SYNOPSIS

Group No: 05

BE Computer Engineering SEM-1

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Title of Project: Crop classification and plant leaf disease prediction using CNN

In general, agriculture is the backbone of India and plays an important role in Indian economy by providing a certain percentage of domestic product to ensure the food security. But now-a-days, food production and prediction are getting depleted due to unnatural climatic changes, which will adversely affect the economy of farmers by getting a poor yield and help the farmers to remain less familiar in forecasting the future crops. This project helps the beginner farmer in such a way to guide them for sowing the reasonable crops by deploying machine learning, one of the advanced technologies in crop prediction. a supervised learning algorithm puts forth in the way to achieve it. The expert system will collect the seed data of the crops, with the appropriate parameters like temperature, humidity and moisture content, which helps the crops to achieve a successful growth. The deep convolutional network model used in this project uses a variety of plant leaf disease photos to provide quick and accurate automated detection. Inexperienced farmers may have a harder time spotting infections than trained plant pathologists. An autonomous system that is created to recognize agricultural illnesses by the appearance of the crop and visual symptoms could be a huge assistance to farmers as a verification system in disease identification.

Relevance of Work:

- **Importance of Early Disease Detection:** In the field of agricultural production, ignoring the early signs of plant disease may lead to losses in food crops, which could eventually destroy the world's economy. A CNN-based deep learning model was proposed for the accurate classification of plant disease. For classification, a CNN was used. Although this model attained a recognition accuracy it failed to classify some classes, leading to confusion with the classes in subsequent stages." this model attained a recognition accuracy it failed to classify some classes, leading to confusion with the classes in subsequent stages.
- **Deep Learning Model for Disease Identification:** The paragraph discusses the development of a CNN-based deep learning model for accurate plant disease classification. While this may not be directly related to the user's work, it showcases advancements in technology that can benefit agriculture, including their fun activities in the field.
- **Hybrid CNN-SVM Approach for Banana Disease:** The mention of a hybrid CNN-SVM approach for classifying banana plant diseases could be tangentially related to the user's work if they have any involvement with banana farming or disease management.
- **Use of Pre-trained CNN Models:** The use of pre-trained CNN models like AlexNet and GoogleNet for identifying diseases in soybean plants may be of interest to the user if soybean farming is part of their agricultural activities.

Review of Literature:

Sr. No.	Title and Authors	Conference/ Journal Name and Publication Year	Topic Reviewed/ Algorithms or methodology used
1.	A Systematic Literature Review on Plant Disease Detection: Motivations, Classification Techniques, Datasets, Challenges, and Future Trends	Wasswa Shafik Ali Tufail, Abdallah Namoun, Liyanage Chandratilak De Silva , Rosyzie Anna Awg Haji Mohd Apong (2023)	Plant pests and diseases are a significant threat to almost all major types of plants and global food security. Therefore, many smart agricultural practices are deployed to control plant diseases and pests. In this study, we conduct a systematic literature review and present a detailed survey of the studies employing data collection techniques and publicly available datasets. To begin the review, 1349 papers were chosen from five major academic databases, namely Springer, IEEE Xplore, Scopus, Google Scholar, and ACM library. Several crops, including grapes, rice, apples, cucumbers, maize, tomatoes, wheat, and potatoes, have tested mainly on the hyperspectral imagery and vision-centred approaches. Support Vector Machines and Logistic regression classifiers demonstrated an increased accuracy in experiments compared to traditional classifiers.
2.	Crop Prediction Based on Characteristics of the Agricultural Environment Using Various Feature Selection Techniques and Classifiers	S. P. Raja, Barbara Sawicka, Zoran Stamenkovic, And G. Mariammal (2022)	This systematic review in the past, farmers were able to decide on the crop to be cultivated, monitor its growth, and determine when it could be harvested. Today, rapid changes in environmental conditions have made it difficult for the farming community to continue to do so. Consequently, in recent years, machine learning techniques have taken over the task of prediction, and this work has used several of these to determine crop yield. To ensure that a given machine learning model works at a high level of precision, it is imperative to employ efficient feature selection methods to preprocess the raw data into an easily computable Machine Learning friendly dataset. Optimal feature selection arises to ensure that only the most relevant features are accepted as a part of the model.

3.	Fast Plant Leaf Recognition Using Improved Multiscale Triangle Representation and KNN for Optimization	Jianyu Su, Meihua Wang, Zhenxin Wu, And Qingliang Chen (2020)	The paper concludes by due to the complexity and similarity of plant leaves; it is very important to study an effective leaf-feature extraction method to improve the recognition rate of plant leaves. In this method the curvature features of the contour, the texture features and the shape area feature are extracted to provide a multiscale leaf-feature description, and a new adaptive KNN for optimization method is proposed to improve the retrieval rate of leaf datasets.
4.	Chaotic Jaya Optimization Algorithm With Computer Vision-Based Soil Type Classification for Smart Farming	Hussain Alshahrani, Hend Khalid Alkahtani, Khalid Mahmood, Mofadal Alymani, Gouse Pasha Mohammed, Amgad Atta Abdelmageed, Sitelbanat Abdelbagi, And Suhanda Drar (2023)	Smart Farming utilizes advanced technologies namely data mining, machine learning, the Internet of Things, and data analytics for collecting the data, predicting the outcomes and training the system. One of the most significant parameters is proper soil prediction which decides the proper crop and is manually executed by the agriculturalists. Hence, the farmer's efficacy can be improved by producing automated tools for soil type classification. This study presents a Chaotic Jaya Optimization Algorithm with Computer Vision based Soil Type Classification (CJOCV-STC) for smart farming. The presented CJOCV-STC technique applies CV with metaheuristic algorithms for the automated soil classification process, which identifies the soil into distinct types.
5.	Machine learning based Pedantic Analysis of Predictive Algorithms in Crop Yield Management	M Chandraprabha, Rajesh Kumar Dhanaraj.(2020)	Machine learning means the process of making the system to learn from the previous experiences that help in prediction. In this paper, an conjectural evaluation on diverse prediction algorithms like support vector machines, recurrent neural networks, K nearest neighbour regression, Naïve Bayes, BayesNet, support vector regression etc., is done and its performance are described on the basis of error rates and accuracy level in crop yield. BayesNet shows the higher accuracy of about 97.53% and RNN has less percentage error rates that dominate other algorithms in harvest prediction.

