ENHANCED INTELLIGENT INTERFACE FOR CROP YIELD AND DISEASE DETECTION

Mr.T.Murali ,M.E Associate professor
Department of Computer Science and Engineering Paavai Engineering College, Namakkal

Aravinth.S UG Student
Department of Computer Science and Engineering Paavai Engineering College, Namakkal

Dharshannath.Y UG Student Department of Computer Science and Engineering
Paavai Engineering College, Namakkal

Harish Kumar.C UG Student Department of Computer Science and Engineering
Paavai Engineering College, Namakkal

Abstract--- Machine learning and deep learning are used for many practical purposes such as We build a simple Machine Learning and Deep Learning website that recommends the best plants to grow, what fertilizer to use for your plants, and weed control measures such as your weed disease. Agriculture is one of the main sectors that affect the economic development of the country. In a country like India, the majority of the population depends on agriculture for their livelihood. Many new technologies, such as machine learning and deep learning, are introduced to agriculture, making it easier for farmers to grow and increase their productivity. In this project, I present a website where the following programs are implemented; Planting advice, fertilizer recommendations and plant disease forecasts. In the crop advisory program, the user can provide soil information and the user will be predetermined what the crop will grow. For the fertilizer advisory program, a user can input soil information and the type of crops planted, and the program will predict the lack or excess of soil and recommend improvements. For the last program, the plant disease prediction program, users can input images of diseased plant leaves and the program will predict what the disease is and provide some information about the disease and recommendations for its treatment and finally graphical chart are been shown for highly yielded crop are listed out based on analysis of historical data .

Keywords: Crop yield, disease detection, supervised learning, image processing, user interface design, precision farming.

I.INTRODUCTION

Using machine learning and deep learning, we help improve overall crop quality and accuracy
- precision agriculture. Machine learning technology helps detect diseases in crops, pests and farm nutrient deficiencies. Deep learning tools can detect and target weeds, then use a flexible web application to determine which herbicide to use in the area. Deep learning techniques are used to identify diseases and recommend interventions for those diseases. We are building a simple Machine and Deep Learning based website that advises you how to plant the best crops, what fertilizers to use for your crops, and how to prevent weeds like diseases in your lawn.

Using machine learning and deep learning, we are building a web application that recommends the best plants to grow, fertilizers to use, and what diseases your plants are prone to. Machine learning and deep learning are being implemented in agriculture to make it easier for farmers to grow and increase their productivity. In this project, I present a website where the following programs are implemented; Planting advice, fertilizer recommendations and plant disease forecasts. In the crop advisory program, the user can provide soil information and the user will be predetermined what the crop will grow. For the Soil Advisor program, users can input soil information and the types of crops grown, and the program will predict soil deficiency or excess and recommend improvements and analyse historical data.

II.LITERATURE SURVEY

“Weed detection uses image processing” and deep learning by Jaiendra Reddy ,(2022).

Identifying weeds in crop fields is difficult because the plants are randomly spaced. By

conducting research in this field, weeds are identified mainly through conventional approaches that focus on the direct differentiation of weeds. Grasses can be difficult to identify by eye because there are many types of weeds in fields, including broadleaf and broadleaf. Automation is used forweed detection

deep learning (DL) and image processing (IP). First, a convolutional neural network (CNN) algorithm is used to identify weeds by drawing a bounding box around green plants, and the rest are identified as plants. Then, the support vector machine (SVM) is applied to the same database and the confusion and precision matrix is generated. Agri Data is a dataset used for training and testing data. Using the algorithm, we can determine whether it is weeds or plants. CNN and SVM accuracies are compared for weed detection.

“A review of computer-based weed detection techniques” in University of Technology (China),May (2021). Grass is one of the most important factors affecting agricultural production. Agricultural waste and pollution caused by the application of chemical herbicides are most obvious. With the continuous increase of agricultural productivity, it is important to accurately distinguish plants from weeds and achieve precision spraying only for weeds. . In recent years, some scientists have used various computer vision techniques to achieve this goal. This review describes two aspects of using traditional image processing methods and deep learning-based methods to solve the problem of weed detection. It reviews various weed detection methods in recent years, analyses the advantages and disadvantages of existing methods, and introduces some plant leaves, weed databases, and weeds.

