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PLANT DISEASE IDENTIFICATION FROM INDIVIDUAL LESIONS AND SPOTS

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Abstract - *The current framework the ranchers are utilizing for the location of illnesses in the plants is that they could be distinguished through the unaided eye and there information about plant sickness. For doing as such, on enormous number of plants is tedious, troublesome and exactness isn't acceptable. Counseling specialists is of extraordinary expense. In such sort of conditions to improve the exactness rate and make it more helpful proposed methods are executed where gadgets are utilized for the programmed location of the illnesses that makes the interaction less expensive and simpler. Serious level of the intricacy is joined by noticing the manifestations on the plant leave optically where the plant infection could be effectively analyzed. Presently days the vast majority of the agro help focuses and numerous ranchers utilize various sorts of innovation to improve creation in agribusiness. The main wellspring of energy is plants. Plants are frequently inclined to infections which may cause social and monetary misfortunes. Numerous infections are at first spotted on the leaves of the plants. It could prompt more damage if the sickness isn't recognized in the primary stage. By recognizing the shading highlights of the Leaves picture handling helps in the identification of the sicknesses and furthermore gives anticipation to the specific diseases. At the absolute first stage the picture is divided by snapping the photo of the plant in the RGB structure and later the green pixel is withdrawn. Surface insights is a course of action of powers in a locale that is utilized for the extraction by the fragments is at last finished and the illness counteraction is given by the investigation.*

Key Words: plant, diseases, leaf spots, apple.,

1.INTRODUCTION

The agricultural industry has historically been India's most significant economic driver. Agriculture is crucial because of its impact on the global food supply, capital creation, raw materials for manufacturing, consumer demand for manufactured goods, and international trade. Although agriculture's share of the economy is shrinking, it's still the major source of employment in most places, but with some variation as the population grows. It is imperative that we quicken the pace toward agriculture that is competitive, productive, varied, and sustainable [1, 2].

There are three key issues facing Indian agriculture today: increasing agricultural output per acre of land, eliminating rural poverty through a comprehensive social programme, and ensuring that agricultural expansion responds to the country's growing food security demands. India enjoys a diverse array of climatic and geographical environments thanks to its fortunate genetic inheritance [3].

1.1 Apple: Diseases and Symptoms

Apple scab, marsonina coronaria, black rot canker, powdery mildew, apple mosaic, and other viral diseases, and alternaria leaf spot are only a few of the many diseases that primarily attack apple leaves. Here are some of the illnesses that might strike an apple orchard and what signs to look out for.

1.2 APPLE SCAB

Apple scab disease, caused by ventura inaequalis virus, is commonly found on the plant's leaves and fruit. The leaves of infected plants twist and develop black, globular patches on their top surfaces. The dots are hairy and may combine to cover the whole underside of the leaf. A severe illness may cause the leaves to become yellow and fall off a plant. Flowers can wilt and die if scab infects their stems. In time, the sores will recede and turn brown with spores dotting their edges. Apples afflicted with a disease deform and may crack, allowing secondary viruses to enter the crop. Ventura inaequalis ascospore production is stimulated by conditions of adequate temperature and humidity.

Fig1: Apple Leaf Affected with Apple Scab Diseases

1.3Marsonina Coronaria

The symptoms of the illness appear as dark green, circular spots on the upper surface of the leaf, ranging in size from 5 to 12 millimetres in diameter, and eventually becoming much darker. In its advanced stage, it spreads on the underside of apple leaves. On the leaf's surface, you can see a few tiny, black acervuli. When there are many different kinds of spots, they blend together to form large, dark, shadowy patches, and the areas around them turn yellow. Figure 1.5 shows a marsonina coronaria-infected leaf. High precipitation and temperatures between 20 and 22 degrees Celsius aid the spread of this illness.

