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A Survey on Grapes Leaves Disease Detection

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ABSTRACT— This paper introduces a new approach that combines image processing and deep learning to automatically detect grape leaf diseases. Grape leaf disease is a significant concern in the viticulture industry as it can lead to reduced grape yields and lower quality grapes. Traditional methods for diagnosing these diseases involve manual visual inspections conducted by skilled experts, which are subjective and time-consuming. In this study, we propose a non-invasive and efficient solution for identifying grape leaf diseases by utilizing a dataset comprising high-resolution photographs of healthy and diseased grape leaves. To accomplish this, we employ various image processing techniques to pre-process the images and extract relevant features. These features are then utilized to train multiple deep learning models.
Our results show that the suggested method works better than current cutting-edge techniques in terms of high accuracy in the detection of grape leaf diseases.

KEYWORDS— Grapes disease; Image processing; CNN; Deep learning;

I. INTRODCUTION

As our project name is 'Grape Leaf Disease Detection using Image Processing', In this stage-I of our project we have done the survey on the research papers which are given in Literature Survey and in the references. The objective of this project is to detection and identification of the diseases in leaf of grapes from the dataset provided int the form of image. To implement this project we are going to use the algorithm/ classifier known as CNN.

Grapes hold immense significance globally due to their economic, nutritional, and cultural value, making them one of the most important fruit crops worldwide. According to the FAO, grape cultivation is widespread, resulting in an annual production of approximately 70 million tonnes. However, grapevines are susceptible to various diseases that can significantly impact both yield and quality. These diseases can be caused by fungi, bacteria, viruses, other pathogens, as well as abiotic factors such as drought, heat, and nutrient deficiencies [1].

Early detection of grape diseases is crucial for implementing appropriate measures to mitigate their effects. In recent years, there has been a growing development of automated systems for detecting plant diseases using machine learning techniques. Among these techniques, convolutional neural networks (CNNs) have shown remarkable potential in accurately and efficiently identifying plant diseases. CNNs are a type of deep learning algorithm inspired by the organization of the human brain. They excel in automatically extracting features from images and classifying them, making them widely employed in image processing tasks.

The utilization of CNNs in the identification of plant diseases has proven successful across different types of diseases, including those affecting grapes.
The objective of this study is to develop a CNN- based system specifically designed for diagnosing grape leaf diseases. The system will be capable of accurately detecting diseases such as Black Rot, Black Measles, and Leaf Blight (Isariopsis Leaf Spot). To achieve this, a substantial dataset of grape leaf images will be used to train the system. The performance of the proposed system will be evaluated using various metrics, including recall, precision, accuracy, and F1-score [2].
The rest of this essay is organized into several sections. A brief summary of relevant studies regarding the application of CNNs in plant disease identification is provided.

Grapes hold great economic importance as a crop, and the presence of diseases poses a significant challenge to grape production. It is crucial to detect and identify grape diseases early on for effective disease management. Image processing techniques offer a non-invasive and efficient approach to detect grape diseases. The purpose of this survey

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paper is to present a comprehensive overview of the latest advancements in grape disease detection using image processing techniques [3].

II. LITERATURE SURVEY

Numerous researchers have studied various
plant diseases and provided some strategies for identifying them. We conduct a study on several sorts of diseased plants to gain insight into this research topic. Some of them are given below:

1. The paper which we have referred is Plant disease detection which has published in 2022 by Disease Identification Using SVM.The author of paper is 1 Krushna Sonar,2 Anushri Angaitkar , 3 Sakshi Sarode, 4Pratiksha Harshe, 5 Shreni Chavhan,6 Prof.S.N.Wasankar [3].
2. The paper which we have referred is Plant Disease Detection using Image Processing which was published in 2020 by Plant Disease Detection using Image Processing. Findings are The proposed system is implemented in MATLAB 2018a. The proposed system detects crop disease and provide 90 percent accuracy [4].
3. The paper which we have referred is Detection of Computer based diagnosis of disease of crop images using K-means Algorithm which was published in 2019 by IJERT. The author of paper is Prof. Nikhil Patil, Prof. Rajab Ali, Prof. Vaibhav Wankhedkar, Prof. Deepti [5].
4. The paper which we have referred is Plant Disease Detection Using CNN which is published in 2021 by IEEE. Finding are out of CNN using classification images. [6]
5. The paper which we have referred is Plant Disease Detection Using Different Algorithms which has published in 2017 .The author of paper is Prof. Trimi Neha Tete, Sushma Kamlu and finding out different algorithms of image processeing [7].

III. OBJECTIVES

The objectives for a survey paper on grape disease detection using image processing may include:

1. The main goal of this study is to give a comprehensive and current analysis of the developments in the diagnosis of grape disease.
2. The aim is to identify and analyze the diverse image processing techniques that have been employed in the detection of grape diseases and to provide a comprehensive overview of the latest advancements in detection of grapes disease.
3. The intention is to highlight the strengths and weaknesses associated with different image processing techniques utilized for grape disease detection.
4. The purpose is to propose future research directions aimed at enhancing the accuracy and efficiency.

