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A Survey on Implementation of Deep Dictionary Learning and Coding Network for Plant Disease Detection in Agricultural Field

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Abstract: ***A novel deep dictionary learning and coding technique to detect plant diseases based on leaf image proposed through this paper. The two concepts of Deep learning & Dictionary Learning is combined here. The proposed deep dictionary learning DDLCN framework amalgamate the advantages of both dictionary learning and deep learning methods. In this dictionary learning and coding layer, which can fill-ins the convolution layer in the standard deep learning architectures. Along with DDLCN we proposed DDLCN for 2 layers and 3 layers. Specifically, DDLCN- 2 uses fusion of dictionary learning and coding layers: the first layer aims to learn a dictionary to represent the input image and the second layer target to take in a dictionary to represent the activated atoms in the first layer.***
Keywords: Dictionary Learning, Deep learning, technique, DDLCN.

I. INTRODUCTION

The key step of classifying images is obtaining feature representations encoding relevant label information. [6] The focus is on improving productivity without taking into consideration the environmental effects that have appeared in the degeneration of the environment. Plant disease discovered by visual way is more laborious task and at the same time not precise and can be done only in limited areas. Whereas if self-regulating detection technique is used it will take less efforts, less time and more accurately. Image processing is the technique which is used to compute affected area of disease, and to determine the difference in the color of the affected area [5] [6].

There are currently many disparate ways of performing image classification, ranging from thresholding methods. This might be color information, borders or segment of an image [1] [3]. Image classification refers to the task of drawing out information classes from a multiband raster image. The arising raster from image classification can be used to create thematic maps. Machine based perspective for disease detection and classification of agricultural product have become an important part of civilization. Dictionary learning is learning a set of atoms so that a given image can be well roughly by a sparse linear combination of these learned atoms, while deep learning methods focuses at extracting deep semantic feature representations via a deep network.

In latter times, server based and mobile based approach for disease identification has been employed for disease identification. Several factors of these technologies being big resolution camera, high performance processing and ample of built in accessories are the added advantages resulting in automatic disease recognition. [7]

II. LITERATURE REVIEW

The Paper presents classification and detection techniques that can be used for plant leaf disease classification. Here preprocess is done before feature extraction. RGB images are turn into white and then converted into grey level image to extract the image of vein from each leaf. Then fundamental Morphological functions are applied on the image. Then the image is translated into binary image. After that if binary pixel value is 0 it's converted to correlate with RGB image value. . Finally by using Pearson correlation and Dominating feature set and Naïve Bayesian classifier disease is detected. [1]

The paper presents the technique of determining jute plant disease using image processing. Image is captured and then it is realized to meet with the size of the image to be stored in the database. Then the image is magnify in quality and noises are removed. Hue based segmentation is applied on the image with custom-make thresholding formula. Then the image is converted into HSV from RGB as it aids extracting region of interest. This approach can significantly support detecting stem oriented disease for jute plant. [3]

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The detection of unhealthy plant leaves include some steps are RGB image acquisition. Transforming the input image from RGB to HSI format. Masking and removing the green pixels. Segment the components using Otsu's method. Computing the texture features using color-co-occurrence methodology and finally classifying the disease using Genetic Algorithm. [5]

There are four steps. Out of them the first one is assembling image from several part of the country for training and testing. Second part is applying Gaussian filter is used to remove all the noise and thresholding is done to get the all green color item. K- means clustering is used for segmentation. All RGB images are converted into HSV for extracting features. [2]

III. WORKING

The images of the plant leaf are captured via the camera. This image is in RGB (Red, Green and Blue) configuration. Color transformation structure for RGB leaf image is generated and then a device individualistic color space transformation for the color transformation structure is applied.

Feature extraction plays a key role for identification of an object. In many approach of image processing feature extraction is used. Color, texture, morphology, edges etc. are the features which can be taken into consideration in plant disease detection. . In this application we proposed scale invariant feature transform algorithm to extract features from the image. SIFT descriptor encompass a method for detecting interest points from a grey-level image at which statistics of local gradient directions of image magnitudes were accumulated to give a summarizing illustration of the local image structures in a local neighborhood about each interest point, with the intention that this descriptor should be used for equating corresponding interest points between different images. Later, the SIFT descriptor has also been applied at dense grids (dense SIFT) which have been shown to lead the way to better performance for tasks such as object categorization, texture classification, image alignment and biometrics.

IV. ALGORITHM

A. Haar Wavelet

Wavelet is a waves that are below & above the X-axis with properties such as varying frequency, limited duration & zero average value. Haar wavelet is a one wave cycle & it's a square wave.

There are different types of wavelet: Haar wavelet, Morlet, Daubechies.

Wavelet compression works by examining an image and converting it into a set of mathematical expressions that can then be decoded by the receiver. Wavelet transforms uses variable length window (related signal frequency).wavelets are commonly used in image processing to detect and Gaussian filter noise, due to their high contrast of neighboring pixel intensity values. As wavelet is a mathematical functions useful in digital signal transforming and image compression.

