ICEST-2K24 [International Conference on Engineering, Science and Technology]
In Association with
International Journal of Scientific Research in Science, Engineering and Technology
Print ISSN - 2395-1990 | Online ISSN : 2394-4099 (www.ijsrset.com)

App-Based Solution to Identify and Solve Disease in Plants/Crops

Aniruddha P. Kshirsagar*[1], Aarti D. Barg[2], Vrunda P. Kulkarni[2], Mansi D. Nalawade[2]

*[1]Assistant Professor, Department of Computer Science and Engineering, Karmaveer Bhaurao Patil College of Engineering, Satara, Maharashtra, India

[2]UG Student, Department of Computer Engineering, Karmaveer Bhaurao Patil College of Engineering, Satara, Maharashtra, India

ABSTRACT

Predicting plant diseases in their early stages is advised. But unfortunately early on in the crop's life, illnesses are hard to forecast as some of the plant diseases do not have visibility during early stages and it appears only at the last stage. Plant disease identifying is very important at earlier stages to treat the disease so that it won't damage the entire cultivation. As per the needs of farmer, a system has been proposed that uses ML and image classification.

We are going to develop a mobile pp driven by machine learning to automate the leaf disease identification. The Android mobile application will allow farmers to take pictures of the leaves of the affected plants. It will display the category of the disease and will help farmers to maintain the health of their crops and minimize the use of incorrect fertilizers that can harm plants.

Machine learning techniques like Support Vector Machine (SVM), Convolutional Neural Network (CNN), and K-Nearest Neighbor (K NN) are used to classify the retrieved features.

KEYWORDS: plant disease, leaf disease, image classify, ML, DL, disease detection, artificial intelligence, agriculture, mobile app, CNN, SVM.

I. INTRODUCTION

Plant diseases are an inherent occurrence that restricts the growth and progress of plants. Plant illnesses mostly result from infestations by fungal organisms, which negatively impact plant growth. Therefore, the identification of plant diseases is crucial in order to prevent potential and lasting damage to crops and plants. Timely detection of plant diseases enables the implementation of preventive measures and minimizes the extent of damage [4].

In the past, farmers used to attempt to identify plant illnesses by visually examining the many signs on plant leaves, a process that was both intricate and time-consuming. Furthermore, any incorrect identification of the crop will result in the use of inappropriate fertilizers, which can cause stress to the plants and lead to nutrient deficiencies in the agricultural field. Consequently, it becomes an unreliable practice [3].

Copyright © 2024 The Author(s): This is an open-access article distributed under the terms of the Creative Commons Attribution **4.0 International License (CC BY-NC 4.0)**

Therefore, employing analysis and detection procedures with the most modern technology available aids farmers in finding solutions to such issues [1], additionally, smartphones and other technologies can offer a high-precision, low-cost substitute [4] to use remotely sensed pictures to detect plant and crop disease. Farmers will be better able to choose which fertilizers to apply to detect plant diseases in their crops if they have access to a mobile-based system that accurately identifies the many forms of plant diseases [3].
In this study, we apply machine learning to address a range of plant diseases. Three steps make up this method's process division: Determine, Examine, and Confirm using the Available Database [1].

