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DISEASE OF COTTON LEAF CLASSIFICATION WITH IMAGE PROCESSING & AI FOR SUSTAINABLE COTTON PRODUCTION

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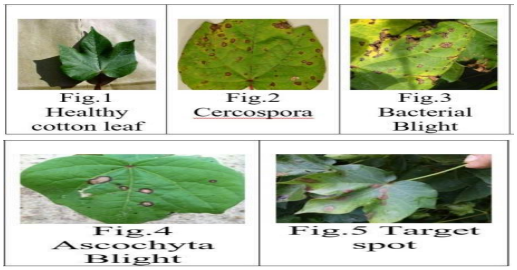
ABSTRACT

Agriculture production being the main factor for improving economic status of India and reduction in production rate is mainly due to various diseases in plants. So, identification of plant disease in early stage is the main challenge for farmers for improving the production rate as well as economic status. As India being the country of villages and farmers, the economic profit of the country, mostly join on the crop production quality and quantity. The production could get improved by cotton leaf disease detection in less but correct time. There are numerous types of image processing methods have been developed for disease detection of cotton leaf. Basically, the technical improvement allows the task easier and faster at a very early stage. Cotton leaf disease is considered as one of the biggest issues in the agriculture field. The Cotton crop leaves are basically get affected by the named Cercospora, Bacterial blight, blight, and Target spot diseases. For this, the neural network approach was introduced with use of artificial intelligence for identification of disease onto cotton leaf automatically with the help of proper device application.

Keywords: Neural Network, Leaf Disease, Cotton Crops.

I. INTRODUCTION

If we look from economy view of India, agriculture is always been the most important key parameter to enhance the Indian economy. As the economy of India can be improved and raised by increasing the agriculture production. The damage caused due to diseases in plants has to be reduced to increase production. Talking about cotton crop cultivation in India, as diseases are quite natural in plants so early detection of disease is required to improve production and quality. Continuously monitoring the large cotton fields with naked eye is time consuming and highly costly process. Gujarat is the biggest cotton-growing state. Cotton leaf diseases being the main reason for the reduce the productivity of the cotton. Mainly about 80-90% of diseases such as Alternaria leaf spot and Bacterial blight will mainly occur on the leaf of the cotton plant leaves. Concepts like image processing are being emerged to detect the leaf diseases which consists of image filtering, image segmentation and image feature extraction. Techniques such as Support Vector Machine (SVM), Neural Network (NN), and Homogeneous Pixel Counting technique for Cotton Diseases Detection (HPCCDD) can be used for classification. Features played an important role in the classification of the process. Previous proposed works for detecting disease has some limitations such as low, resulting accuracy and a smaller number of images used to detect disease. Artificial Intelligence is helping us in all aspects. The very proposed system is mainly used to develop an application which recognizes cotton leaf diseases. To solve agricultural problems using Artificial Intelligence, a cotton plant disease prediction which will help to detect the disease on the cotton crop and tell the farmers how to cure it. “Cotton Leaf Disease Classification for Sustainable Cotton Production” using Artificial Intelligence especially by Deep learning method could help farmers a lot. We know farmer can’t solve farm’s complex and even small problems due to lack of perfect education. So, this application would be beneficial for the user. User need to upload the image and then using image processing, we can get a digitized color image of a diseased leaf and then we can proceed with applying the forward algorithm to predict cotton leaf disease and also provide a solution to the cotton disease found in plants by suggesting names of pesticide.



II. LITERATURE SURVEY

Cotton is a primary cash crop in India. It affects India's economy in many ways. Large number of people depends on Cotton crop either by its cultivation or processing. The experts usually judge the symptoms with bare eyes. However, this imposes continuous monitoring by experts which is expensive in case of huge farms. On the other hand, farmers judge the symptoms by their experiences, the incorrect identification leads to wrong control measurements, such as excess use of pesticides and at inappropriate time. Cotton leaf disease can be detected by pattern recognition techniques through which we can achieve the accuracy 85.52 percent. Some of the researchers who carried out their research are as:

[1] A. Jenifa; R. Ramalakshmi; V. Ramachandran (2019) (Use of Deep Convolutional Neural Network) Developed cotton leaf disease classification using Deep Convolution Neural Network. For this, they introduce Deep Convolutional Neural Network based approach for identifying Cotton leaf diseases automatically. Deep learning is a piece of a more extensive group of machine learning techniques dependent on learning information representations, as opposed to task-specific algorithms. Learning can be managed, semi-administered or unsupervised. The "deep" in "deep learning" alludes to the quantity of layers through which the information is changed. In the learning method, learning process might be Supervised, Unsupervised and semi-supervised for the representation learning method in deep learning. They trained their data and assess the experimental result. The execution of the proposed method is implemented in MATLAB, a set of healthy and diseased leaves images of cotton is used for experimentation and have evaluated the classification and detection process. The disadvantage in detection of disease and classification for this project is that the leaves are similar to each other with different disease. Thus, this cause the leaves to be fold in the wrong classes. The classification was efficient only some leaves were classified incorrectly for each class.

