Tea Leaf Disease Detector

Suhaas Sabari Girish.C.S
Computer science and engineering
KCG College of Technology
Chennai, India
20CS071@kcgcollege.com

Velmurugan
Computer science and engineering
KCG College of Technology
Chennai, India
20CS080@kcgcollege.com

Sibisezhiyan.G
Computer science and engineering
KCG College of Technology
Chennai, India
20CS107@kcgcollege.com

Vishal.A.C
Computer science and engineering
KCG College of Technology
Chennai, India
20CS091@kcgcollege.com

***Abstract*—** In the domain of agriculture, efficient disease management is paramount for sustainable crop production. This paper presents a novel web-based platform leveraging advanced image recognition techniques tailored specifically for the tea farming industry. Our system offers swift and precise analysis of tea leaf diseases through an intuitive interface, facilitating remote collaboration between farmers and experts. Key features of our platform include sophisticated image recognition algorithms capable of identifying various diseases affecting tea leaves with high accuracy. The system provides farmers with instant results, enabling timely intervention to mitigate the spread of diseases and minimize crop loss. Additionally, the platform fosters remote collaboration by connecting farmers with expert advice, facilitating personalized disease management strategies. The significance of this platform lies in its ability to promote sustainable tea farming practices. By empowering farmers with timely and accurate disease diagnosis, our system aids in reducing reliance on chemical treatments, thereby minimizing environmental impact and promoting long-term sustainability in tea cultivation. Through a combination of advanced technology and user-friendly design, our tea leaf disease analysis system offers a practical solution for enhancing productivity and sustainability in the tea farming industry.

1. INTRODUCTION

Tea, renowned for its rich cultural heritage and global popularity, serves as a cornerstone of agriculture in many regions, sustaining livelihoods and economies worldwide. However, the flourishing tea industry faces persistent challenges, chief among them being the threat of diseases that can ravage tea plantations and jeopardize yields. Traditional methods of disease detection and management often fall short, leaving farmers grappling with the complexities of maintaining plant health amidst evolving environmental conditions.

In response to these challenges, this project introduces a groundbreaking solution: an advanced image recognition system tailored specifically for tea leaf disease analysis. This system represents a fusion of cutting-edge technology and agricultural expertise, aimed at revolutionizing the way tea farmers diagnose and manage diseases in their plantations.

By harnessing the power of artificial intelligence and machine learning, the system offers rapid and precise identification of tea leaf diseases, empowering farmers with actionable insights for timely intervention.

TECHNOLOGY IN USE

Advanced Image Recognition:

The system utilizes sophisticated image recognition algorithms, including convolutional neural networks (CNNs), to analyze tea leaf images based on color, spots, and textures. These algorithms are trained on large datasets of annotated tea leaf images to accurately identify various diseases and abnormalities.

Web-Based Platform: -

The system is implemented as a web-based application, accessible through standard web browsers on desktop and mobile devices. This approach ensures widespread accessibility, allowing tea farmers to upload images and receive analysis results from any location with internet connectivity.

Cloud Computing Infrastructure: -

The system relies on cloud computing infrastructure to perform intensive image processing tasks. By leveraging scalable cloud resources, the system can handle large volumes of image data and accommodate fluctuations in user demand without sacrificing performance.

User Interface Design: -

The system features an intuitive user interface designed to simplify the process of uploading images and interpreting analysis results. User-friendly controls and interactive visualizations enable tea farmers to navigate the platform with ease, facilitating seamless interaction and efficient workflow.