Fig 2: Apple Leaf Affected with Marsonina Coronaria Diseases

1.4 Black Rot Canker

Indicators of leaf diseases typically appear early in the spring, when leaves begin to unfurl. Apple leaves develop little purple spots on the upper surface that eventually turn into globular lesions between 3 and 6 mm in size. Spots have a purple border that fades to tan and brown in the middle. These leaf patches will develop a secondary growth phase in a matter of weeks. When a plant's leaves get severely infected, they turn chlorotic and eventually fall off. A series of uniformly sized concentric rings that progress in colour from black to brown form as the degraded section grows. Cankers form due to bark lesions caused by either viruses or bacteria. Cysts (ascospores) in decomposing organic matter in the soil provide the pathogen with a means of survival and serve as a source of secondary infection.

Fig 3: Apple Fruit and Leaf Affected with Black Rot Canker Diseases

2. METHODOLOGY

This study is experimental. The literature survey examines agricultural image processing methods and applications. Experts discuss and choose crops and illnesses. Apple leaves were chosen because apple scab and marsonina, coronaria illnesses are reducing agricultural yields in Jammu and Kashmir, India. After the conversation, apple farms in both states are sampled.

Experts from agricultural and horticultural institutions discuss the samples. Image processing technologies identify and describe collected pictures. Algorithms segment and classify damaged apple leaves. Finally, several parameters evaluate the algorithm's performance.

2.1 FIELD SURVEY FOR APPLE FIELDS

Jammu & Kashmir intensively study apple leaves. sopore, shopain, and pulwama fields in were surveyed. Apple scab and marsonina coronaria are the main apple plant diseases, according to the report. Apple scab disease is prevalent & marsonina coronaria. June and July saw the field survey. In daylight, an 8-megapixel Smartphone camera captures sick apple leaves.

Three different types of leaves, healthy leaves, apple scab diseased leaves and marsonina coronaria diseased leaves have been surveyed and captured with live backgrounds and black and white background.

2.2 DATA COLLECTION

When a farmer may inspect the field, apple leaf photographs are captured in natural light. Live, white, and black apple leaf photos are taken. 8-megapixel smartphone cameras produce RGB. color photographs of healthy and sick apple leaves. Digitized photos average 225 KB. June and July collect. 70% of the data base trains the system, 30% tests it. The computer stores all data in JPEG format.

3. PROPOSED WORK

Research has presented a unique method for improvement and automatic segmentation of apple leaves illnesses to increase disease detection accuracy. Recommended research technique. Pre-processing, processing, and post-processing comprise research technique.

3.1 PREPROCESSING

Gaussian filter is used to colored apple leaf picture in pre-processing. Section 3.6.1 introduces binary preserving dynamic fuzzy histogram equalization (BPDFHE), which enhances the filtered picture. Lastly, performance measures are used to compare the suggested improvement approach to current strategies.

3.2 PROCESSING

A unique algorithm segments sick parts of the improved apple leaf during processing. Segmented region of interest (ROI) extracts diseased component characteristics to effectively classify apple illnesses in post-processing. Then several performance indicators are used to compare the recommended segmentation approach to the current ones. Classifying ROI characteristics follows segmentation. Textural characteristics (first- and second-order) are extracted here.1st-order features include mean, variance, skewness, and kurtosis, whereas 2nd-order texture characteristics include GLCM features.

3.3 POST PROCESSING

Four apple scab and marsonina coronaria classification methods are used in post-processing. The most effective method was k closest neighbour, followed by support vector machine, naïve bayes, and decision tree. Several performance measures compare four classifiers.

4. IMAGE FILTERING AND ENHANCEMENT

Farmers and anyone interested in apple production may use the proposed algorithm to segment and classify marsonina coronaria and apple scab disease in apple leaves without waiting for specialists. Preprocessing detects apple pathogens. It increases localization and segmentation of damaged apple picture characteristics, making it crucial for automated apple leaf disease identification. Gaussian filter is used to coloured sick apple leaf picture in pre-processing. Binary maintained dynamic fuzzy histogram equalisation enhances the filtered picture.

