O-MyNatural

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***Abstract*— Agriculture is an integral part of India's socio-economic fabric. Farmers' failure to choose the best crop for the land using non-scientific and traditional methods is a severe problem in a country where farming employs approximately 58 percent of the population. Farmers have occasionally failed to select suitable crops based on the condition of the soil, sowing season, and geographic location. As a result, people commit suicide, leave agriculture, and seek employment in cities. To address the problem mentioned above, this study proposed a system to assist farmers in crop selection by considering all the factors such as sowing season, soil condition, and geographic location. Precision agriculture is also being implemented with modern agricultural technology and is evolving. This paper uses machine learning approaches like Random Forest and Decision Tree to predict which crop is best for which soil type based on the data sets. According to previous studies, 42 percent of agricultural production is lost, and this is due solely to the rising rate of plant leaf disease losses. This plant leaf disease detection technique can be used to detect a disease from the input images to solve this significant problem. Image pre-processing, image segmentation, and feature extraction were all part of this process. On the results of these three stages, the ResNet 50 classification is applied. Plant leaf diseases were predicted with 98.56 percent accuracy using the proposed implementation.**

Keywords—Agriculture, Model, Decision Tree Classifier, Resnet50(Transfer Learning Algorithm).

I. Introduction

By 2050, the world's population will have increased by approximately 34% to 9.1 billion people. Due to rapid urbanization, food demand will rise by 70%, and land availability for agriculture will decrease dramatically in the coming years. By 2050, the population will rapidly increase, and domestic food production will already be behind. Lack of planning, unpredictable weather conditions, improper harvesting and irrigation techniques, and livestock mismanagement are the leading causes of reduced food production.

Agriculture is becoming more prominent as new technologies emerge, as it is used not only to feed a large population but also in various applications. Plants are significant in our lives because they provide energy and help to combat global warming. Many diseases affect plants today, causing devastating economic, social, and ecological losses, among other things. As a result of it, it is critical to identify plant diseases accurately and quickly. Plant diseases are classified into two categories infectious and non-infectious.

The used method employs digital image processing tools to achieve the desired result. Because the symptoms are subjective, the human eye cannot accurately determine the extent of the disease. Observations made with the naked eye are commonly used to assess the severity of conditions in the production area. In the field of agriculture, image processing has made a significant contribution. Several neural network techniques, such as Back Propagation and Principal Component Analysis, were used to identify the fungi disease (PCA). To improve the required rate in the classification technique to detect plant leaf disease. Until now, linear SVM, a multi-class classification that only classifies data into two classes, has been used. The fundamental goal of this project was to investigate and analyze different techniques for detecting plant leaf disease using image processing techniques and propose improvements in existing classification techniques for plant leaf disease detection using machine learning.

Furthermore, 48% of farmers do not want their children to be involved in agriculture and instead prefer to live in cities. This is because farmers frequently make poor crop selection decisions, such as choosing a crop that will not yield much for the soil, planting in the wrong season, etc. The farmer may have purchased the land from others, so the decision was made without prior experience. A reduced yield will always come from poor crop selection. It is challenging to survive if the family relies entirely on this income.

Potential researchers are discouraged from working on developing country case studies due to a lack of accurate and current information. With the resources at our disposal, a system has been presented to solve by providing predictive insight and guidance on crop sustainability based on machine learning models trained using critical environmental and economic parameters.

To recommend a suitable crop to the user, the proposed system considers environmental factors such as rainfall, temperature, and geographical location in terms of the state and soil characteristics such as soil type, pH value, and nutrient concentration. Moreover, if the farmer chooses the right crop, they will receive a yield prediction.

The goal is to:

1. Develop a robust model that can accurately predict crop sustainability for each state's specific soil types and climatic conditions.

2. Make recommendations for the best crops for the location so that the farmer does not lose money.

3. Building an image net ML model for classifying the disease from crop leaf image using the advanced transfer learning approaches.

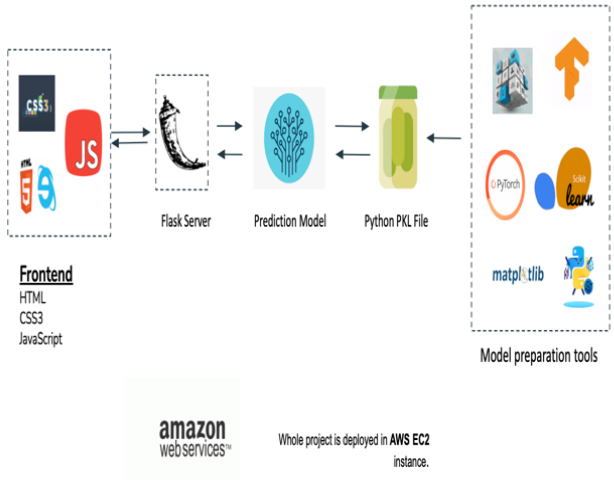
Machine learning is used to implement the proposed system. Machine learning is an application of Artificial Intelligence that enables systems to learn and evolve without being explicitly programmed by a programmer. Following that, the program's accuracy will be enhanced without human intervention. Many researchers are currently working in this field to help farmers choose a suitable crop by considering various factors such as physical, ecological, and economic aspects. Before cultivation, the crops were ranked using Decision Tree Learning. An Artificial Neural Network was implemented to predict crop disease and recommend measures to treat the crop organically. The random forest algorithm was implemented to analyze crop features.