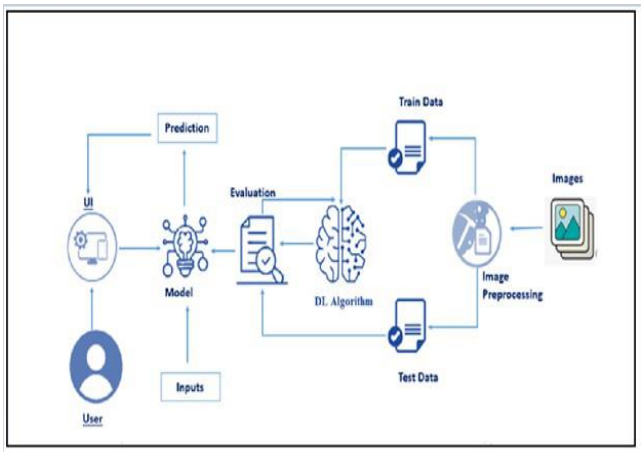


Fig1.1 Block Diagram

The inception of prediction embarks upon a journey propelled by the provision of inputs from users. Within this intricate dance of data exchange, inputs emerge as the lifeblood, ranging from discrete data points to multifaceted features, all essential for the grand tapestry of prediction. As the curtains part, the stage is set for the model, an entity embodied by the intricate gears of computational prowess. Here, amidst the symphony of whirring machinery, the true spectacle unfolds—a convergence of science and sorcery! Deep learning algorithms stand as the virtuosos, conducting a harmonious orchestra of data analysis, pattern recognition, and predictive insight. Nestled at the very core of this grand spectacle lie the deep learning algorithms, weaving intricate webs of understanding from the threads of raw data. Their connections extend deep into the realms of both training data, shaping the model's cognition, and test data, scrutinizing its very essence. Should the stream of inputs include images, they undergo a meticulous metamorphosis known as image preprocessing, a transformative journey ensuring their pristine readiness for the discerning gaze of deep learning algorithms. And as the gears turn and algorithms churn, predictions emerge as the phoenix rising from the ashes of raw data, transcending mere numbers to unveil profound insights. From the meticulous classification of objects in images to the audacious foresight in forecasting stock prices, the panorama of predictions unfolds, each a testament to the boundless potential of human-machine symbiosis. Thus, the cycle perpetuates, each prediction fueling the next stride towards enlightenment, as humanity ventures ever deeper into the labyrinth of predictive intelligence.

2. LITERATURE SURVEY

[1] Proposed CNN Demonstrate for Tea Leaf Illness Classification: (Rahul Singh Chitkara College Founded of Designing and Innovation; Neha Sharma, 2023) Tea leaf infections have had a significant affect both on the amount and quality of the tea created. The tall exactness programmed location and distinguishing proof of ailments that can be found in tea clears out is useful to the exact anticipation and control of those illnesses. Manual strategies, which require a parcel of time and exertion, are still the essential instrument for diagnosing tea ailments and deciding the seriousness of their impacts and influence horticulture. This circumstance has held on for a few time. It is supportive to the tea leaf illness avoidance and control endeavors to have precise and expedient malady location. This investigate presents a method for tea leaf malady classification that is based on an moved forward form of a profound convolutional neural arrange.

This extend points to create a profound convolutional neural arrange show competent of recognizing illnesses influencing tea plants based on picture sets of their clears out. The comes about of the ponders show that the proposed strategy has a normal distinguishing proof precision of 73%, which is higher than the exactness of more ordinary manual approaches.

Data Collection: This involves collecting images of crop leaves, including images of healthy leaves and leaves with diseases. In the example given, the dataset is from the Plant Village dataset.

Pre-processing: This step involves preparing the images for use in the CNN model. This may include resizing the images, normalizing the pixel values, and data augmentation. Data augmentation involves creating additional images from the existing ones by rotating, flipping, or jittering them.

Training the Model: The preprocessed data is then split into a training set and a testing set. The training set is used to train the CNN model, and the testing set is used to evaluate the performance of the model.

Testing the Model: The trained CNN model is then used to classify images of crop leaves as healthy or diseased. The performance of the model is evaluated on the testing set.