Proposed Method:

The features and characteristics of various soil types to understand which crops grow better in certain soil types. Machine learning techniques can be helpful in this case. Here we can use clustering technique to group data, and then classified the data by the order of soil and places with Random Tree algorithm. Then apply apriority Mining process to generate an association rule for finding suitable crops for the specific soil. Soil series and land type combine represent the soil class in the database. Plant illnesses are typically brought on by pests, insects, and pathogens, and if they are not promptly handled, they significantly reduce yield. Farmers are losing money as a result of different crop diseases. The suggested system offers a way to automatically detect plant leaf disease as well as a solution for routinely monitoring the farmed area. The suggested technology aims to detect plant illnesses early, as soon as they begin to spread to the leaf's outer layer.

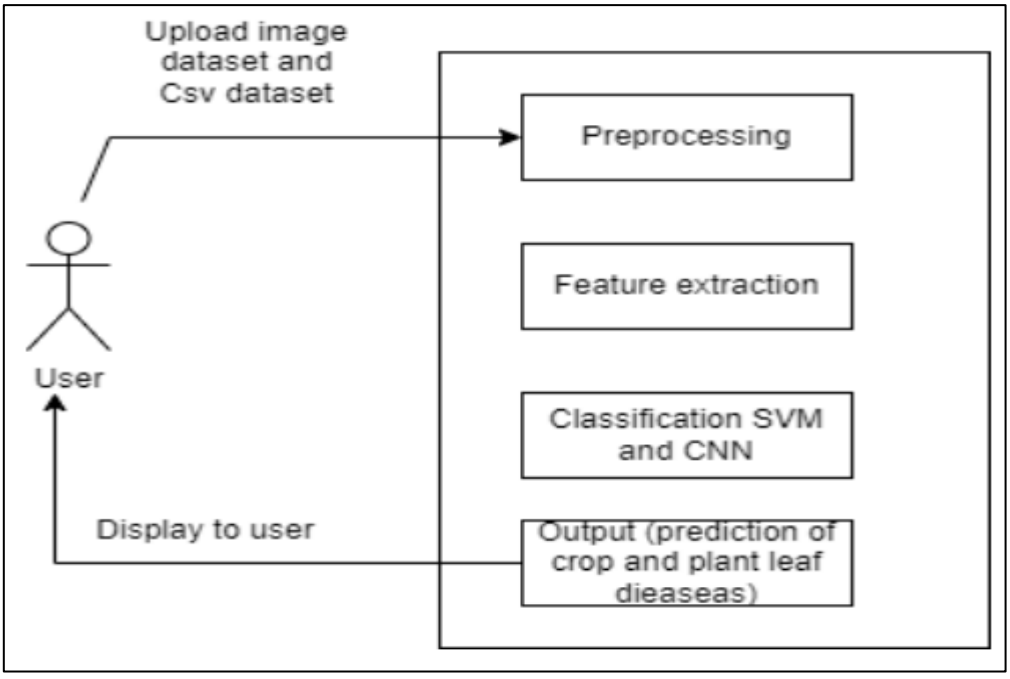

Fig. 1: Architecture

• **Data Collection**: First, the information form various Websites and Social Media applications based on certain parameters is extracted data.

• **Pre- Processing:** Then we are going to apply numerous pre-processing steps like as Noise removal, resizing, binary conversion and gray scaling to make our dataset proper to use.

• **Noise Removal:** Noise is detached from the input video. In image processing, the key method for denoising is filtering. Generally average filters, median filters, Wiener filters and Kalman filters are utilized to diminish noise.

• **Resizing Image:** resizing is necessary when the necessity is to increase or decrease the total number of pixels, whereas remap done when we are adjusting for lens distortion or rotating an image.

• **Binary Conversion:** A binary image is one that holds the pixels that can have any one of precisely two colours, classically black and white. Binary images are also entitled as bi-level or two-level. This means that every single pixel is stored as a solitary bit—i.e., in value of 0 or 1.

• **Gray Scaling:** Gray-scaling is the method of transforming a continuous-tone image to an image that a computer can manipulate effortlessly.

• **Segmentation Image:** segmentation is the significant process in which isolation of a digital image into multiple segments is carried out i.e. (sets of pixels, also recognized as image objects).

• **Feature Extraction:** Feature extraction is a part of the dimensionality decrease procedure, in which, an initial set of the raw data is separated and compact to more controllable groups.

• **Classification:** Classification is the method of sorting and labeling groups of pixels or vectors within an image based on definite rules and instruction.

• **Data Training:** We compile artificial as well as real time using social media data and provide training with any machine learning classifier.

• **Data Testing with Machine Learning:** We give testing dataset to system and apply machine learning algorithm to detect the activity accordingly.

• **Analysis:** We determine the accuracy of proposed system and estimate with other existing systems.

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