II. LITERATURE REVIEW

1) S.S. Harakannanavar,; J.M. Rudagi,; V.I. Puranikmath et al.;[1] During the preprocessing stage, computer vision techniques including contour tracing, HE, K means clustering, and RGB conversion to gray are used. To discriminate between a leaf that is diseased and one that is not, machine learning techniques like SVM, K-NN, and CNN are utilized.
2) Shubham Naik.; Pushpak Chhajed.; Jeet Trivedi.; Prof. Sarika Davare.;[2] Our main work is to apply deep neural networks to detect diseases in practical scenes and under challenging conditions such as luminescence, rigorous climatic conditions, complex background, different images resolution, dimensions, pose and structure. After several attempts our system was able to find good classification results. This paper describes the steps to detect the issue and shows the implementation of problem.
3) Ahmed, A.A.; Reddy, G.H.;[3] Farmers may identify the 38 most prevalent plant illnesses across 14 species with the help of an ML powered plant disease detector. Using an imaging collection of 96,206 images of both healthy and diseased plant leaves—images with cluttered backgrounds, low contrast, and varying illumination conditions—we trained a CNN model. With the use of a convenient smartphone app, the model could analyze a plant image in its natural agricultural setting in less than a second.
4) Siddiqua, A.; Kabir, M.A.; Ferdous, T.; Ali, I.B.; Weston, L.A.;[4] Modern plant disease detection apps need to incorporate these technical improvements because there have been many studies conducted on the plant disease identification,detection, localization, visualization, as well as disease severity estimation. These enhanced plant disease detection applications will soon be available for use in the field by botanists and producers.
5) Mr. Prasham Shah.; Mr. Anshul Kherde.; Mrs. Rasika Solav.; Mrs. Megha Warghane.; Mrs. Nafiya Khan.; Dr. A. A. Khodaskar.; S. W. Wasankar.; Dr V. K. Shandilya.;[5] Using the phone's camera, the application user takes a picture of a leaf from the target plant. Next, image processing is applied to the acquired image. The program then determines whether the plant is healthy or sick based on how accurate the picture is. The outcome will provide the precise name of the ailment along with suggested treatments.
6) L. Li, S. Zhang and B. Wang.;[6] Deep learning has been utilized extensively in voice, natural language, and picture and video processing in recent years due to its benefits for autonomous learning and feature extraction. In addition, it has developed into a hub for research on agricultural plant protection, including the identification of plant diseases and the evaluation of pest ranges.
7) Manjunatha Badiger, Varuna Kumara, Sachin C N Shetty, Sudhir Poojary.;[7] Disease detection uses image processing techniques, which entail mathematical transformations and equations. While a

computer saves images in a mathematical manner, which means it interprets them as numbers, human eyes perceive images as a blend of RGB colors from which we can extract certain features.

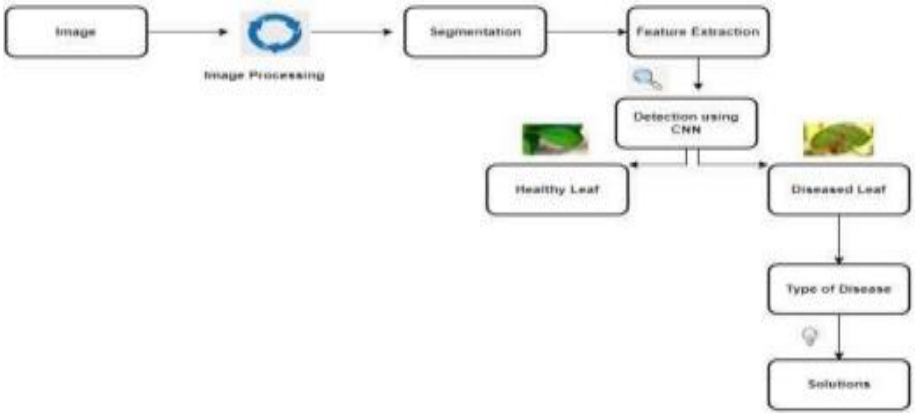

Fig 1: Architecture of Proposed Work

III. EXISTING PROBLEM

Farmers typically use experience to identify pests and plant diseases. This approach is ineffective, tedious, subjective, and time-consuming. Inexperienced farmers may misdiagnose the illness and use the incorrect pesticides while trying to identify it. Pollution of the environment will result from this, which will also cost money. Research is being done on the application of image processing techniques for plant disease recognition in order to prevent these circumstances [6].