[2] H. D. Gadade, Dr. D.K.Kirange "Machine Learning Approach towards Tomato Leaf Disease Classification" Feb 2020 They have developed a system to detect symptoms of disease, they have developed a module that classifies the plant leaf disease automatically. It shows the performance measure for different feature extraction techniques for tomato leaf disease detection including GLCM, Gabor and SURF and classification techniques including decision trees, SVM, KNN and Naïve Bayes. The dataset contains 500 images of tomato leaves with seven symptoms of diseases. They have modeled a system for automatic feature extraction and classification. They have evaluated the performance of the system using different performance measures to conclude with appropriate features set and classification technique for tomato leaf disease classification. The experimental results validate that Gabor features effectively recognizes different types of tomato leaf diseases. Accuracy of SVM is better as compared to other classification method but the execution time is more. KNN classification framework with Gabor features is used for tomato leaf disease classification. Different features like SURF, Statistical and Gabor are used. The different classifiers including SVM, KNN, Naïve Bayes and decision trees are trained to carry out the final classification. Main focus of this study was to preprocess the tomato leaf images for noise removal.

[3] Dilpreet Kaur, Dr. S.K MITTAL "Textual Feature Analysis and Classification Method for the Plant Disease Detection" 2019: In the proposed research study, they analyzed that feature extraction, segmentation and classification are 3 essential phases of plant infection detection. The GLCM algorithmic rule is applied for the extraction of textural features in the earlier approach. The input pictures are segmented with the help of k-mean clustering. In the proposed study, The Naïve bayes classifier was utilized in place of multi-class SVM classifier for the classification of data into various classes. The performance of the proposed algorithm was compared with existing in terms of accuracy and execution time. The proposed Naïve Bayes technique rules found high accuracy and low execution time than SVM algorithm.

[4] Narinder Kaur; Prabhjot Kaur "Classification and Segmentation Approach for Plant Disease Detection" August- 2019: They developed a system for detection of infections in plants leafs. Different phases such as textural feature scrutiny, segmentation and classification are involved in plant infection or disease recognition. This study utilizes the KNN classifier along with GLCM algorithm for the plant disease detection. The projected method primarily takes pre-processed picture in form of input. In the subsequent step, texture feature scrutiny is performed with the help of GLCM algorithm. The area-based segmentation is executed through K-mean clustering and KNN classifier is implemented for the infection forecasting. MATLAB programming is used for the implementation of projected approach.

[5] R. Meena Prakash, G. P. Saraswathy, G. Ramalakshmi, "Detection of Leaf Diseases and Classification using Digital Image Processing", 2017: R. Meena Prakash, et.al (2017) reviewed numerous image processing approaches for the identification of plant diseases. The main objective of their study was the implementation of image analysis and classification methods for the detection and classification of the leaf infections. The projected structure mainly included four dissimilar sections. These were identified as picture processing, segmentation of leaf with the help of k-means clustering for the recognition of contaminated regions, characteristic withdrawal and categorization of infections. This methodology utilized arithmetical Gray-Level Co-Occurrence Matrix (GLCM) aspects and categorization processes for the retrieval of textural features. The projected approach exploited Support Vector Machine (SVM) classifier for providing enhanced feature extraction.

[6] Kawaljit Kaur, Chetan Marwaha, "Analysis of Diseases in Fruits using Image Processing Techniques", International Conference on Trends in Electronics and Informatics ICEI 2017 proposed an inclusive research work relevant to numerous ailments recognized inside the fruit's crops. An automatic technique was developed for the identification of fruit infections and this technique also reduced the amount of time required for the detection of fruit diseases. The noise was the main cause of image distortion. Therefore, this approach also utilized noise removal scheme. The proposed research work scrutinized that affliction infection affected mostly fruit harvest. The performance investigation was carried out with the help of indistinct lead picture for the identification of infections inside the fruit yields. The particular valued scrutiny was implemented inside the image processing systems for the detection of diseases in the preliminary phase.

