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Sugarcane Disease Detection Using Deep Learning

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Abstract: The Sugar Cane is particularly crucial agricultural commodities in the world with a number of cuisines scattered across the globe, which are incomplete without it. In developing countries like India, Sugar Cane has spurred agriculture driven growth in the past century, when export of agricultural produce was the major source of foreign exchange. At times, the prices face a blow from the demand side, while at times facing drastic conditions on the supply side, owing to which, the prices of the commodity have seen a drastic fall. In such years, farmers often cannot afford the services of agricultural consultants for tasks such as of sicknesses of the leaves and addressing them at the earliest. The prescribed remedy is an inexpensive strategy which is easy use of image processing to detect leaf diseases in the leaves of Sugar Cane plants a way to streamline life for landowners in addition to consumers, since this would balance the prices at a median price. In this project, the affected leaves are captures as images using a camera. upon then, these photographs are adjusted. further using various methods and the key characteristics originate via them using various methods.

Keywords: Sugar cane, Image Processing.

INTRODUCTION

The condition of a leaf is an important aspect that affects the yield, both in terms of quantity as well as quality SugarCane. The process to recognise sugar cane leaf disease is based on image processing &uses visual cues on the leaf surface to know the disease. Numerous methods have been devised. that use cameras and computer vision algorithms to study the Sugar Cane leaves.

The starting point of image processing stipulates the processing of digital images by removing noise, any anomalies of any kind that potentially emerged in the shot, either during its formation, transformation, storage, etc. An image can be defined mathematically as a two-dimensional function f(x,y), where x and y are spatial variables. coordinates and the amplitude of f at any point (x,y) is called the intensity of f at that point. In grey scale images, it is also called the grey level. When x,y and these intensity values are all finite, discrete quantities, it is claimed that the picture is digital. A digital image must consist of a limited number of components, each of which must have coordinates and a worth. We refer to these components as picture elements or pixels and are the smallest part of an image.

In picture preprocessing utilises sensor-captured image data on a camera related to geometry or brightness values of the pixels may not be very precise, as a lot of noise may interfere with these bit values. Using suitable mathematical models—definite or statistical models—these inaccuracies are rectified. Image enhancement refers to the process of altering images by tweaking the brightness levels of the pixels to enhance its visual effect. A variety of methods are used in image enhancement to enhance the visual appeal of an image- both to machines as well as humans.

The process of labelling a pixel or set of pixels according to their grey value is known as image categorization. One of the most used techniques for extracting information is classification. Multiple features are typically employed for a set of pixels in classification, meaning that numerous photos of a specific object are required. In remote sensing area, The process is predicated on the assumption that imagery of a given region is gathered in several electromagnetic spectrum regions and is well-registered. The majority of information extraction methods use specialised algorithms created to carry out different kinds of analysis of the spectral reference features of such imagery spectral analysis.

LITERATUREREVIEW

Prajwala T M proposed[1] This piece of work was produced by The Department of Computer Science and Engineering, National Institute of Technology, Surathkal, Karnataka during the eleventh international conference on contemporary computing, 2018, which was held in Noida, India. This approach made use of Convolutional Neural Networks as the classifier, which was implemented using LeNet which comprises all the convolutional, activation, pooling and fully connected layers.

This software has by far been very successful in detecting leaf diseases accurately to a large extent. Moreover, this piece of software has actually been used on field by the farming community around Surathkal, which has really helped the farmers a lot. However, its popularity has waned as Sugar Cane growing near Surathkal is not very popular and the software did not manage to reach other places as it was still in the early phases and did not evolve. This software was by far among the best to be developed with the highest accuracy rates, since it was trained by over 54000 images of Sugar Cane leaves, which is quite an impressive number of inputs to train the model. One basic thumb rule in machine learning has always been that a higher number of inputs almost always result in better accuracy while classifying.

This is another aspect to look into, since a more powerful software, designed perfectly would be similarly accurate with lower number of pictures from the training collection. We would like our software to be better equipped and implemented in a more modern way as we have more powerful algorithms today. Moreover, it would be better to see farmers actually using our software to address their day to day problems.

Akshaya Kumar, proposed[2] This paper also uses CNN to detect Sugar Cane leaf diseases. This project was again put forth by National Institute of Technology, Surathkal, Karnataka in 2019 at an IEEE conference, as an advancement over the 2018 version.