"A comprehensive review of crop disease detection methods using deep learning". S. Srinivasan and S. Jayasankar. (2021) The authors provide a comprehensive overview of deep learning techniques used for crop disease detection, including convolutional neural networks (CNNs), recurrent neural networks (RNNs), and generative adversarial networks (GANs). It also discusses the challenges and limitations of existing methods and suggests future directions for research."Crop yield prediction using machine learning techniques: a review". A. Singh, A. Kumar and S. S. Saini. (2021) This paper provides a comprehensive overview of machine learning techniques used for crop yield forecasting, including linear regression, decision trees, SVM, and artificial neural networks (ANN). The author discusses the advantages and limitations of each method and suggests directions for future research.

"A review of crop yield prediction using machine learning techniques". A. Nazir, A. Sohail and M. A. Tariq. (2021) This article reviews machine learning techniques used for crop yield forecasting, including regression analysis, SVM, decision trees, and ANNs. The author discusses the challenges of building an accurate model and the importance of choosingappropriate features.

III. EXISTING SYSTEM

Identifying weeds in crop fields is difficult because the plants are randomly spaced. By conducting research in this field, weeds are identified mainly through conventional approaches that focus on the direct differentiation of weeds. Grasses can be difficult to identify by eye because there are many types of weeds in fields, including broadleaf and broadleaf. Automation, deep learning (DL) and image processing (IP) are used for weed detection. First, a convolutional neural network (CNN) algorithm is used to identify weeds by drawing a bounding box around green plants, and the rest are identified as plants. Then, the support vector machine (SVM) is applied to the same database and the confusion and precision matrix is generated. Agri Data is a dataset used for training and testing data. Using the algorithm, we can determine whether it is weeds or plants.

CNN and SVM accuracies are compared for grass detection and prediction.

IV. PROPOSED SYSTEM

We noted earlier that only one component (weather or soil) is considered when predicting the suitability of crop growth. However, we believe that each of these elements must be considered simultaneously for the best and most accurate forecast. This is because a particular

ype of soil may be perfect for supporting a type of plant, but if the climate in that area is not suitable for that plant, the results may be reduced.

In a country like India, the majority of the population depends on agriculture for their livelihood. Many new technologies, such as machine learning and deep learning, are introduced to agriculture, making it easier for farmers to grow and increase their productivity. I present a website where the following programs are implemented; Planting advice, fertilizer recommendations and plant disease forecasts and historical data are seen through state and city. In the crop advisory program, the user can provide soil information and the user will be predetermined what the crop will grow. For the fertilizer advisory program, a user can input soil information and the type of crops planted, and the program will predict the lack or excess of soil and recommend improvements.

The last program, the plant disease prediction program, can be entered by the user image of diseased plant leaves, and the program will predict what the disease is and give a little information about the disease and provide historical data that can be used to treat it and analyze high yield.

V.METHODOLOGY

A. Data Collection:

The first step in building a machine learning or deep learning model is collecting data. In crop forecasting and disease mitigation, data can be collected from various sources, including weather stations, satellite images, and field sensors. Data should include information on weather conditions, soil moisture, temperature, and other environmental factors that may affect plant growth and disease incidence. The quality and quantity of data collected can greatly affect the accuracy and performance of the model. Therefore, it is important to collect a large amount of high quality data to build an accuratemodel.

B. Data processing:

After the data is collected, it needs to be processed. This includes cleaning the data, removing all outliers, and converting it into a format that can be used by machine learningalgorithms. Data processing also includes data normalization, which is the process of scaling data to a common range for efficient learning models. Data normalization is important for models such as neural networks that are sensitive to the range of input features. Data processing also includes feature engineering, which is the process of selecting or creating the most important features from the data that can provide meaningful insights into plant growth and disease patterns.

C. Choose a feature:

Feature selection is the process of selecting a subset of the most important features from the data that can provide the most information for the model. This is important because not all features are equally important for the model to learn patterns and make predictions. Feature selection can be done using statistical methods or domain knowledge. For example, domain experts can identify characteristics such as soil moisture, temperature, and humidity that significantly affect plant growth and disease occurrence.

D. Model options:

There are several machine learning and deep learning algorithms that can be used for crop prediction and disease mitigation. Commonly used algorithms include random forest, support vector machine (SVM), neural network, and convolutional neural network (CNN). The choice of algorithm depends on the nature of the problem and the available data. For example, if the data is structured and has a limited number of features, a tree-based decision algorithm such as random forest may be appropriate. On the other hand, if the data is unstructured and has a large number of features, deep learning algorithms such as CNN may be more appropriate.

E. Study Model:

After the algorithm is selected, the model must be trained using the pre-processed data. During training, the algorithm learns from the data and adjusts its parameters to improve its accuracy. The training process involves feeding data to the algorithm and continuously adjusting the model's weights or parameters to reduce the error between the predicted and actual results. The learning process can take several cycles, which is how many times the algorithm covers the entire database.

