IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 9, June 2022
Impact Factor: 6.252

Medicinal Leaf Classification Using Artificial Intelligence

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Abstract: *The automatically identified by the medicinal plant species is required in environments such as mountains, forests, and densely populated areas. Medicinal plants (herbs) are plants that have been shown to contain health-promoting compounds. Indonesia has 30,000 plant species, 7000 of which are medicinal plants (herbs). Chemical medicines contain inorganic and pure chemicals, whereas the human body is complex and organic. As a result, chemical medicine is deemed unfit for human consumption and, in large quantities, can be harmfully for human health. Some chemical drugs, on the other hand, are symptomatic (temporary), and patients with certain diseases must continue to take them for the rest of their lives. As a result, a system is needed to help the community identify medicinal plants, which in this case are concentrate here on opening of medicinal leaf. In this study, the CNNs (Convolutional Neural Network) method was used to determine a medicinal plant leaf. This research will use Convolutional Neural Networks to develop a system for identifying medicinal plant leaf. Using computer-generated training data to determine its varieties and advantages of medicinal plant leaf.*

Keywords: Image Recognition, Classification, VGG19, Machine Learning

I. INTRODUCTION

In so many application fields, such as plant recognition and face recognition, an image is more beneficial than like a natural characterization. In comparing to human people, the desktop finds it extremely difficult to separate the features. To reach high validity, the desktop must first be given proper training with a training sample. The more feature vectors extracted during the extraction process, the more the training data-set provides. It also offers high accuracy in the identification process. Recognition accuracy is the most important parameter for distinguishing between similar types of objects as well as distinguishing between different types of objects. This parameter restricts access to only authenticated persons in applications such as face recognition, whereas it identifies the absolutely necessary medicinal plant to save a patient's life in applications such as medicinal plant recognition systems. Recognition accuracy is the most important parameter for identifying similar types of objects as well as distinguishing between different types of objects. This variable blocks access to only authorized individuals throughout applications such as image recognition, although it identifies the entirely essential medicinal herbs to save a persons life in applications such as medicinal plant character recognition.

II. LITERATURE SURVEY

A survey is a way of scientific study that enables researcher collects data from the large population. (Generalization).
Herdiyeni et al., (2020) [1] introduced a mobile based on leaf images for medicinal plant identification and information retrieval. The model consists of leaf characteristics such as structure, composition, image propagation, and a classification. To recognise plants, a probabilistic neural network is used.
Y. R. Azee et al., (2020) [2] proposed a learning algorithm to recognise 5-7 various herbs different kinds collected in Sri Lanka. For each leaf, the inception model's feature extraction component extracted and cached nearly 2048 characteristics. The knowledge gained was decided to apply to the goal task of characterising plants. The model was retrained and its performance was compared to that of other deep learning models such as Resnet,V MobileNet, and Inception Resnet v2 were all used, with the Resnet obtaining the maximum accuracy of 95.5 percent.

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Karen Simonyan et al., (2020) [3] investigated the use of extremely cnn model for huge image classification (up to 19 weight layers). Classification accuracy benefits from representation depth. A traditional ConvNet architecture with significantly increased depth can achieve the performance on the ILSVRC dataset. The main contribution of this paper is a comprehensive evaluation of increasing detail channels using an architectural style with very small (3x3) convolution layer. It shows that by increasing the detail to 1619 mass layers often results in a significant improvement over prior-art configurations.

Sandeep Kumar, V. T. E., et al., (2020) [4] The authors of this paper investigated and created software using a training set of ten plant species and fifty leaf images.

Liu, Albert et al., (2019) [4] created a leaf recognition system for collecting bottle neck characteristics known as Convolutional neural network codes, using CNN Finally, for classification purposes, these CNN codes were trained with SVM. This method, however, just appears to work to smooth images. The leaves in these images are well aligned on a comparison background, with few if any variations in colouring or luminance.

Siraj et al., (2019) [6] They concentrated their efforts by emphasising the colour and texture of the flower. They followed the following procedure: The photos were taken in capturing images, image analysis, and Neural phases. The flowers were photographed with a digital camera and located in the middle of the frame. The set of data There are 18 flower image categories to choose from. The most common are flower identification and classification. crucial task that must be completed precisely. This phase comprises of 4 image-related steps, Classifier was used to classify the images based on colour and texture through image filtering, image classification, region recognition, and feature extraction. Some are completely accurate. They came to the conclusion that the number of flower images depends on the accuracy of the training result.