[2] Tea Leaf Illness Classification and Tea Bud Recognizable proof (S. Jayanthy; V. M. Sathyendraa; K. P. Sumedh 2022) Tea is one of the well known and broadly developed. manor crops in Tamil Nadu. Their preparations are influenced by diverse illnesses that influence them. The quality of the tea clears out and buds needs to be observed to increment the benefit. In this paper a demonstrate is actualized utilizing profound learning and machine learning strategies to identify the common maladies that influence the tea takes off and to classify the tea bud whether they are in the right arrange to be culled or not which implies the tall quality and low-quality bud individually. In this venture two calculations to be specific CNN and SVM are executed utilizing genuine time dataset.

Since profound learning requires a expansive dataset for preparing. 1050 pictures for tea takes off malady location and 262 pictures for tea bud classification are collected in genuine time and increase on these pictures is carried out to increment the number of input images. In CNN Dense-Net Design 121 and 201 are actualized for malady and bud classification. which with profound convolution layers gives a tall precision of 96.703% and 96.923% individually. In SVM the same convolution demonstrate is built and changed over into an SVM bit. which gives way better comes about than standard usage with an exactness as 65.934% and 73.077% for infection and bud classification separately. Assessment measurements such as Precision, Misfortune, Accuracy, Review, F1 Score, Cruel Square Blunder, Cruel Outright Blunder, Specificity and Affectability of the demonstrate were analyzed. and sensor systems, this framework points to consequently alter activity signals in reaction to changing activity conditions. This energetic flag control capability

[3] Tea Leaf Maladies Classification and Location utilizing a Convolutional Neural Organize (Vishesh Tanwar) It is worth noticing the reality that tea is the most well known drink on the planet and India is one of the beat makers and shoppers of it. In any case, numerous infections that influence edit quality and abdicate can meddled with tea generation. Machine learning procedures such as profound learning are making it simpler to recognize and classify these maladies in tea takes off. The nearness of malady indications in tea clears out can be utilized to classify and distinguish different maladies utilizing profound learning procedures such as Convolutional Neural Systems (CNN). This procedure makes a difference distinguish infection early and keep up great wellbeing. Both of these are fundamental to economical rural hones. As manual location can be time-consuming and require specialized work force, applying picture preparing models can significantly help in distinguishing infections in a huge number of tea clears out. A proposed think about utilizing CNN layers classified submitted photographs into one of his eight categories with a amazing 96% exactness. The key objective of the methodology that has been proposed here is to make utilize of machine learning innovation to identify and categorize the forecast of tea leaf infection. This will be finished through the utilize of the method that has been given. to accurately analyze the numerous ailments that are related with tea. progressing execution by joining the most profitable perspectives of demonstrated deep-learning techniques.

[4] Versatile based Application for Tea Clears out Illness Discovery (Manasa J P; Nethravathi 2023) Tea plant leaf maladies are one of the amazing challenges that confront in horticulture segment around the world. In India around 20% to 30% of the takes

off are misplaced due to different illnesses each year. Tea leaf illness distinguishing proof is challenging for constrained- assets agriculturists if performed through optical perception of plant takes off side effects. Hence, it is critical to capture the spread of the illness can spread of the malady in its early organize some time recently they reach scourge extent something else the infection can spread rapidly all through the whole manor coming about in tremendous misfortunes for the ranchers.
To help the ranchers in the pivotal assignment of distinguishing tea leaf maladies in its early arrange. it is viable to have an brilliantly framework for location, recognizable proof and classification framework in put as a preventive degree. This proposed show is a ML fueled portable based framework to mechanize the plant leaf infection conclusion prepare. The created framework employments CNN for feature lessening and classifying five maladies categories. The client interface is created as a versatile application, permitting ranchers to capture a photo of the tainted Tea plant clears out. Captured picture is at that point transferred into the Database and at that point into the calculation by indicating picture way. It at that point shows the infection category and side effects of infection along with the certainty rate. This arrangement will be client neighborly and will perform in an compelling and productive way. It is anticipated that this framework would make a way better opportunity for agriculturists to keep their crops solid and kill the utilize of off-base fertilizers that may stretch the plants.

