is established based on the pedagogical data with assessment data of learners are classified into course list. This generic knowledge graph is compared with the CNN based model and GCN based model[13.]Ezhilarasi, K., and G. Maria Kalavathy. "Enhanced Neuro-Fuzzy-Based Crop Ontology for Effective Information Retrieval." The crux of conventional keyword matching-related IR utilizes advanced algorithms for recovering facts from the Internet, mapping the connection between keywords and information, and categorizing the retrieval outcomes[11].

## III. PROBLEM DEFINITION

The lack of planning, the unpredictable environment, and inappropriate harvesting and irrigation techniques are the main causes of lower food output. The most major obstacles for poor farmers are frequent droughts and severe precipitation. According to the Indian government's annual economic study, bad weather reduced the farmer's financial benefit

by 20-25 percent. Exact agriculture is one of the options for ensuring global food security. In agriculture, it is the adoption of contemporary information technology and software package tools for call assistance. Farmers use a variety of software packages and technology to anticipate crop yields, and many different types of analysis are being conducted to increase accuracy. Several existing techniques failed to forecast using soil as a parameter. Accuracy is over the present system. There are tons of software packages accessible for prediction. Therefore it is tough to use by the farmers.

## IV. METHODOLOGY

IV.I. MACHINE LEARNING MODULE

1) CROP AND FERTILIZER PREDICTION

A. Data Collection:

Data consists of a unique supply and optimized for knowledge sets. Moreover, the information is employed to judge descriptively. Many abstract on-line shops, like Kaggle, Google weather forestation, and data government, give the information for up to 10years serial. The data sets like soil nature, location are used for the crop prediction and higher crop yields.

B. Preprocessing Step

Preprocessing the information is taken into account in a big step machine learning section. Preprocessing involves adding the missing values, the right set of information, and extracting the practicality. The information set is crucial to the process of study. Will be elicited collected knowledge during this step in pandas to induce the required output

C. Feature Extraction

Extraction of the options would cut back the information size involved to characterize a comprehensive assortment of information. The characteristics of soil, crop collected from the pretreatment method establishes the final training information collection. This approach selects the options supporting the matrix, i.eThe options that have additional correlation worth are chosen as an important prognostication function for yield.

D. Data Prediction

In advance of this step, we have a tendency to split the information into the coaching and check datasets. By applying a random forest algorithm classifier, the information is trained with offered input and output knowledge. figure1: the flow chart for crop and fertilizer prediction is drawn below[1]. Within the check section, the information is tested if the model's accuracy is good. Then the new information is foretold by a machine learning module


FIGURE 1: *CROP AND FERTILIZER PREDICTION FLOW CHART[1]*

IV.II. DEEP LEARNING MODULE

2) DISEASE IDENTIFICATION:

The proposed disease prediction methodology takes input from the plant's leaves pictures. First the information is pre-processed by resizing the input pictures and more a NumPy array is formed for identical. Next the dataset and label of all the pictures are sequestered. The model has been trained on a selected data set consisting of pictures of the different unhealthy plant leaves that are thought-about for this study. The labeled information is currently stored in pickle files that are once more extracted throughout the training amount of the model. After that, twenty fifths of the entire information is dropped out. The output is two-dimensional to feed the dense network. The last layer incorporates a SoftMax

activation to predict the illness of the given leaf. To scale back the loss perform Adam optimizer is used. The framework consequently distinguishes the image of leaf given and pre-processes the picture more for prediction. The model can manufacture fifteen distinctive likelihood values for fifteen labels severally among that the chance worth with highest score to the related name are going to be the anticipated unwellness or result for that particular image.

A. Input Layer

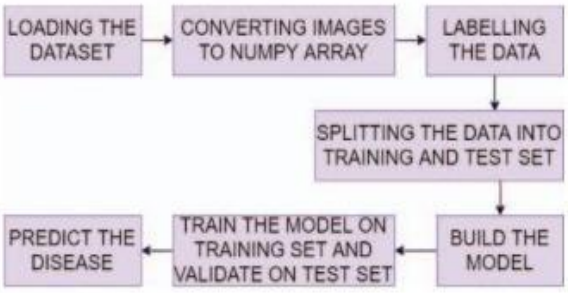
The input is fed into the layer . At this starting stage of the neural network, the number of neurons and range of options are equal. Considering a picture the quantity of pixels in it's similar to the whole range of options .The input file is split into 2 components that are used for training and testing the model . The foremost part of information is used for training and also the minor part of it's used for testing.

B. Hidden Layer

The input layer receives from the output layer. It is dependent upon each model and size of information moreover.Number of neurons could vary in every of the hidden layers .

C. Output Layer

A logistical performer receives the info from hidden layers as input The likelihood score is obtained for every category by converting the output of every category by a logistical performer. It converts every category output into a similar chancescore for identical.

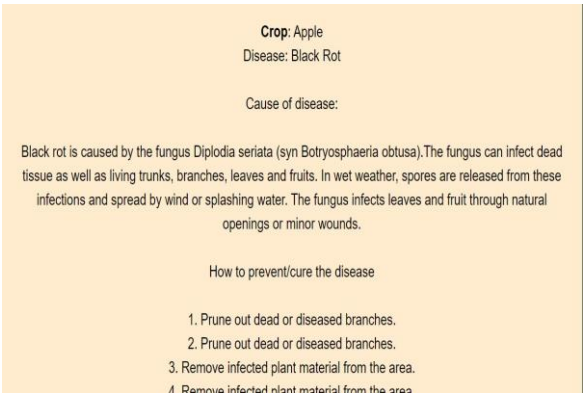



BLOCK DIAGRAM FOR DISEASE IDENTIFICATION

## V. RESULT AND ANALYSIS

Finally, developed a webapp with four input parameters as district name, crop name, area in (acres) and soil type. so, if the inputs are given then it shows the yield prediction. of crop. and it identifies fertilizer macro and micro nutrients. and disease can be identified with plant image by that it identifies the crops diseases..