F. Model evaluation:

After the model is trained, it must be evaluated to determine its accuracy. This can be done using various metrics such as mean squared error, root mean squared error, and R-squared. The evaluation process involves testing the model on a separate dataset that was not seen during training. This is done to ensure that the model can generalize to new data. If the accuracy of the model is not satisfactory, it may need to be retrained using different algorithms or parameters

G. Estimate:

After the model is trained and evaluated, it can be used to predict plant growth and disease patterns. This can be done by feeding the model new data and making predictions based on learning patterns. These predictions can be used by farmers or agricultural professionals to make informed decisions about crop and disease management

VI.SYSTEM DESIGN & ARCHIETECTURE

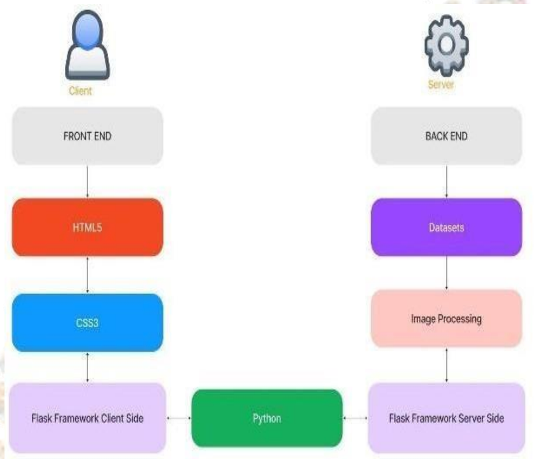

Fig 1: System architecture

A. FLOW CHART

A data flow diagram is a two-dimensional diagram that describes how data is processed and transferred in a system. Graphical representation identifies each data source and how it interacts with other data sources to produce overall results. Individuals who want to create a data flow diagram must identify external inputs and outputs, determine how the inputs and outputs relate to each other, andgraphically describe how these relate to theoutput.

LEVEL 0:

Fig 2: Level 0 DFD Diagram

LEVEL 1:

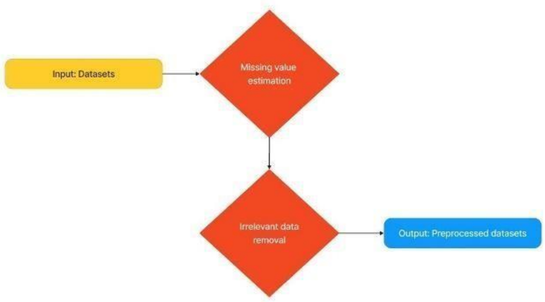

Figure 3: Level 1 DFD Diagram

LEVEL 2:

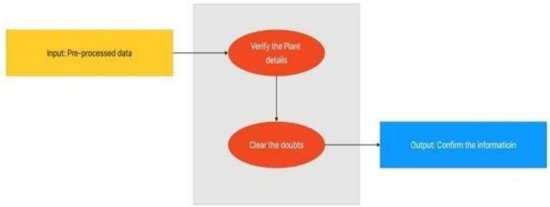

Figure 4: Level 2 DFD Diagram

LEVEL 3:

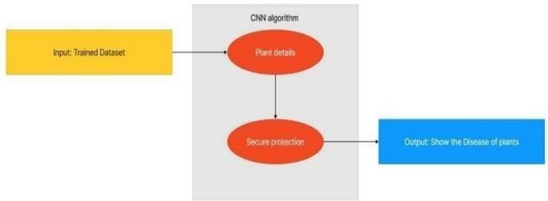

Figure 5: Level 3 DFD Diagram

B. ACCURACY OF VARIOUS ALGORITHM

Fig 6: Accuracy result

model_name	best_estimator	best_score	
0	Random Forest	(DecisionTreeClassifier(ccp_alpha=0.03, max_de...	0.897321
1	logistic	LogisticRegression(C=0.75, max_iter=194, multi...	0.895875
2	D-tree	DecisionTreeClassifier(ccp_alpha=0.035, max_fe...	0.586482
3	SVM	SVC(C=0.5, kernel='poly', max_iter=139, tol=1e...	0.956793