[5] Edit Expectation Based on Characteristics of the Rural Environment Utilizing Different Include Determination Strategies and Classifiers (S. P. Raja , Barbara Sawicka et al.,) Farming is a developing field of inquire about. In specific, trim expectation in horticulture is basic and is mainly unexpected upon soil and natural conditions, counting precipitation, stickiness, and temperature. In the past, ranchers were able to choose on the trim to be developed, screen its development, and decide when it may be gathered. Nowadays, in any case, quick changes in natural conditions have made it troublesome for the cultivating community to proceed to do so. Subsequently, in later a long time, machine learning strategies have taken over the errand of expectation, and this work has utilized a few of these to decide trim surrender.
To guarantee that a given machine learning (ML) show works at a tall level of accuracy, it is basic to utilize effective including determination strategies to preprocess the crude information into an effectively computable Machine Learning inviting dataset. To decrease redundancies and make the ML demonstrate more exact, as it were information highlights that have a noteworthy degree of pertinence in deciding the last yield of the demonstrate must be utilized. Hence, ideal highlight choice emerges to guarantee that as it were the most pertinent highlights are acknowledged as a portion of the demonstrate. Conglomerating each single include from crude information without checking for their part in the handle of making the show will superfluously complicate our show. Besides, extra highlights which contribute small to the ML show will increment its time and space complexity and influence the precision of the model's yield. The comes about delineate that an outfit procedure offers way better expectation exactness than the existing classification method.
In the outline In the domain of horticulture, anticipating trim yields has gotten to be progressively complex due to changing natural conditions. To address this challenge, machine learning strategies have been embraced to make strides forecast precision. Key to this is proficient highlight choice, which guarantees that as it were important information are utilized, upgrading show execution whereas diminishing complexity. Outfit procedures, which combine different models, have risen as especially viable in this respect, outflanking conventional strategies. This highlights the progressing require for progressed ML approaches to meet the advancing requests of rural prediction.

3. SYSTEM ANALYSIS

3.1 EXISTING SYSTEM

Plant Village and Leaf Doctor are innovative applications that leverage deep learning techniques to address the critical issue of disease detection in tea leaves.

Plant Village functions as a web-based platform designed with the needs of farmers in mind. It offers a simple and intuitive interface that allows farmers to easily upload images of their tea leaves for analysis. Once uploaded, the deep learning algorithms embedded within the platform work to identify any signs of disease present in the images. This provides farmers with valuable insights into the health of their crops, enabling them to take timely action to prevent further spread of diseases and minimize crop loss.

On the other hand, Leaf Doctor takes a mobile-first approach, catering to users who prefer the convenience of accessing such tools directly from their smartphones. With Leaf Doctor, farmers can simply snap a photo of their tea leaves using their mobile device and submit it for analysis. The app's deep learning technology then processes the image to identify any potential diseases, providing users with instant feedback on the health status of their crops.

Despite the clear benefits that these applications offer to farmers and small-scale industries, there are challenges to widespread adoption. One significant hurdle is the high cost associated with existing disease detection solutions, many of which are developed and marketed by private sector companies. These solutions often come with hefty price tags that may be prohibitive for small-scale farmers with limited resources.

In summary, while applications like Plant Village and Leaf Doctor hold great promise for revolutionizing tea leaf disease detection and empowering farmers, efforts must be made to address the feasibility challenges posed by high costs. This may involve exploring more affordable alternatives or implementing subsidy programs to make these valuable tools more accessible to those who need them most.

4. SOFTWARE USED

Python employed for backend development in the tea leaf disease detection system.
Flask utilized to create a user-friendly interface for seamless interaction.
Implementation of deep learning libraries, specifically TensorFlow, for the Convolutional Neural Network (CNN).
Integration of image processing tools, including OpenCV, to enhance image analysis capabilities.
Structuring the user interface through HTML and CSS, ensuring an organized and visually appealing design.