4.1 IMAGE ACQUISITION AND IMAGE RESIZING

The initial stage in the process of developing the system to capture a picture of a damaged apple leaf is image acquisition. The RGB colour pictures of healthy and sick apple leaves were taken using the digital camera of a cell phone, which had a resolution of 8 megapixels. Each of the digitised pictures has a size of around 225 KB. A total of 20 data samples are gathered, all of which comprise either healthy leaves or leaves that have been afflicted by either apples scab or marsonina coronaria. The images that have been utilised for the diagnosis of illnesses all include one of three distinct kinds of backgrounds: a live backdrop, a black background, or a white background,. JPEG is the format used to store the images. The image processing library from MATLAB is used in the prototype.

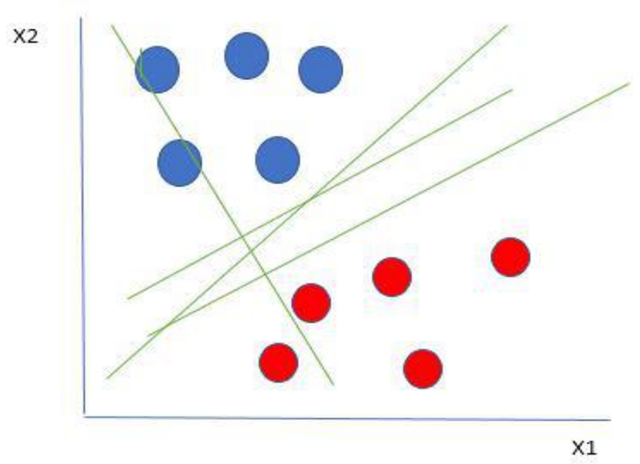
4.2 IMAGE EHANCEMENT

Image enhancement is performed after the image has been filtered, and it is this procedure that increases the reflectivity of information or the interpretability of images for the human eye, in addition to offering additional improvements to the image processing operations. In the work that has been presented, an improvement technique known as binary preserved dynamic fuzzy histogram equalization (BPDFHE) has been introduced for the purpose of enhancing the contrast of the filtered image. Following this, an evaluation of performance indicators is carried out in order to compare the newly proposed enhancement methodology with previously developed enhancement methods. The following paragraph will provide an in-depth analysis of the technique that will be offered, followed by a concise analysis of the techniques that are currently in use.

4.3 SVM CLASSIFICATION

The supervised machine learning approach known as Support Vector Machine (SVM) can be used for both classification and regression. Although we also refer to regression problems, classification is where it really shines. The goal of the Support Vector Machine (SVM) technique is to locate, in an N-dimensional space, a hyper plane that may be used to classify the data points with high accuracy. The hyper plane's size is proportional to the total number of features. If there are just two input characteristics, the hyper plane is a straight line. When there are just three input features, the hyper plane flattens out into two dimensions. When there are more than three distinguishing traits, visualization gets problematic.

Here we have a blue circle and a red circle serving as our dependent variables, and x1 and x2 as our independent variables.



From the figure above it's very clear that there are multiple lines (our hyperplane here is a line because we are considering only two input features x_1, x_2) that segregate our data points or do a classification between red and blue circles.

5. RESULT AND DISCUSSION

The agricultural sector's output is crucial to the health of the economy. Since plant diseases are a fact of life, it stands to reason that the ability to detect them would be useful in the agricultural sector. The quality, quantity, and productivity of plants are all negatively impacted if this area is not properly cared for. One dangerous disease that affects apple trees in Kashmir is called small leaf disease. Plant disease detection by some automatic technology is helpful because it eliminates the need for constant monitoring in large crop farms and catches signs of illness as soon as they manifest on the leaves of plants. An algorithm for an image segmentation technique is presented in this study for the purpose of automating the process of identifying and categorizing leaf diseases in plants. Also included is a review of the many disease classification methods that can be applied to the detection of plant leaf diseases. An essential part of applying a genetic algorithm for disease diagnosis in plant leaf images is segmentation.