Habiba et al., (2019) [7] To classify the leaves, deep convolution neural networks such as Resnet50, VGG19, VGG16, Xception, and Inception were proposed. Transfer of knowledge They used an approach that included eight different datasets to train this model. Plant leaves classifications They worked to assess classifier performance on rotated images, and VGG16 was one of the trained classification models. with a classification accuracy of around 96 percent They did no pre - processing here on training and validation images. To reduce training time, they was using multiple convolution filters throughout Resnet50 and a normalised convolution filter in InceptionV3 instead of a rotation filter. These Models' performances vary depending on their trainable parameters and network design..

According to Sabu et al. (2019) [8,] image pre-processing begins after image acquisition. Prior to feature extraction, the main goals of image pre-processing are just to standardise a image's measure and direction. Conversion to grayscale or binary, remove noise, contrast adjustment, and graph modification are common methods of plant image pre-processing.

Jing Wei Tan et al., (2019) [9] a venation ,DLeaf-based on a CNN design to a plant leaves classifying, was proposed. DLeaf used CNN for feature extraction and ANN for classification. For venation segmentation from resized leaf images, the Edge detection algorithm is used. The classification accuracy of the D-Leaf model was 94.88 percent.

Divya Tomar et al., (2017) [10] Humans suggest a remuneration of leaf species management system of plant utilising classification a Image data of a leaf and the story of based on a direct acyclic graph on the classifier for multi-class ordinary least the dual svm classifier (DAG-MLSTSVM). The HFS method is used to identify a greatest discriminating features for each plant species. The shape and texture of leaves distinguish them.

III. PROPOSED METHODOLOGY

Here, a new medicinal data set has been presented. In order to develop the proposed medicinal data set, there should be review on its literature. In this case, so several species medicinal plant can be chosen to construct this same planned set of data, whereas I only used five here. I have considered the medicinal plants for this proposed data set. There are two phases namely training and testing. The processes mentioned below comes under these two phases. Following data acquisition, pre-processing, extraction of features, and data set generation should take place.

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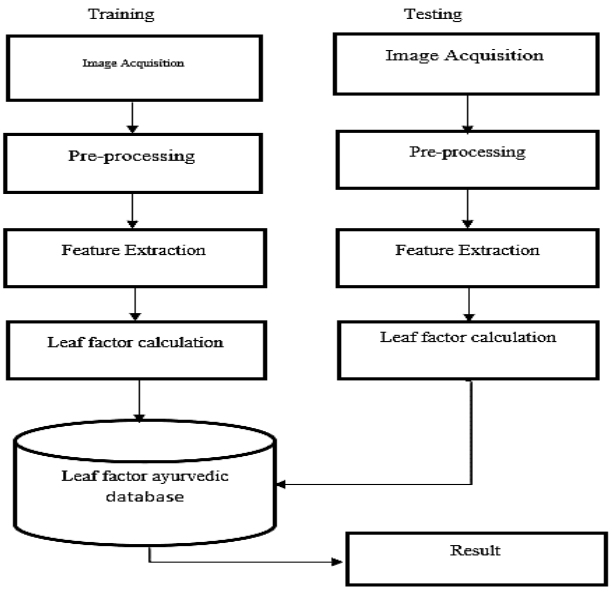

Figure 1: Flow Chart of over the methodology

3.1 Image Acquisition

The collection of data is a critical step in identifying the system. Pictures of leaf are collected using a camera phone. The actual background of a images are removed during in the pre-processing phase.

Figure 2: Specimen image captured a) Indian lilac b) Loureiro c) Malabar nut d) Holy basil

3.2 Pre-processing

The following are the initialisation procedures for each individual image. So every leaves has been isolated in its own image section. Each leaf image undergoes resize operation to obtain all the leaf images in a uniformed size. Removal of unwanted backgrounds is then performed. The rgb Color leaf image section is converted into a gray - scale leaf image. The obtained grey - level image is converted to binary level image once more.

3.3 Feature Extraction

The extraction of leaf characteristics is not only the foundation of medicinal leaves classification, but it is also important for any experiment of image processing. In the Feature extraction, leaf is identified by the color, shape, texture.

- Color: The original leaf image pixel is the combination of a RGB value(i.e length, diameter, width, area.
- Shape: Image part, leaf rectangularity and leaf circularity.
- Texture: It is identified by the various properties like image smoothness, image contrast, image moment of inverse, and spatial arrangement.