5. PROPOSED SYSTEM:

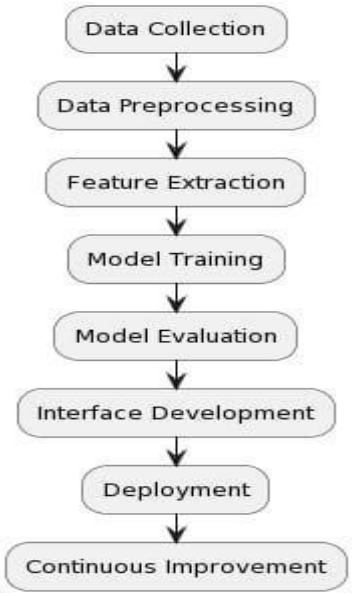
Comprehensive Disease Identification: The automated Deep Learning Model incorporates a wide range of features, including color, spots, and texture characteristics, to ensure thorough and accurate detection of diseases in tea leaves. By analyzing multiple aspects of the leaves, the model enhances its ability to identify various types of diseases, contributing to improved efficiency and reliability in disease detection.

Efficiency and Objectivity: By automating the process of disease detection, the Deep Learning Model eliminates the subjective nature of human judgment, ensuring consistent and objective assessments. This not only streamlines the detection process but also reduces the likelihood of errors or biases, leading to more reliable results and informed decision-making for farmers and experts.

Enhanced Timeliness: The use of automated Deep Learning technology enables rapid analysis and diagnosis of tea leaf diseases, significantly reducing the time required for detection compared to manual methods. This swift turnaround time allows farmers to promptly address any issues affecting their crops, leading to timely interventions and potentially minimizing the spread and impact of diseases on tea production.

User-Friendly Interface: The interface of the system is designed with usability in mind, facilitating easy capture of tea leaf images by both farmers and experts. With intuitive features and clear instructions, users can quickly and effortlessly upload images for analysis, fostering increased participation and engagement in disease monitoring efforts. This user-friendly approach promotes greater collaboration between farmers and experts, ultimately contributing to improved tea production and quality through the enhanced capabilities of the automated system.

6. WORKFLOWS



7. PROCESS METHODOLOGIES

7.1 Implementation of Convolutional Neural Network (CNN):

- Application of deep learning principles to develop a CNN for tea leaf disease pattern recognition.
- Focus on enhancing model adaptability and accuracy through deep learning techniques.
- Aim to achieve robust performance in disease detection by leveraging the capabilities of CNNs**.**

7.2 User-Friendly Interface Development:

- Utilization of Python Flask for creating a user-friendly interface.
- Integration of HTML, CSS, and JavaScript to enhance the interface's functionality and visual appeal.
- Emphasis on seamless interaction for users, facilitating easy navigation and intuitive usage.

7.3. Continuous Data Analysis for Model Refinement:

- Adoption of continuous data analysis techniques to refine and improve the accuracy of the disease detection model.
- Implementation of dynamic features in the front-end to accommodate evolving user needs and preferences.
- Structured presentation of data in the front-end to enhance user experience and facilitate efficient interpretation of results.

REFERENCES

[1] JS. P. Raja , Barbara Sawicka et al., " Crop Prediction Based on Characteristics of the Agricultural Environment Using Various Feature
Selection Techniques and Classifiers" (IEEE).

[2] Jianping Yao, Son N. Tran et al., "Machine learning for leaf disease classification", Springler, 2023.

[3] Md. Fahad Jubayer et al., " Tea leaf disease detection and identification based on YOLOv7 (YOLO-T)", Tea leaf disease detection YOLOv7 (YOLO-T)"

[4] S. Jayanthy et al., "Tea Leaf Disease Classification and Tea Bud Identification"

[5] Rahul Singh et al., "Proposed CNN Model for Tea Leaf Disease Classification"

[6] J P Manasa et al., "Mobile Based Application For Tea Leaf Disease Detection"

[7] Vishesh Tanwar et al., "Tea Leaf Diseases Classification and Detection using a Convolutional Neural Network."