[7] Chaitali G. Dhaware, Mrs. K.H. Wanjale, (2017) proposed a novel approach for the identification and classification of automated leaf diseases from several plant leaves with the help of image processing technique. This scheme was implemented with the help of sensible demand as the descriptions were moved unswervingly because of the least hard work of farmers. Therefore, this approach reduced the hard work of farmers involved in farming. The farmer captured the picture of plant leaf with the help of appropriate mobile camera. This picture was applied to the DSS mechanism without making any supplementary effort.

III. METHODOLOGY

Diseases in cotton farms are seen on different parts of plant like stem, roots, cotton bud, leaves and fiber. The three diseases detected and classified are Alternaria Leaf Spot, Bacterial Blight, Cercospora Leaf Spot, Grey Mildew-Cotton Disease. For experimentation purpose 500 images are used for detection and classification.

The basic method used for proposed system goes step by step

1. Collecting the leaf images from farms or data base.

2. K-means clustering is carried on the input image.

3. Features Extraction is done features such as Contrast, Correlation, Energy, Mean, Standard Deviation, Entropy, Variance and Kurtosis from the cotton leaf.

4. And finally based on the extracted features the diseased type is detected and classified using ANN and SVM classifiers.

5. Comparing the classification results for three different diseases using ANN and SVM.

General approach for detecting the leaf disease is composed of two steps, image processing and classification of disease using machine learning techniques. Image acquisition, Image pre-processing, Image segmentation and Feature extraction steps of image processing are discussed in this section. We also discuss several classification techniques. Diseases in cotton farms are seen on different parts of plant like stem, roots, cotton bud, leaves and fiber.

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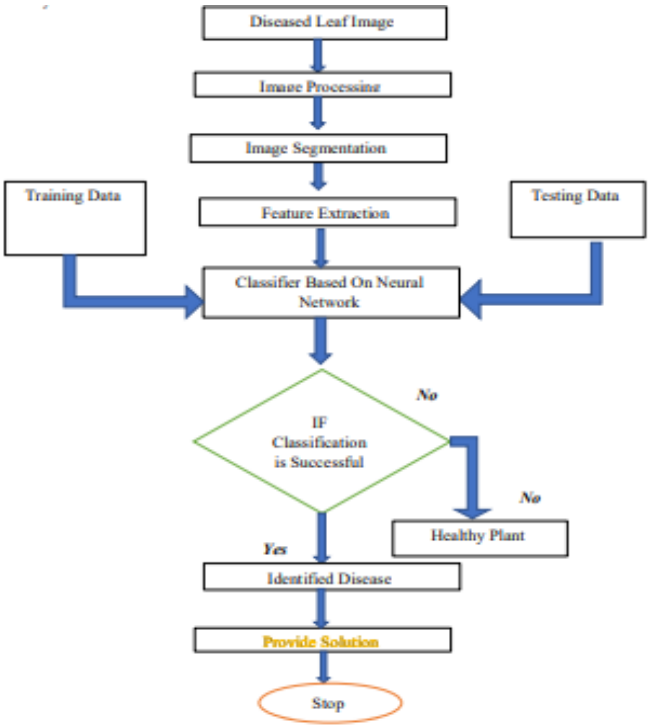

Fig. 3.2: Block Diagram Of Proposed Model

Image Processing:

We have captured images from Anand agricultural university, Anand. Images were captured in September-2015 using Sony DSC-W710 model (16 megapixel camera). Images were stored in PNG format. Resolution of the image is 800×600. There are total 190 images of Alternaria leaf spot, Bacterial blight, Cercospora leaf spot, and Nitrogen deficiency. We have set the white background while capturing leaf images.

Image Acquisition: For capturing the rich details of cotton leaf patterns, an acquisition system should have a minimum resolution of 512 X 512 pixels in frame.

Image Pre-processing: Here initially pre-processing the input image using histogram equalization is applied to increase the contrast in low contrast image.

Feature Extraction: In this, Color feature variance is used for matching the train image features to database images.