C. Disease detection using CNN and ResNet9

Plant disease detection using deep learning has become an active area of research in recent years, and Convolutional Neural Networks (CNN) have been widely used for this problem. A CNN layer is the main component of a CNN model designed to automatically learn the spatial hierarchy of features from an input image. It usually consists of a set of learnable filters combined with an input image to produce a set of feature maps. Each feature map captures specific aspects of the input image, such as edges, textures, or shapes. The output of the CNN layer is then passed through one or more fully connected layers that perform classification or regression on the extracted features.
ResNet-9 is a variant of the Residual Network (ResNet) architecture, a deep neural network architecture designed to solve the gradient missing problem in deep networks. ResNet-9 consists of nine layers, including a convolution layer, four residual blocks, and a fully concatenated layer. Each residual block has two convolutional layers with connections bypassing convolutional layers. This allows the network to learn the residual function, which can be considered as the difference between theinput and output of the block.
When using ResNet-9 for plant disease detection, the input image is passed to the network layer and the output of the last layer is passed to a fully integrated layer that performs classification of the input image. The network is trained using a large dataset of well-tagged images of healthy and diseased plants. During training, the network learns to automatically extract relevant features from input images and make accurate predictions about new images. Overall, CNN and ResNet-9 are powerful tools for plant disease detection through deep learning and can help improve crop yields through early detection and treatment of plant diseases.

VII. CONCLUSION

The use of machine learning and deep learning techniques for crop prediction and disease detection has great potential to increase agricultural productivity and reduce crop losses. By analyzing various data sources, including weather patterns, soil conditions, and historical crop yields, this model can accurately predict future crop yields and help farmers make informed decisions about planting and harvesting.
Similarly, using machine learning models for disease detection can help farmers detect and

VIII.FUTURE DEVELOPMENT

Use of big data: As more data is collected from different sources, there are opportunities to use big data analytics to identify patterns and trends in crop yields and disease prevalence. This can lead to more accurate predictions and moretargeted interventions.

Advances in Deep Learning: Deep learning models such as Convolutional Neural Networks (CNN) and Recurrent Neural Networks (RNNs) have shown promising results in crop prediction and disease detection. Future advances in this model may include developing more efficient architectures and using transfer learning to adapt the model to different plants and environments.

Integration with precision agriculture: precision agriculture practices such as variable rate application of fertilizers and pesticides can improve crop yields and reduce the spread of disease. Machine learning and deep learning models can be integrated with precision agriculture systems to optimize crop management decisions.

Developing mobile applications: Mobile applications using machine learning and deep learning models can be developed to provide farmers with real-time information on crop yields and disease prevalence. These programs can also provide crop management recommendations based on the data collected.

XI. REFRENCES

[1]. Alam M et al (2020) Real-time machine-learning based crop/weed detection and classification for variable-rate spraying in precision agriculture. In: IEEE international conference on electrical and electronics engineering, Peshawar.

[2]. Aji, Wahyu, and Kamarul Hawari. "A Study of Deep Learning Method Opportunity on Palm Oil FFB (Fresh Fruit Bunch) Grading Methods." In 2019 Ahmad Dahlan International Conference Series on Engineering and Science (ADICS-ES 2019), Atlantis Press, 2019.

[3]. Ahmed F, Al-Mamun HA, Bari ASMH, Hossain E, Kwan P (2022) Classification of crops and weeds from digital images: a support vector machine approach. Elsevier, Bangladesh.

[4].Chechliński, Łukasz, Barbara Siemiątkowska, and Michał Majewski. "A System for Weeds and Crops Identification—Reaching over 10 FPS on Raspberry Pi with the Usage of MobileNets, DenseNet and Custom Modifications." Sensors 19, no. 17 (2019)

[5]. Dhayabarani R et al (2018) Detection of weed using neural networks. Int J Eng Res Technol (IJERT), Tamil Nadu.

[6]. Inkyu Sa 1,Marija Popovi´c 1, Raghav Khanna 1 ,'WeedMap: A Large-Scale Semantic Weed Mapping Framework Using Aerial Multispectral Imaging and Deep Neural Network for Precision Farming' 27 July 2018; Accepted: 26 August 2018; Published: 7 September 2018pp. 1–6 (2018).

[7]. Jun X, Che J, Chen Y (2020) Weed identification using deep learning and image processing in vegetable plantation. IEEE,

[8]. Rasti, Pejman, Ali Ahmad, Salma Samiei, Etienne Belin, and David Rousseau. "Supervised image classification by scattering transform with application to weed detection in culture crops of high density." Remote Sensing11, no. 3 (2019): 249.

[9]. Yang, Yuewei, Kevin J. Liang, and Lawrence Carin. "Object detection as a positive-unlabeled problem." arXiv preprint arXiv:2002.04672 (2020).