5.1 SIMULATION RESULTS

MATLAB is used for every single experiment. Diseased leaf samples from plants including roses, beans, lemon trees, banana trees, and even beans with early scorch and fungal disease are taken into account as input data.we see the input photos, followed by the segmented results. Different plant diseases can be identified from segmented images. The apple leaf with early scorch disease serves as both the input and the output image, while the categorization of the disease using the feature extraction approach serves as the output.

Diseases on other input plants can be categorized in the similar way.

After mapping the R, G, and B components of the input image to the threshold images, the co-occurrence features can be computed. The extracted leaf co-occurrence features are then compared to their corresponding feature values in the feature library. First, we use K-Means Clustering to classify the data, and the Minimum Distance Criterion seems to be an effective method with an accuracy of 86.54%.

1. Place the folder 'Leaf_Disease_Detection_code' in the Matlab path, and add all the subfolders into that path.
2.Run Detect Disease GUI.M
3. In the GUI click on Load Image and load the image from Manu's Disease Dataset, click Enhance Contrast.
4. Next click on Segment Image, then enter the cluster no containing the ROI, i.e only the disease affected part or the healthy part.
5. Click on classification results. Then measure accuracy (In this case Healthy vs. All diseases).

5.2 DATA SET RESULTS

The ist data set is testing of leafs using matlab are healthy leaf and alternaria alternate. From the above the results are tabulated as follows

Table 1: Results of Data Set IST

Data Set	Diseases Classification	Affected Region%	Accuracy %
1	Healthy Leaf	None	95.1613
2	Alternaria Alternata	15.314	96.7742
3	Healthy Leaf	None	96.77
4	Alternaria Alternata	53.5633	98.77
5	Alternaria Alternata	15.85	98.38