Leaf Segmentation: For detection of internal and external boundaries of the cotton leaf, use K-mean clustering algorithm technique

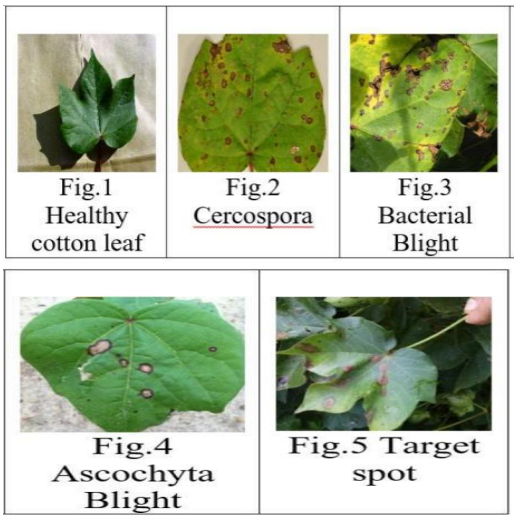

Fig : Major Cotton Leaf Diseases

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Image Segmentation:

The proposed block diagram is shown in Fig 3: for classification of diseases. In this paper the image is partitioned into three clusters using K-means clustering. The diseased cluster are the green pixels and texture and color of the image is considered for extracting features of the diseased leaf.

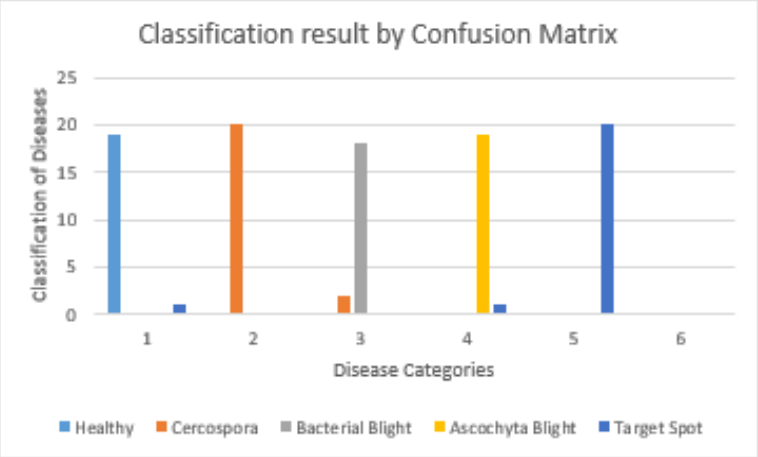

Fig : Classification by Confusion Matrix

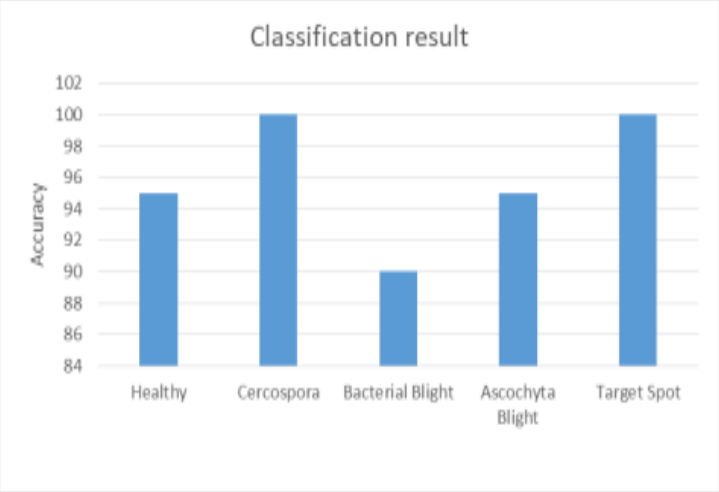

Fig : Graph showing disease categories with accuracy

IV. PROPOSED ALGORITHM

Convolution Neural Network Algorithm:

CNNs being the regularized versions of multilayer perceptron's. And multilayer perceptron's basically mean fully connected networks, that is, each neuron in one layer is connected to all neurons in the next layer. As CNNs calculation depends on various methodology towards regularization, they can exploit the progressive example in information and can gather examples of expanding intricacy utilizing more modest and more straightforward examples embellished in the channels.

DWM Algorithm:

The proposed algorithm tries to find the correlations between data by DWM. As if look, it is very much suitable of detecting the concept drift. The outcome appeared by simulation of the DDDAS-based DWM calculation has up to 88 % precision in a significant part of the reproduction case, and ready to discover the conceptual drift.

Digital image correlation algorithms:

Depend on the following of data across a bunch of pictures, from a 'reference picture' to pictures stepped through later in the examination, regularly called 'deformed pictures. The set of images being used will constitutes a movie from which the displacement measurement will be derived.