While the 2018 version used only LeNet, this model uses 4 CNN architecture using LeNet , VGG16, ResNet50 and Xception. These models were all put to the test on the Plant Leaf dataset. This project yielded better accuracy rates than the previous one which was proposed at Noida in 2018. The main advantage it had over its predecessor is the implementation of CNN using multiple layers and different algorithm providers.

The main difference actually arises out of the use of totally many algorithms that evolve keeping in mind some concept that is basically completely different from the other provider. This acts as a combination of different ideas. Thus, the fact is that these different layers were able to recognize different features or patterns the previous version missed out on. Though this piece of work has set the performance parameters quite high, even this is not widely understood. mainstream use among farmers. Until this is true, no piece of software would be considered totally successful.

Mokhtar. E T Proposed, [3] This is a very recent work, performed by two of the faculty at Maharaja Institute of Technology, Mysore. It is interesting to know that their piece of work has found mention in the International Journal of Computer Vision and Image Processing. This is among the first to combine image processing, machine learning and computer vision. Thus the mention in a journal of such high regard.

Computer Vision is an emerging field in computer science that is very closely associated with image processing, but is completely a different domain in terms of approach. Since this paper employs Computer Vision to detect leaf diseases- it can be said to be a pioneer with the first such approach.Although the rate of accuracy is very high, it is a very complex system, since the developer must have an in depth knowledge in all 3 fields of image processing, machine learning and computer vision to implement it in an acceptable way.

Since we are only in our learning stages, it would be too big a challenge for us- to compete with such an efficient and complex system. That being said. We could still take hints from it, to boost the efficiency of our implementation- probably in the earlier stages of preprocessing and feature extraction, if not in the classifier stage.

METHODOLOGY

The initial stage in running the framework is to select the most crucial attributes. The relevant data is subsequently preprocessed into the appropriate format. The data is then divided into both training and testing sets. The procedures are implemented, and the training data is used to train the model. Testing the system with test data determines its accuracy. This system is enforced using the following modules.

1. Collection of Dataset
2. Selection of attributes
3. Data Pre-Processing
4. Model Training
5. Model Evaluation

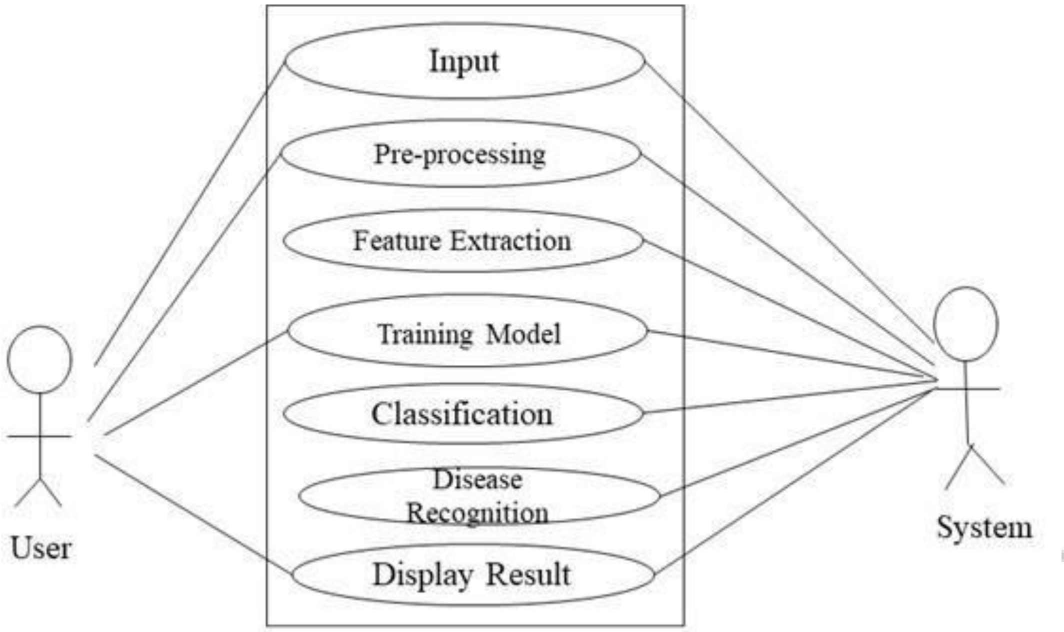

Fig 1.System Architecture

Convolutional Neural Network (CNN):
Convolutional neural networks, often known as CNNs or ConvNets, are a form of deep neural networks used most frequently in deep learning for evaluating visual data. Because to its translation invariance properties and shared-weights architecture, they frequently get referred to as shift invariant or space invariant artificial neural networks (SIANN). They may be employed in mage recommender systems, image classification, medical image analysis, natural language processing, brain-computer interfaces, and financial time series.