IV. PROPOSED METHODOLOGY

This methodology is predicated on the appearance of symptoms on any portion of the plant. The upper or bottom surface of a leaf, fruit, branch, root, etc., can be this portion [9]. Diseases can affect nearly every part of a plant, including the root, stem, leaf, and flower [8].

The model for leaf disease identification was created using machine learning techniques. Fig. 1 illustrates the suggested model for leaf disease diagnosis that uses app-based and machine learning techniques, such segmentation, feature extraction, and CNN detection. SVM, KNN, and CNN are machine learning and deep learning techniques that are used to categorize features and record model performance [1].

4.1 Dataset

The plants that are impacted by various illnesses are taken into consideration based on a database of plant leaves. To conduct the tests for the identification of leaf illness, a variety of pictures of the leaves with various problems will be obtained [1]. A dataset of leaf photos, comprising both healthy and sick samples, can be collected in the event of leaf disease detection. In order to train the CNN model, we will gather a large number of annotated photos of both healthy and diseased plant leaves from several sources, including Google Web Scraper, Kaggle, and Plant Village [3].

4.2 Preprocessing

The photos will undergo preprocessing to ensure that the size and color are uniform. To identify the affected area in leaf photos, the K-means clustering algorithm is used. The K-mean clustering algorithm is used to

determine the image's data center, create clusters inside the image, and determine the distance between the center and the other cluster [1].

4.2.1 Segmentation

Segmentation is the process of dividing a picture of a leaf into distinct sections, such as the healthy and possibly sick portions, based on visual features. It frequently aids in figuring out how effective the feature extraction procedure is [1]. The input image will contain all of the information needed for processing, but the challenge is that the damaged area could be anywhere on the image. To identify the damaged area, CNN and the K-means algorithm will be used to split the image into tiny parts, and image processing will be applied to each component separately [7].

4.3 Feature extraction

In the process of detecting diseases, this is one of the most crucial processes [7]. After gathering the data, the photos must have their features extracted. The leaf and the disease, along with their treatments, can be described using these characteristics [1]. The process of converting unprocessed visual data into numerical features is known as feature extraction. The image's color, intensity, and other elements are changed to highlight the diseases' hidden characteristics. These traits that have been retrieved will assist identify disease promptly and effectively [7].

4.4 Detection using CNN

The Keras development environment is used to implement the CNN model. TensorFlow is the back-end engine for the Python neural network framework Keras, which is available for free. Python developers can create and test deep learning models with relative ease thanks to the Keras packages that operate on top of TensorFlow [3].

4.4.1 Training and Testing

Once the features have been extracted, it is necessary to train a model to detect the disease present. This model can be trained using a machine learning algorithms, CNN. In testing, we use new unseen leaf images to check how well our system accurately identifies healthy and diseased leaves. This helps evaluate the system's real-world performance and accuracy.

V. IMPLEMENTATION

- **Splash Screen**

Fig 2: Splash Screen

The Splash Screen is the first page of the Plant Disease Detection Application. It the first graphical notification the user receive when it visit any application. It appears as an introductory screen of an application. It tells that user has to wait for a few seconds before going on the actual screen of the application.