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3.4 Classification

In this step, we can apply the VGG19 algorithm it is based on the CNN. It will show the how leaf are executed one by one layer. It contain four layers, Convolutional neural networks(3*3), Max pooling(2*2), fully connected and last one is Softmax, it builts the classification layer. The original leaf image is performed to this step.

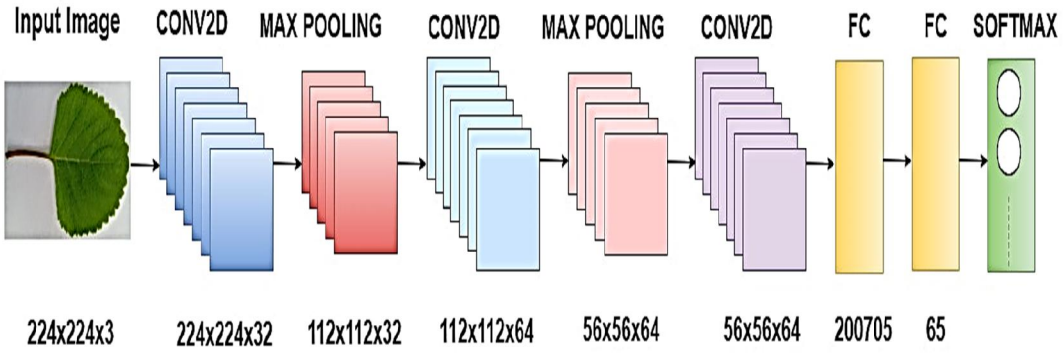

Figure 4: Convolutional Neural Network Architecture

3.5 Convolutional layer

CNN's first building block is the convolutional layer. It takes the features from the input image and extracts them. Convolution mathematically combines the two sets of data. Convolution can be applied to the input data. The future map is created using convolution.

1	1	1	0	0
0	1	1	1	0
0	0	1	1	1
0	0	1	1	0
0	1	1	0	0

Input

1	0	1
0	1	0
1	0	1

Kernel

On the left side of the figures above, for example, the input image, there is a convolution layer. On the right side, there is a filter known as the kernel.

Map

1	1	1	0	0
0	1	1	1	0
0	0	1*1	1*0	1*1
0	0	1*0	1*1	1*0
0	1	1*1	1*0	1*1

Feature
Input*filter

4	3	4
2	4	3
2	3	4

Figure 5: The operation of convolution

Convolutional operations can be carried out by rolling the filter so over insight. Every place performs matrix multiplication. The feature map will get the entire sum by adding all. Figure 5 in the receptive field is undergoing a convolutional operation. Because the dimensions are filtered, the field is 3*3.

3.6 Max Pooling

The max pooling is used we take a maximum value of window over input.it does not take any parameters and only contain hyperparameters.

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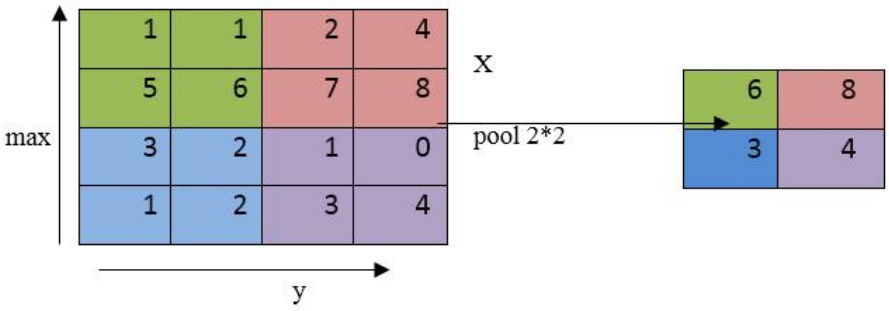

Figure 6: Max pooling

Figure 6 depicts each window, which is denoted by a various colors. Max pooling runs a 2*2 matrix over the input to find the maximum value in two rows and columns.

3.7 Fully Connected Layer

It adds the fully connected layer after the convolutional and max pooling layers have been completed. This layer is where neurons, biases, and weights reside. It connects one layer of neurons to another. A training between different categories is used to classify the images. It anticipates a 1D vector of numbers.