Multilayer perceptrons are regularised variants of CNNs. Generally speaking, multilayer perceptrons refer to completely connected networks, in which every neuron in one layer is coupled to every other layer's neuron. These networks' "fully-connectedness" renders them vulnerable to overfitting of data. Regularisation techniques often include including a magnitude measurement of weights into the loss function. CNNs employ a distinct strategy for regularisation: they leverage the hierarchical pattern present in the data to piece together more complicated patterns from smaller, simpler patterns. CNNs are therefore at the lower end of the connectivity and complexity spectrum.

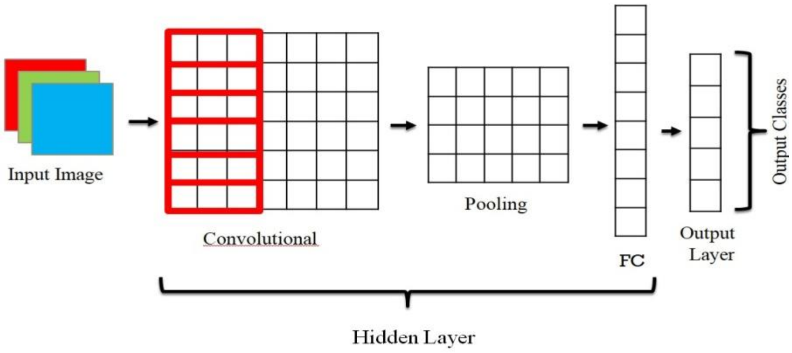

Fig 2. Typical CNN Architecture

Conversion From RGB to Grey Scale:

The first step in pre-processing is converting the image from RGB to Greyscale.It can be obtained by applying the below formula to the RGB image.The figure 3 depicts the Conversion from RGB to grayscale.

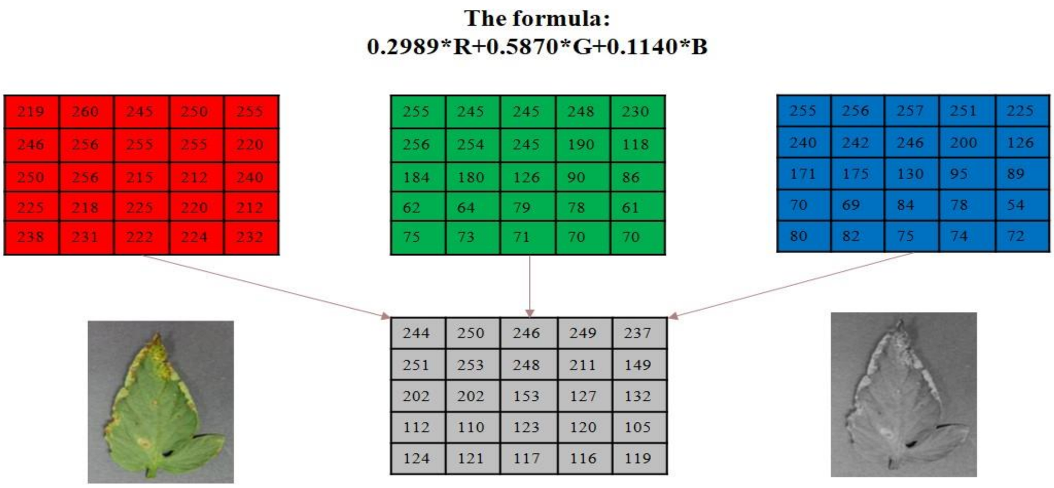

Fig 3. Conversion From RGB to Grey Scale

AlexNetV2:

AlexNetV2 is a significant improvement over AlexNetV1 and pushes the most advanced for Alex visual recognition including classification, object detection and semantic segmentation. AlexNetV2 is released in the course of TensorFlow - Slim Image Classification Library, or you can start exploring AlexNetV2 right away in Colaboratoey. Alternately, you can download the notebook and explore it locally usingJupyter.AlexNetV2 is also available asmoduleson TF-Hub, and pretrained check points can be foundgithub.AlexNetV2 builds upon the ideas from AlexNetV1, using depthwise separable convolution as efficient building blocks.