- **Select Language Page**

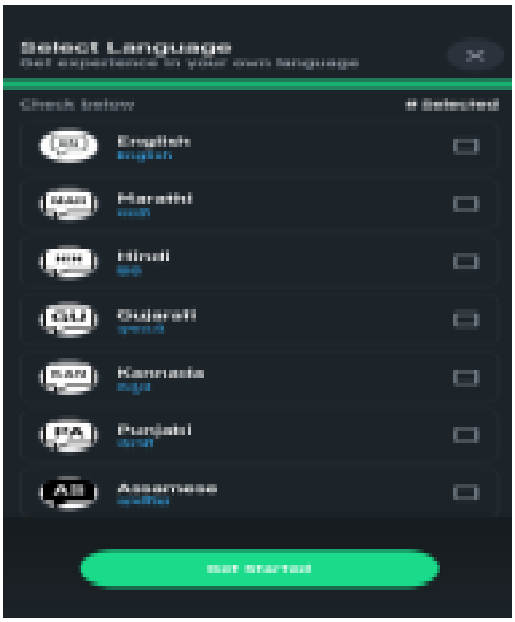

Fig 3: Select Language

The use of the Select Language Page is to choose your preferred language from our wide range of options to enhance your browsing experience. This interactive feature allows users to seamlessly switch between languages, enhancing accessibility and user experience. The page dynamically updates content based on the selected language, ensuring a localized experience for all users. From English to Marathi, Hindi to Gujarati, our website accommodates a diverse global audience.

- **Log In Page**

Fig 4: Login Page

The Log In Page includes two text input fields for entering the name and password. The labels are added inside the fields to guide the user. The Sign Up Here includes a link for users who don't have prior account and wants to create a new account. The Forgot Password includes a link for users who forgot their password, leading to a password reset page. The Sign In Button is used to initiate the login process.

- **Forgot Password Page**

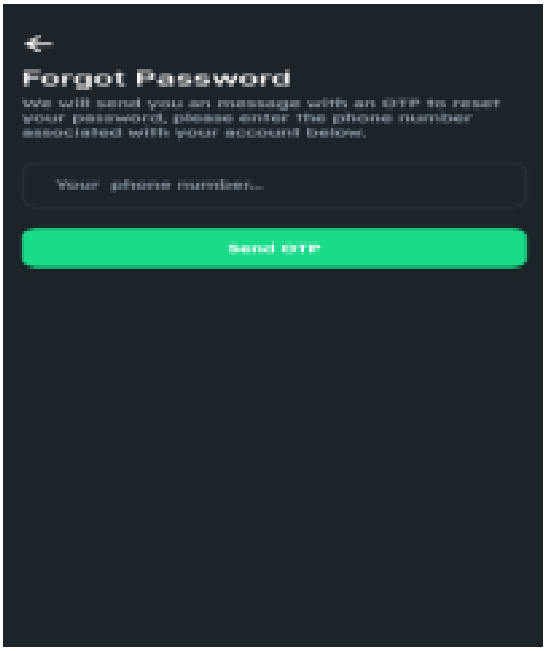

Fig 5: Forgot Password Page

The Forgot Password is used to reset the password. The user will have to enter their mobile number and click on Send OTP. The user will get a message with an OTP which will be further used to reset the password.

- **Sign Up Page**

Fig 6: Sign Up Page

The Sign Up Page includes two text input fields for entering the name and password. The labels are added inside the fields to guide the user. Sign in includes a link for users who have prior account and wants to Sign In into that account. The Sign up Button
is used to initiate the registration.

- **Home Page**

Fig 7: Home Page

Here the user is prompted to either take a picture using their device's camera or upload an existing picture from their device. This picture should be of a plant i.e plant leaf. After the user has taken or uploaded a picture, the user will proceed to the next step. This step includes the image processing and analysis algorithm that examines the plant picture and provides some result or information based on it on next page.

➢ **Plant Details Page**

Fig 8: Plant Details Page

- The Plant Details Page provides cause and the diagnosis report of the detected disease based on the uploaded or captured image. The report might contain information about the plant's health, species identification, potential diseases, care recommendations, etc. Once the analysis is complete, the button Get Preventive Measures provides the user with advice for the detected disease.
- Overall, this page analyzes the plant images for various purposes, including plant identification, disease detection and providing care advice.

VI. CONCLUSION

We have developed a machine learning-based app for plant disease detection that helps farmers identify the most prevalent illnesses. With the use of an imagery dataset made up of numerous images of both healthy and sick plant leaves, we have trained a CNN model. We have created a smartphone app to improve the system's usability and give farmers with limited resources a greater chance to identify plant illnesses early on and avoid using the wrong fertilizers, which can harm the soil and plants alike. The farmer can take a picture of a leaf exhibiting symptoms, and the system will accurately identify the disease's type.