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V. EXPERIMENTAL RESULTS

Diseased Cotton Plant Or Leaf–

(If disease found)

Healthy Cotton Plant Or Leaf –

(If no particular diseased found)

If disease found then –

Name of disease:

Solution for disease:

INPUT **OUTPUT**

Fig: Application For Prediction of Cotton Leaf Disease

Fig: Output Of The Selected Cotton Crop Image

VI. CONCLUSION

In this paper, our result on prediction and classification of the cotton leaf disease using artificial intelligence and with the use of machine learning techniques was carried out. The survey on background elimination and segmentation techniques was also discussed here. Through this survey, we had concluded that for the purpose of background removal color space converted from RGB to HSV is useful. We performed color segmentation by masking green pixels in the background removed image and then applying otsu thresholding on the obtained masked image to get binary image. This is very useful to remove accurate features of disease. We searched that SVM gives good results, in terms of accuracy, for classification of diseases. There are main five important steps in our proposed present work, out of which three steps have been implemented: Image Acquisition, Image pre-processing, and Image segmentation implemented in our first module and the remaining two steps are feature extraction and classification which we implemented in our second module.

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VII. REFERENCES

[1] Features Selection of Cotton Disease Leaves Image based on Fuzzy Feature Selection Techniques”, Proceedings of the International Conference on Wavelet Analysis and Pattern Recognition, Beijing, China, 2007.

[2] P. Revathi, M.Hemalatha, "Classification of Cotton Leaf Spot Diseases using Image Processing Edge Detection Techniques" International Conference on Emerging trends in Science, Engineering and Technology, 2012.

[3] A. Kumar, S. Gupta, S. K. Singh and K. K. Shukla, "Comparison of various metrics used in collaborative filtering for recommendation system," 2015 Eighth International Conference on Contemporary.

[4] M. K. Kharita, A. Kumar and P. Singh, "Item-Based Collaborative Filtering in Movie Recommendation in Real time," 2018 First International Conference on Secure Cyber Computing and Communication (ICSCCC), Jalandhar, India, 2018, pp. 340-342. Publisher: IEEE.

[5] K.Yang and L.Toni,"GRAPH-BASED RECOMMENDATION SYSTEM," 2018 IEEE Global Conference on Signal and Information Processing (GlobalSIP), Anaheim, CA, USA, 2018, pp. 798-802. Publisher: IEEE

[6] Weizheng S.,Yachun W., Zhanliang C., and Hongda W., "Grading Method of Leaf Spot Disease Based on Image Processing" in Proceedings of the 2008 international conference on Computer Science and Software Engineering, Volume 06, December 12-14.

[7] J. Gupta and J. Gadge, "Performance analysis of recommendation system based on collaborative filtering and demographics," 2015 International Conference on Communication, Information & Computing Technology (ICCICT), Mumbai, 2015, pp. 1 -6. Publisher: IEEE.

[8] Namrata R Bhimte, V.R.Thool," Diseases Detection of Cotton Leaf Spot using Image Processing and SVM Classifier", Second International on Intelligent Computing and Control Systems (ICICCS),pp 340 -344, 2018.

[9] A. Luke, J. Johnson and Y. Ng, "Recommending Long - Tail Items Using Extended Tripartite Graphs," 2018 IEEE International Conference on Big Knowledge (ICBK), Singapore, 2018, pp. 123 -130. Publisher: IEEE.

[10] A. Luke, J. Johnson and Y. Ng, "Recommending Long - Tail Items Using Extended Tripartite Graphs," 2018 IEEE International Conference on Big Knowledge (ICBK), Singapore, 2018, pp. 123 -130. Publisher: IEEE.

[11] Linden, Greg, Brent Smith, and Jeremy York. "Amazon. Com recommendations: Item -to -item collaborative filtering." IEEE Internet computing 7.1 (2003): 76 -80.

[12] Sahebi, Shaghayegh, and Peter Brusilovsky. "Cross - domain collaborative recommendation in a cold - start context: The impact of user profile size on the quality of recommendation." International Conference on User Modeling, Adaptation, and Personalization. Springer, Berlin, Heidelberg, 2019.

[13] Paterek, Arkadiusz. "Improving regularized singular value decomposition for collaborative filtering." Proceedings of KDD cup and workshop. Vol. 2019.

[14] Kula, Maciej. "Metadata embeddings for user and item cold -start recommendations." arXiv preprint arXiv:1507.08439 (2020).

[15] Wang, Chong, and David M. Blei. "Collaborative topic modeling for recommending scientific articles." Proceedings of the 17th ACM SIGKDD international conference on Knowledge discovery and data mining. ACM, 2019.