RESULTS

Deep learning has been applied for sugarcane illness identification using promising results. Scholars have created models that can accurately classify various diseases affecting sugarcane based on images of the plants. These models typically use neural networks with convolutions (CNNs) to examine the visual patterns associated with different diseases and distinguish them from healthy plants. The accuracy of these models depends on elements like the calibre and volume of training data, the architecture of the neural network, and the preprocessing techniques applied to the images. Overall, deep learning offers a powerful tool for automating the detection and diagnosis of sugarcane diseases.

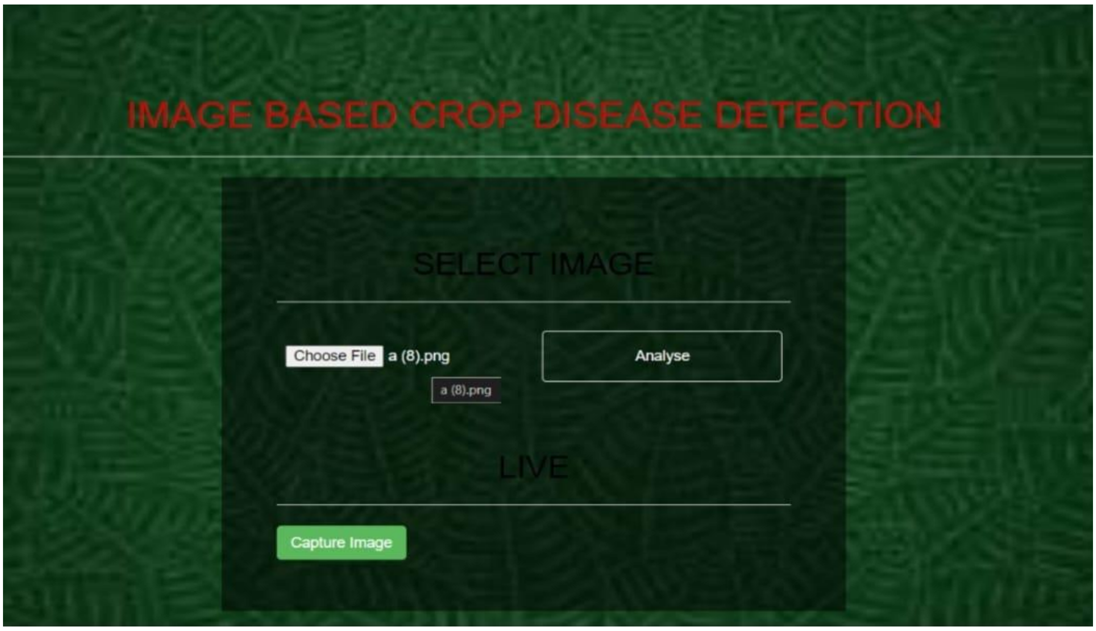

Fig 4. Interface that takes data sets

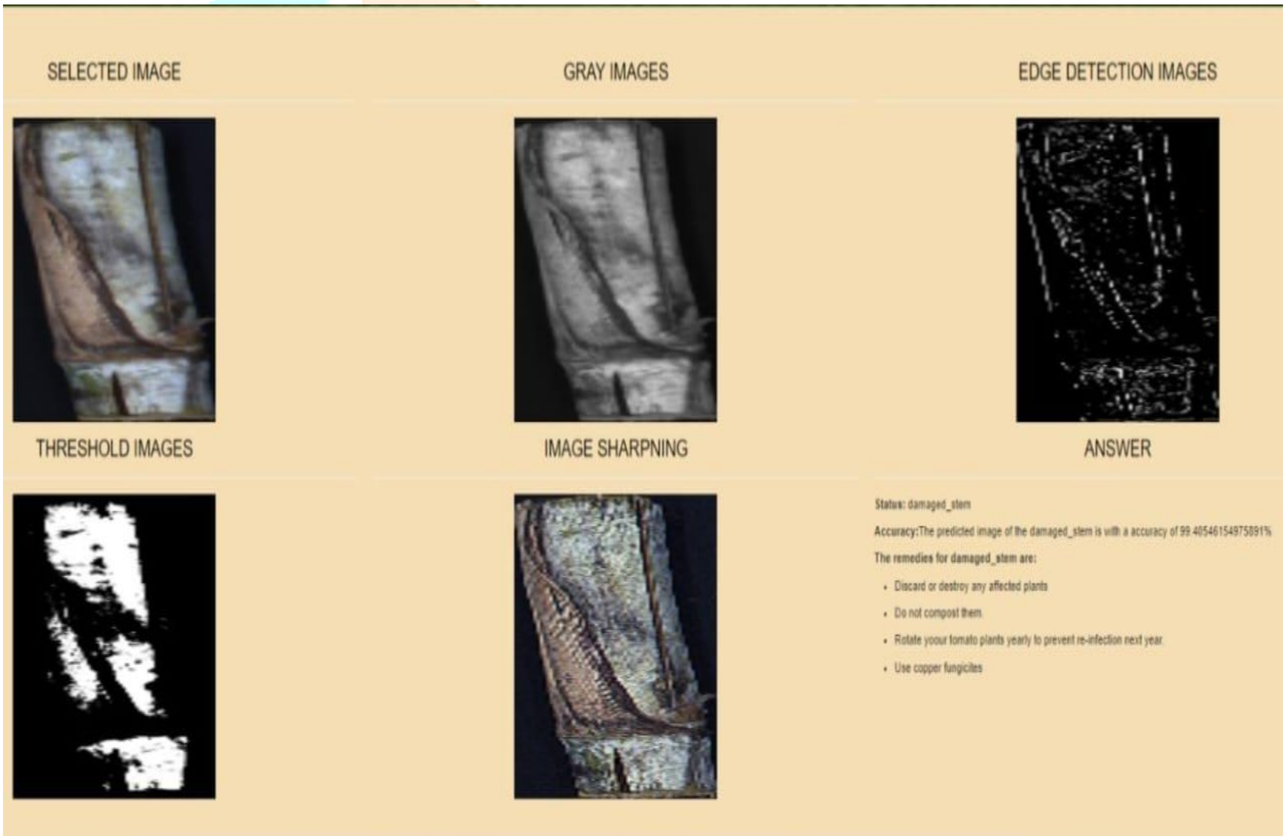

Fig 5. Damaged Stem

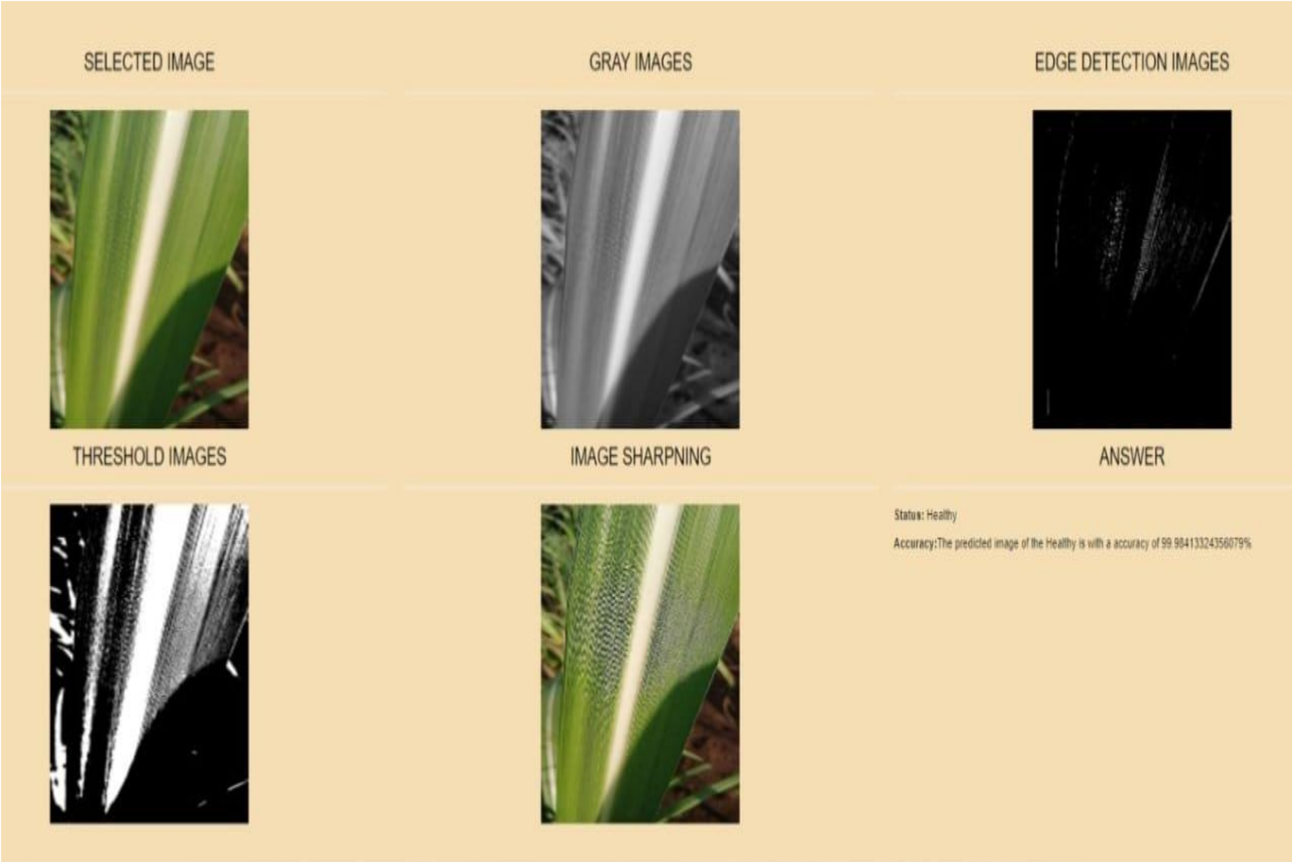

Fig 6. Healthy Leaf

CONCLUSION

In this project work, a very basic yet effective technique is employed to detect Sugar Cane leaf diseases using various CNN architectures. In this project we focus on different methods for prediction and classification