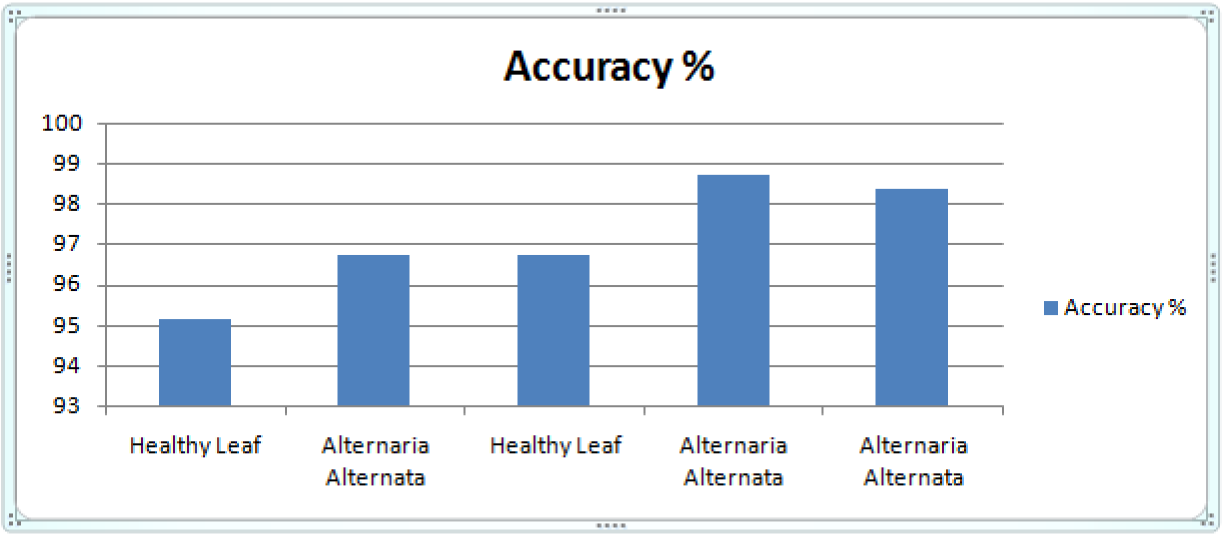


Table 2: DATA SET 2

Data Set	Diseases Classification	Affected Region%	Accuracy %
1	Anthracnose	17.8756	96.77
2	Anthracnose	15.0015	98.38
3	Anthracnose	15.2267	96.77
4	Anthracnose	15.79	98.38
5	Anthracnose	15.77	96.77

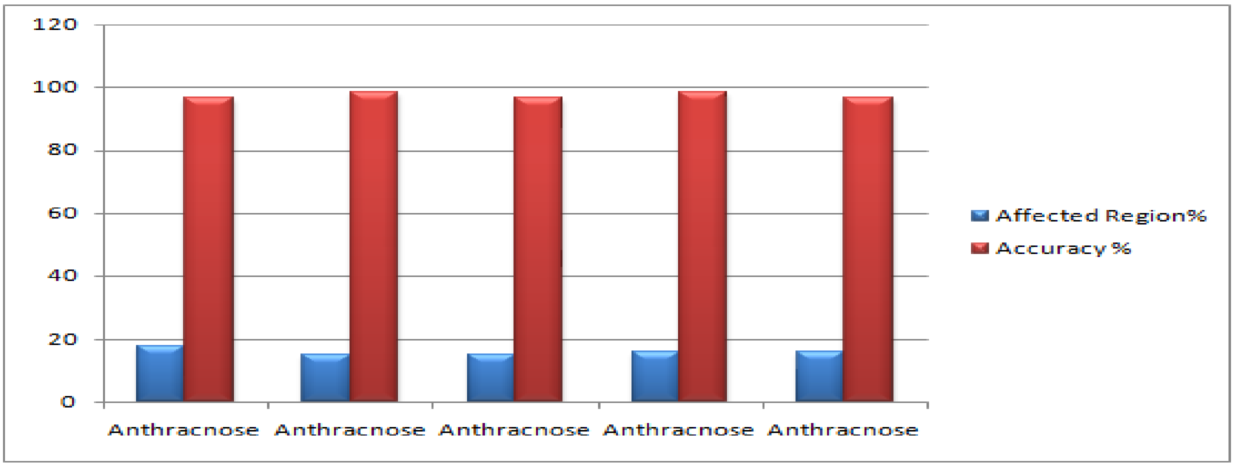


Table 3: DATASET 3

Data Set	Diseases Classification	Affected Region%	Accuracy %
1	Bacterial Blight	15.0092	96.7742
2	Bacterial Blight	15.0092	95.1613
3	Bacterial Blight	15.0093	96.7742
4	Bacterial Blight	15.0201	96.3871
5	Bacterial Blight	15.0142	96.77