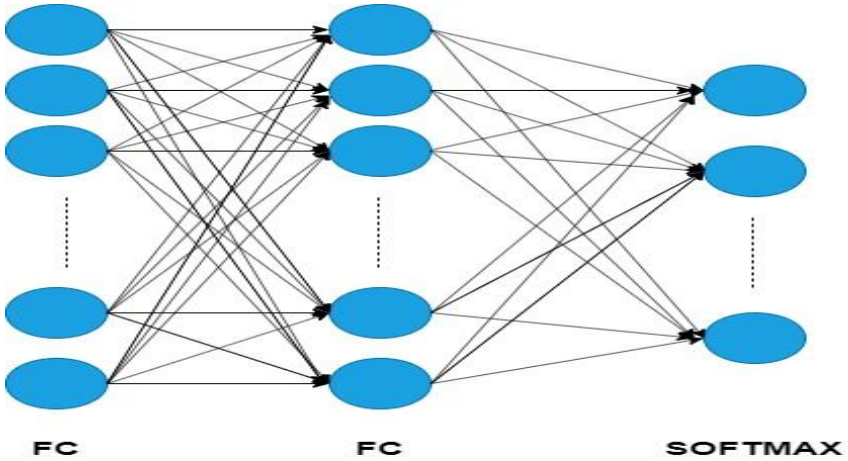

Figure 7: Fully Connected layer

The above layer contains the n and m weights. The letters n and m stand for input and output, respectively. The biases of each output node in this layer are (n+1)*m parameters.

3.8 Softmax Layer

The final layer is a softmax layer, and softmax is a multiple categorization in this layer. Softmax connects to the fully - connected layers and provides the output probability. That is, the values within the fully connected layer contain leaf species, and the softmax is multiple classes at once. This layer will display the matched output.

IV. RESULTS AND DISCUSSION

We demonstrate all of this while comparing pre-trained basic CNN, CNN model, and VGG19. This experiment makes use of medicinal leaves from five different plant species. In this testing, we will use training data for 80 percent of the data and testing data for the remaining 20 percent for validation. We're going to set epochs 2 and a batch size of 32. The accuracy of the test is recorded at the end. We trained the neural network on the training image dataset. We used a dataset of training images and a model to be evaluated to train. CNN architecture compresses three layers, has a kernel size of 3*3, and uses softmax as an activation function. We used the first three convolutional layers to extract features. The output layer is the dense fully connected layer of the input, and final prediction is performed.

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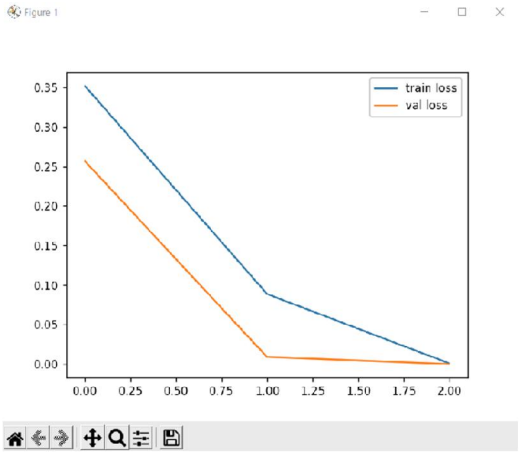

Figure 7: Loss of training and validation

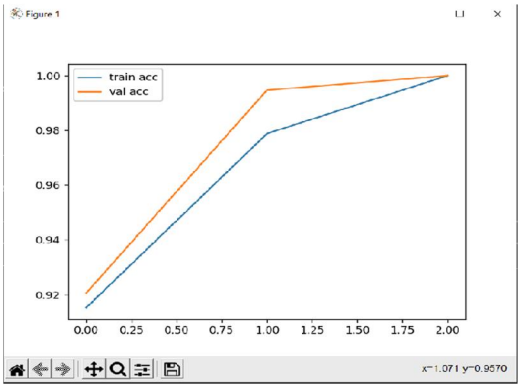

Figure 8: Accuracy in training and validation

Figure 7 and 8 At successful CNN and VGG19 epochs, training loss and training accuracy values, validation loss and validation accuracy values.

Figure 9: Accuracy in predicting the medicinal leaf

V. CONCLUSION

Medicinal plants such as turmeric, ginger cure, aloe, tulsi, and neeem are used to treat a variety of ailments. This is used as a home remedy for medicine in many parts of the world. It is true that people use tulsi to make medicine, black tea for pooja, and other activities in their daily lives. In this project, we implement a technique for medicinal leaf classification based on texture, colour, and other features to identify the correct species of medicinal leaf. The combination of colouring, texture, structure, and characteristics results in correct leaf identification with high accuracy. In this result, all of the

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techniques are very trustworthy, indicating that this algorithm is correct for medicinal leaf classification, and we can further extend this work for a large number of plant species while improving feature accuracy.

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