II. Architecture

A. *Methodologies*

Despite the many solutions that have recently been suggested, there are still open challenges in developing a user-friendly crop recommendation application. The proposed solution aims to address these limitations by creating a user-friendly application that considers rainfall, temperature, soil type, and other factors that directly affect cultivation. The main goal is to increase the number of crops grown throughout the season. The developed scheme would assist farmers in minimizing the difficulties they face when picking produce and maximizing yield, thus further lowering suicide rates. For the data sets of the given region, the proposed model predicts crop yield. Integrating agriculture and machine learning will help to improve the agriculture sector by increasing profits and optimizing resources. The critical elements in forecasting current performance are data from previous years. Data is gathered from various trustworthy sources, including data.gov.in and kaggle.com. The data sets are for the states of Maharashtra and Karnataka. State, district, year, season, type of crop, the area under cultivation, production, and so on are all included in the data. Other datasets with state and district specifications include the soil type as an attribute. This soil type column is extracted from the primary data set and merged.

The proposed model's system architecture is shown in Figure.

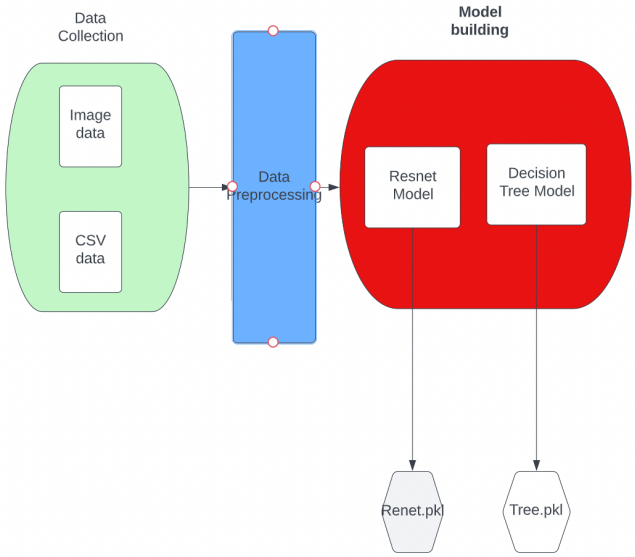


It's a website with two modules: the fertilizer and prediction modules. The website provides numerous services. The farmer must complete the registration process to use the app. The farmer can use the web application services after a successful registration. The prediction module predicts the crop yield using selected attributes from the data sets for the specific crop. The farmer can also check the disease of the crop by uploading the image.

III. Data Analysis

A. *Pre-processing Phase*

This is a preparation procedure for obtaining plant leaf images. A digital camera was used to capture RGB shading images of plant leaves with pixel goals of 568×1020. The model uses the Python Picture Preparation Library to take a plant leaf image as an input and convert it to grayscale.



The figure has a block diagram of the phases used in the proposed work.

A general block diagram to depict the various phases of the methodology. This research uses the region-based Resnet Model segmentation technique for image segmentation because it is more noise vulnerable and works well in homogeneous regions. The input to image segmentation will be a data set provided by us, and the output will be in the form of cluster data.

B. Image Segmentation

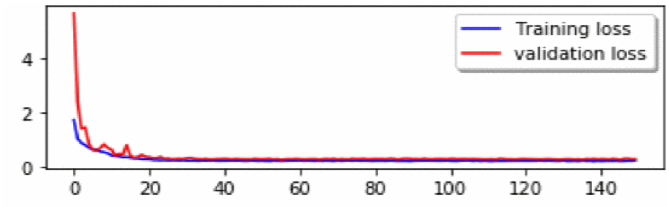
Image segmentation is used, which divides the image into parts based on their properties. Image segmentation categorized into 2 classifications: region-based segmentation and threshold-based segmentation. The vital sections must now be extracted. Not all sections have significant amounts of data. As a result, the parts that contain more than 50% of the data are considered for further exploration.

C. Feature Extraction

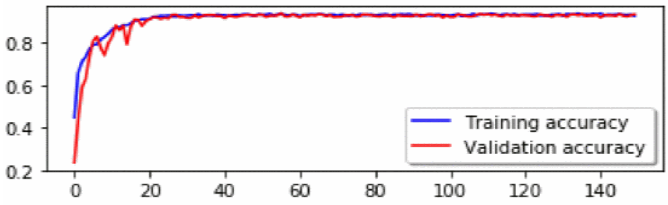
To represent the unique qualities of the leaves, various features were chosen. A few leaves have a distinctive look, others have distinct surface examples, and still, others are described by a combination of these features.

D. Results

This model attained a success rate of 97.33 percent on the training dataset and 97.78 percent on the validation set after 150 continuous epochs. Following the training session, the exam with random pictures went successfully. It was a remarkable level of precision. After examining the result and confusion matrix, it is clear that our model's performance is satisfactory. Our model's total performance is shown below.



(1)



(2)

IV. Conclusion

The proposed system assists farmers in selecting the appropriate crop by delivering information that regular farmers are unaware of, reducing crop failure and improving output. It also helps them avoid losing money. We developed a model to identify many plant diseases from 38 distinct classes encompassing 14 different plants as part of our research. This approach aids in detecting and classifying plant leaf diseases based on their physical characteristics. Our suggested model can reach a recognition rate of 97.33 percent, demonstrating its successful performance.

V. Application and Source Code

Cloud: https://ec2-54-164-225-67.compute-1.amazonaws.com:8080/

GitHub: https://github.com/sjsucmpe272SP22/O-MyNatural

VI. References

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