of leaf diseases. Also, in proposed methodology we discuss different methods of image processing techniques. We can modify available algorithms so as to obtain good accuracy while classifying leaves. Accuracy and early identification of certain illnesses will help farmers to take early precautions and prevent huge losses. The method used will give the name of the disease as the class to which the image belongs as the result. This project also helps farmers to address the disease by providing them with a small amount of details regarding the illness. In the implemented system the results were very accurate. One of important enhancement in this project is that it can be carried out by government authorities over a large span of farms to check if certain diseases have become more dominant over the others and are proving difficult to tame.

REFERENCE

[1] Prajwala T M, et al. Sugar Cane Leaf Disease Detection using Convolutional Neural Networks, Proceedings of 2018 Eleventh International Conference on Contemporary Computing, 2-4 August, 2018, Noida India.

[2] Akshay Kumar, et al. Image Based Sugar Cane Leaf Disease Detection, 10th ICCCNT, 68 July, 2019, IIT-Kanpur, Kanpur, India.

[3] Mokhtar, et al. Sugar Cane leaves diseases detection approach based on Support Vector Machines, IEEE International Computer Engineering Conference- ICENCO, Cairo, 30 Dec 2015.

[4] Balakrishna K & Rao M, Sugar Cane Plant Leaves Disease Classification Using KNN and PNN. International Journal of Computer Vision and Image Processing, 9(1),51.56, 2019.

[5] Mainkar, P. M, Ghorpade S, & Adawadkar, M. Plant leaf disease detection and classification using image processing techniques, International Journal of Innovative and Emerging Research in Engineering, 2015.

[6] Xie C, Shao Y, Li X, & He Y,Detection of early blight and late blight diseases on Sugar Cane leaves using hyperspectral imagin, Scientific Reports, 5, 16564, 2015.

[7] Jihen Amara, Bassem Bouaziz, Alsayed Algergawy, et al. Deep Learning-based Approach for Banana Leaf Diseases Classification, BTW, 2017.

[8] H Sabrol and K Satish, Sugar Cane plant disease classification in digital images using classification tree, Communication and Signal Processing (ICCSP), 2016 International Conference on. IEEE, 2016.