USER INTERFACE HOME PAGE



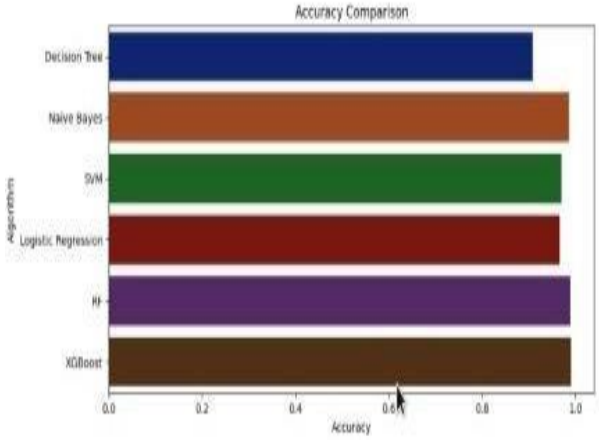

PREDICTED RESULT FOR DISEASE IDENTIFICATION

## VI. FUTURE SCOPE

In order to improve the existing system, combine a larger number of algorithms. and also take advantage of advanced complicated algorithms that can anticipate more accurately. This improves the precision. These techniques help to increase the accuracy resulting in a

favorable outcome for farmers in the sector of agriculture.

## VII. CONCLUSION




COMPARISON CHART

The above figure concluded that random forest is the fine version with $R^2$ accuracy of 96%. India is a kingdom where agriculture performs a top role. in the prosperity of the farmers, the kingdom prospers. Thus our work might assist farmers in sowing the proper seed primarily based totally on soil necessities to grow the productiveness of the kingdom. Our destiny work is geared toward progressed records set with a massive variety of attributes and additionally implements yield prediction. by making use of both RAF and CNN algorithms for harvest yield it allows making certain precision and effectiveness of crop yield for maximizing crop production.

### Reference

[1] Arun Kumar, Naveen Kumar, Vishal Vats, "Efficient Crop Yield Prediction Using Machine Learning Algorithms", International Research Journal of Engineering and Technology (IRJET)- e-ISSN: 2395-0056, pISSN:2395-0072, Volume: 05 Issue: 06 | June-2018

[2] Aakash Parmar & Mithila Sompura, "Rainfall Prediction using Machine Learning", 2017 International Conference on (ICIIECS) at Coimbatore Volume: 3 | March 2017.

[3] Ganesan, S.Sajiv, L.Megalanleo Leo, "CIELuv Color Space for Identification and Segmentation of Disease Affected Plant Leaves Using Fuzzy based Approach", 3rd International Conference on Science Technology Engineering & Management (ICONSTEM),Chennai India, 23-24 March 2017, pp. 889-894.

[4] H.Sabrol, K.Satish, "Tomato Plant Disease Classification in Digital Images using Classification Tree", International Conference on Communication and Signal Processing (ICCSP), Melmaruvathur, India, 6-8 April 2016, pp. 1242-1246I. S. Jacobs and C. P. Bean, "Fine particles, thin films and exchange anisotropy," in Magnetism, vol. III, G. T. Rado and H. Suhl, Eds. New York: Academic, 1963, pp. 271–350.

[5] K.K.Singh, "An Artificial Intelligence and Cloud-Based Collaborative Platform for Plant Disease Identification, Tracking and Forecasting for Farmers", IEEE International Conference on Cloud Computing in Emerging Markets(CCEM), Bangalore, India, 23-24 Nov 2018, pp. 49-56

[6] N.Petrellis, "Plant Disease Diagnosis With Color Normalization", 8th International Conference on Modern Circuits and Systems Technologies(MOCAST), Thessaloniki, Greece,13-15 May 2019.

[7] N.Petrellis, "A Smart Phone Image Processing Application for Plant Disease Diagnosis", 6th International Conference on Modern Circuits and Systems Technologies(MOCAST), Thessaloniki, Greece, 4-6May2016.

[8] Sachee Nene & Priya, R "Prediction of Crop yield using Machine Learning", International Research Journal of Engineering and Technology (IRJET) Volume: 05 Issue: 02 | Feb-2018

[9] Shivnath Ghosh,Santanu Koley, "Machine Learning for Soil Fertility and Plant Nutrient Management using Back Propagation Neural Networks" IJRITCC, vol. 2, Issue 2,292-297,2014.

[10] Vinita Shah & Prachi Shah, "Groundnut Prediction Using Machine Learning Techniques ",published in IJSRCSEIT. UGC Journal No : 64718 | March-2020.

[11] Ezhilarasi, K., and G. Maria Kalavathy. "Enhanced Neuro-Fuzzy-Based Crop Ontology for Effective Information

Retrieval." COMPUTER SYSTEMS SCIENCE AND ENGINEERING 41.2 (2022)

[12] Sathyanarayanan, D.,Krishnamurthy, M.Efficient intelligent generic recommendation knowledge graph in education domain using association rule mining and machine learning International Journal of Innovative Technology and Exploring Engineering Volume 8, Issue 10, August 2019

[13] Komal Kumar, N Vigneswari, D "A Drug Recommendation System for Multi-disease in HealCare Using Machine Learning"1st International Conference on Advanced Communication and Computational Technology, ICACCT 2019; Kurukshetra; India,Volume 668, 2021