Fig.1 processing of image

B. Scale-invariant Feature Transform

The scale-invariant feature transform (SIFT) is a feature detection algorithm in computer vision to detect and describe local features in images. There is a procedure for SIFT : Scale-Space Extreme Detection , Key point Localization, Orientations Assignment ,Key point Descriptor ,key point matching .In Scale-Space Extreme Detection, once the image is blurred using Gaussian blurring , the pixels is compared with 8 neighbour. In key point localization, if the intensity at the extrema is less than the threshold values they are rejected. Orientation histogram is created. Highest peak in histogram above 80% is considered. Descriptor is a vector of size (number of key points *128) achieved from orientation histogram. Key point matching between two images is done by identifying the nearest neighbour.

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C. Deep Learning & Dictionary Learning

Dictionary learning is learning a set of atoms so that a given image can be well resemble by a sparse linear combination of these learned atoms. Dictionary learning also called sparse representation or sparse coding, represents a signal with a linear merger of a few elements/atoms from a dictionary matrix containing several prototype signal atoms. Deep learning methods aim at extracting deep semantic feature depicts via a deep network. Deep learning is a type of machine learning motivated by the structure of human brain. In deep learning the features are picked out by the neural network without human invention but off course that kind of independence comes at the cost of much higher volume of the data to train a machine. Neural network is train to identify the images.

V. CONCLUSION

We have used the concept of Deep Dictionary learning & Coding Network to detect the disease present on plant leaves. The concept of the algorithm is that they compare the existing data with the upcoming data. Day after day, new detection techniques will come in picture to solve the upcoming problems of plant leaves.

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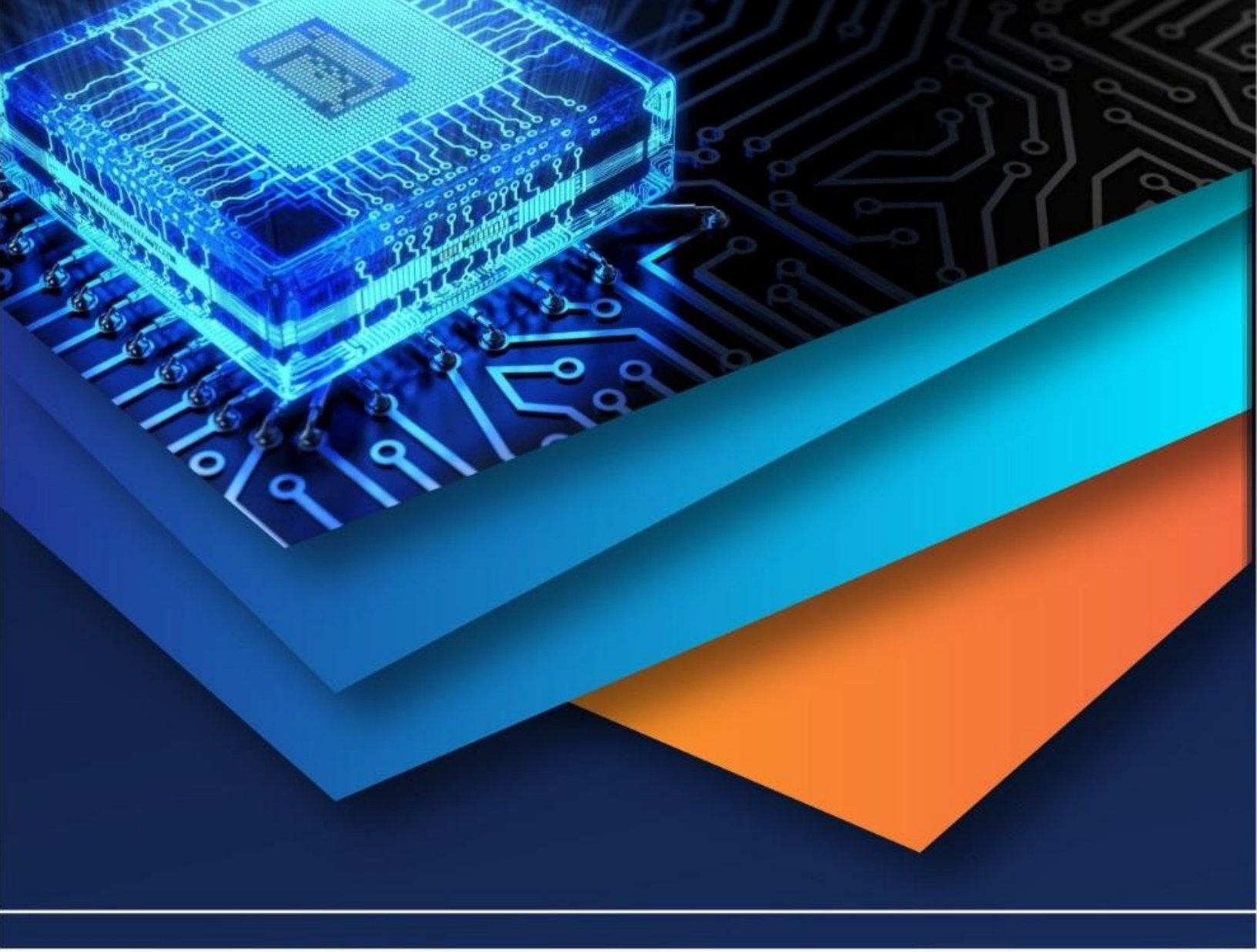

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