IV. METHODOLOGY

In the process of plant disease detection system basically involves the following seven phases which are shown in the figure given below:

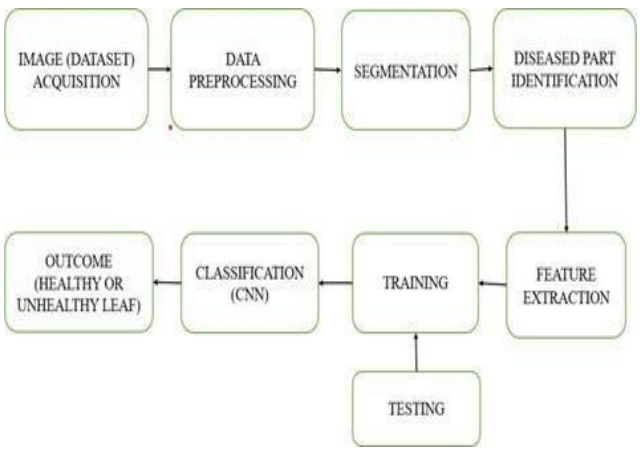

Fig. Phases in Image Processing

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1. During this stage, plant leaf images are collected using digital devices such as cameras or mobile phones, which have particular size and resolution requirements. Images can also be obtained from the internet. The application system developer is accountable for building an image database because it greatly enhances the performance of the classifier in the detection system's final phase [6].
2. In the second phase, data pre-processing is performed, which involves converting the image data into a structured format, if necessary.
3. The second phase focuses on segmenting the image into multiple clusters, and various techniques can be employed for this purpose. The goal of this phase is to simplify the image representation, making it more meaningful and facilitating easier analysis [6].
4. The subsequent phase involves feature extraction methods, while the final phase focuses on disease classification. Features can be derived from various characteristics such as color, shape, and texture. Recently, there has been a growing trend among researchers to utilize texture features for the detection of plant diseases.
5. Following feature extraction, the dataset comprising grape leaf images is trained for further processing.
6. In the subsequent step, classification is performed to determine whether a leaf is healthy or
7. diseased. The classification phase involves using Convolutional Neural Networks (CNN) to determine the health or sickness of the input image. The CNN analysis classifies an image as unhealthy if it is found to be diseased.

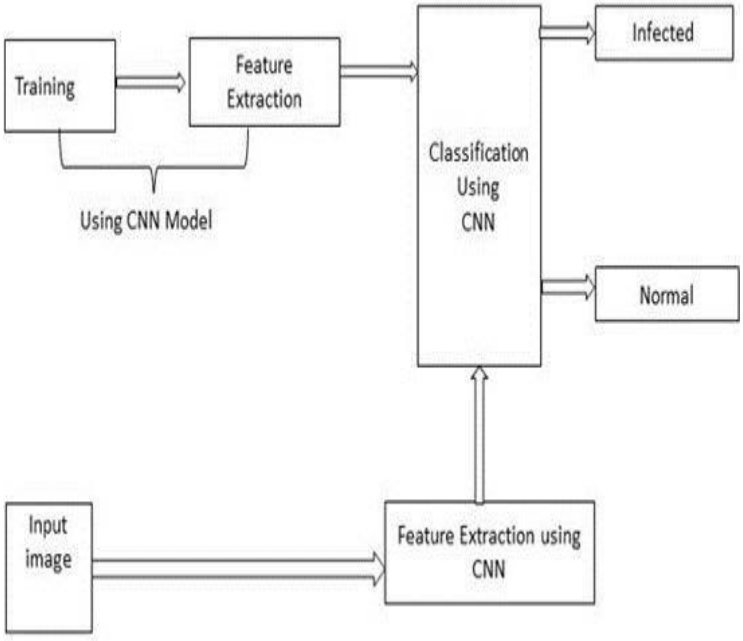

Fig. Model architecture

Given below is the Data flow diagram where the CNN model is represented with respect to the project [6].

V. FUTURE SCOPE

Increasing the dataset's size is crucial as it has a significant impact on the model's performance. While diversity plays a vital role, The accuracy of the model can be improved by using a larger dataset with more samples.
Furthermore, exploring transfer learning can be advantageous. In the current approach, an already trained CNN model for grape leaf disease detection was improved. Transfer learning involves utilizing the knowledge acquired from pre-trained models to enhance the performance of a specific task. By adapting and fine-tuning the pre- trained CNN model specifically for grape leaf disease detection, the model can benefit from the learned features and patterns from the initial training, potentially leading to improve performance and efficiency.

Additionally, the exploration of transfer learning can provide significant benefits. In the current methodology, an existing CNN model that has been trained to detect grape leaf disease was enhanced. By adapting and fine-tuning the

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pre-trained CNN model specifically for grape leaf disease detection, the model can take advantage of the learned features and patterns from the initial training, potentially resulting in improved performance and increased efficiency.

VII. CONCLUSION

Our research findings indicate that convolutional neural networks (CNN) have shown promising results in detecting diseases in grape leaves. To improve the accuracy of the model, several approaches can be employed, including increasing the size of the dataset, optimizing hyperparameters, and experimenting with different network architectures. By implementing these techniques, the suggested method can assist farmers in diagnosing diseases at an early stage, enabling them to take necessary measures to prevent or control the spread of the disease. This, in turn, can lead to higher agricultural yields, improved crop quality, and reduced crop costs.

In conclusion, this study demonstrates the applicability of deep learning techniques, particularly in the identification of diseases in grape leaves, and highlights their potential for broader applications in agricultural settings, including the detection of diseases in other crops.

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