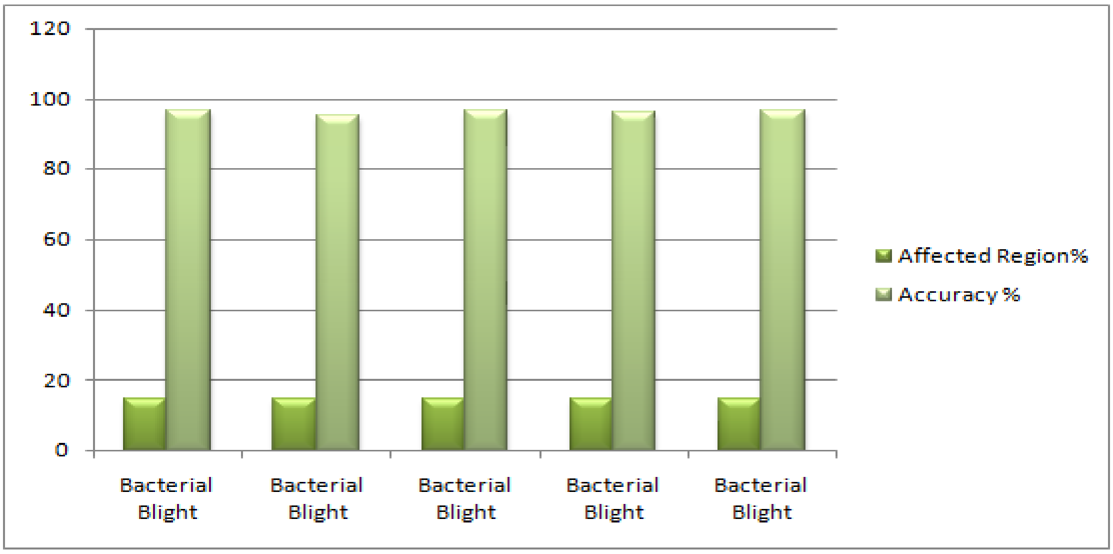


Table 4: DATA SET 4

Data Set	Diseases Classification	Affected Region%	Accuracy %
1	cercospora leaf spot	18.5974	95.1613
2	cercospora leaf spot	15.6133	96.77
3	cercospora leaf spot	15.6133	98.38
4	cercospora leaf spot	15.4707	98.38
5	cercospora leaf spot	15.4297	96.77

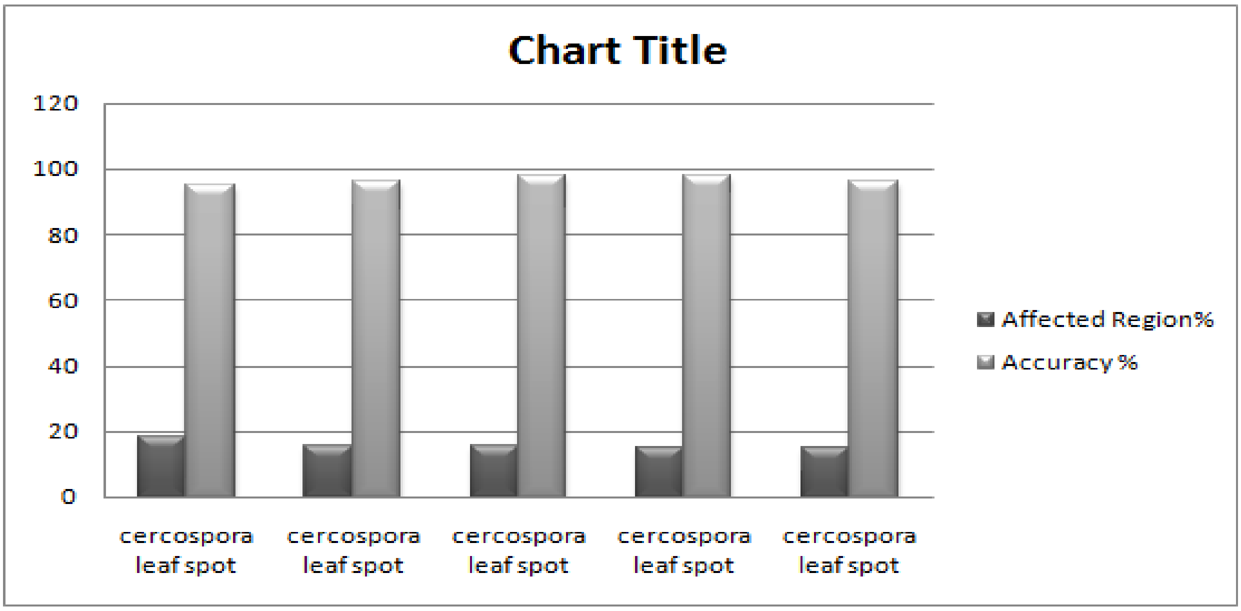
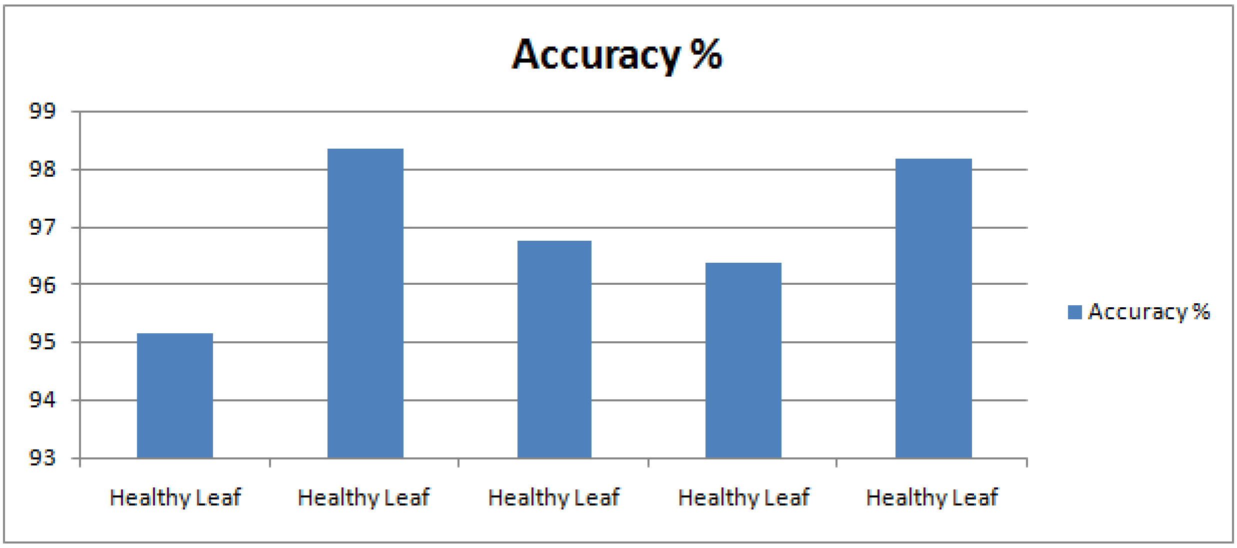