VII. REFERENCES

[1]. L. Li, S. Zhang and B. Wang.; "Plant Disease Detection and Classification by Deep Learning—A Review", in IEEE Access, vol. 9, pp. 56683-56698, 2021, doi: 10.1109/ACCESS.2021.3069646, https://ieeexplore.ieee.org/document/9399342

[2]. Manjunatha Badiger, Varuna Kumara, Sachin C N Shetty, Sudhir Poojary.; "Leaf and skin disease detection using image processing", Global Transitions Proceedings, Volume 3, Issue 1, 2022, Pages 272-278, ISSN 2666- 285X, https://doi.org/10.1016/j.gltp.2022.03.010

[3]. Sinha, A. and Shekhawat, R.S.; "Review of image processing approaches for detecting plant diseases", IET Image Processing, 2020, 14: 1427-1439, https://doi.org/10.1049/ietipr.2018.6210

[4]. Petrellis, N.; Plant Disease Diagnosis for Smart Phone Applications with Extensible Set of Diseases. Appl. Sci. 2019, 9, 1952, https://doi.org/10.3390/app9091952

[5]. Patel, H.; Patel, D.; "Survey of android apps for agriculture sector", Int. J. Inf. Sci. Tech. 2016, 6, 61–67, https://www.aircconline.com/ijist/V6N2/6216 ijist07.pdf

[6]. Mr. Prasham Shah, Mr. Anshul Kherde, Mrs. Rasika Solav, Mrs. Megha Warghane, Mrs. Nafiya Khan, Dr. A. A.Khodaskar, S. W. Wasankar, Dr V. K. Shandilya, Volume 11 Issue IV Apr 2023- Available at www.ijraset.com https://typeset.io/papers/research-paper-on app-based-solution-to-identify-solve 1mxopnu9

[7]. Sharada P. Mohanty, David P. Hughes, Marcel Salathé, 26 May 2023-Frontiers in Plant https://typeset.io/papers/plant pathologist-a-machine-learning-diagnostician for-the-2lhmjrjl

[8]. Bita Parga Zen, Iqsyahiro Kresna A, Diandra Chika Fransisca 29 Oct 2022- Sinkron : jurnal dan penelitian teknik informatika-Vol. 7, Iss: 4, pp 2537-2546 https://typeset.io/papers/applications-for detecting-plant-diseases-based-on 37id0pfj

[9]. Aniket Gahiware, Nikhil Bawake, Bhushan Dhage, Lokesh Ahir, Prof. V. K. Abang 11 May 2022-International Journal of Advanced Research in Science, Communication and Technology-pp 63-66 https://typeset.io/papers/potato-plant disease-detection-using-deep-learning 2cvmcr8g

[10]. N. V. Megha Chandra Reddy, K. Ashish Reddy, G. Sushanth, S. Sujatha 20 Aug 2021-Vol. 12, Iss: 4, pp 1084-1092 https://typeset.io/papers/plant-disease diagnosis-and-solution-system-based-on neural-azdunmeylx

[11]. Addakula Lavanya, T.Murali Krishna 28 Nov 2022-International journal of engineering technology and management sciences-Vol. 6, Iss: 6, pp 527-537 https://typeset.io/papers/an-ai-and-cloud based-collaborative-platform-for 26vbg9e5

[12]. Andreas Stühlinger 01 Jan 2022-Smart Innovation, Systems and Technologies (Smart Innovation, Systems and Technologies)-pp 144-151 https://typeset.io/papers/detection-of disease-in-plants-with-android integration-1ux4cbvo

[13]. Vidushi Yadav, Satyajit A. Pangaonkar, Reena Gunjan, Prakash Pandharinath Rokade 26 May 2023-pp 1-5 https://typeset.io/papers/plant-pathologist-a machine-learning-diagnostician-for-the 2lhmjrjl