Table 5: Dataset 5

Data Set	Diseases Classification	Affected Region%	Accuracy %
1	Healthy Leaf	None	95.1613
2	Healthy Leaf	None	98.3871
3	Healthy Leaf	None	96.7742
4	Healthy Leaf	None	96.38
5	Healthy Leaf	None	98.2



6. CONCLUSION

Apple is a crucial product for India's economy, which has played a significant role in our economy in the past, but are not as plentiful today because to different diseases that affect the crops.Thankfully, more people are becoming aware of the importance of apple farming, and what better way to raise awareness of it than by providing a convenience that any farmer can utilise on their smartphone. Since we live in a digital age, we should utilise technology as much as possible across all industries. Machine learning was used as a result. The primary focus of the proposed work is on the apple illnesses marsonina coronaria and apple scab, which yield varied outcomes for disease prediction using artificial intelligence.

An algorithm for image segmentation approach that can be utilised for automatic detection and classification of plant illnesses, as well as a survey on several diseases classification techniques for plant leaf disease detection, are presented in this study later leaf diseases. On ten different species, including the apple, banana, bean, jackfruit, lemon, mango, potato, and tomato, the proposed algorithm is tested. As a result, samples of associated diseases for these plants were taken for analysis. The best results were attained with a minimum amount of computing work, demonstrating the effectiveness of the suggested algorithm in the identification and categorization of leaf diseases. Utilizing this technology also has the benefit of allowing for the early or first detection of plant diseases. Artificial Neural Networks are used to classify data and increase recognition rates.

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