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Identification of Herbal Plants using CNN

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Abstract: Plants were also essential to human life because they provide us with air, food, shelter, medicine, fuel, and gums that help to preserve the environment. Many plants have valuable medicinal properties and active components that can be used in medicines. Many beneficial plant species are currently becoming extinct or being destroyed as a result of factors such as global warming, rising population, professional secrecy, a lack of government awareness for research operations, and a lack of knowledge about therapeutic plants. Because manual identification of medicinal plants takes a long time, professional help is required. The automatic identification of medicinal plants is a hot topic in image processing research right now. We created our own dataset of 4 categories of herbal plants for experimental investigation, including cinnamon, henna, marigold, and turmeric, and we also used an existing Malaysian flavia dataset. We created a leaf and flower identification technique that uses a CNN classifier and has a 95% accuracy.

Keywords: Image processing, Herbal plant, CNN, leaf and flower

I. INTRODUCTION

Plants play an important role in human life by providing oxygen, food, shelter, medicine, fuel, and environmental protection. Many plants have medicinal values and contain active ingredients for medicinal use [1]. Many useful plant species are becoming extinct and being destroyed as a result of factors such as global warming, increasing population, professional secrecy, a lack of government support for research activities, and a lack of awareness about medicinal plants [12]. Manual identification of herbal plants is a time-consuming process that necessitates the assistance of experts. To avoid this situation, automatic identification and classification of herbal plants is required for greater benefit to mankind. The automatic identification and classification of herbal plants is a current research topic in the fields of machine learning and image processing [5]. The main steps in the process of identifying herbal plants are feature extraction and classification, which affect the overall accuracy of the classification system [10].

The ancient Indian Ayurvedic system of healing which utilises medicinal plants found naturally in the Indian subcontinent, also known as the mother of healing arts [2]. According to history, Ayurveda originated more than 5,000 years ago and was developed by ancient Indian sages such as Charka, Sushruta, and Vaghbhata. Acharya Charaka stated that all herbs in the earth have their own medicinal values [3], for curing diseases and teaching us how to balance our body, sense of organs, mind, and soul. According to the World Health Organization (WHO), 65 to 80 percent of the world's population currently uses medicinal plants as remedies for various diseases [13]. The main objective of automatic identification and classification of herbal plants is to educate and provide sufficient knowledge to common people and farmers, thereby increasing medicinal plant cultivation.

II. LITERATURE REVIEW

Nayana G. Gavhale et.al[3] developed a technique for automatic identification of herbal plants using Random Forest algorithm. Based on the features like color, texture and geometric shapes of the medicinal plant leaves. They have to use 10 types of medicinal plant species for identification. The blend of highlights like shape, variety and surface outcomes in right ID with the exactness of 94.54%.

Zaidah Ibrahim et.al[4] implement a automatic herbal plant identification system in Malaysia using texture features for leaf recognition . They have done relative concentrate on surface highlights by Local Binary Pattern (LBP), Speeded-Up Robust Features (SURF) and Histogram of Oriented Gradients (HOG). Creators considered a current flavia informational collection and new leaf dataset of 10 unique spice plants. The extracted texture element is integrated into the multiclass SVM separator. Following accuracy yield by different texture features with flavia dataset and new dataset respectively, HOG (99%, 97%), LBP (99%, 97%), SURF (74%, 63%). SURF outperforms the other two texture features.

Izwan Asraf Md Zin et.al[5] proposed a profound convolution brain network(CNN) for home grown plant acknowledgment through leaf recognizable proof. This concentrate additionally exhibited the massive impacts of multi-facet demonstrating in little example sizes to accomplish ideal execution. Besides, information expansion gives more huge advantages on the general execution. Simple enhancements, for example, resizing and endless pivoting, will substantially improve precision by improving mobility and preventing the model from learning irrelevant features.

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Random homegrown plants were chosen and photographed in this work at a natural nursery on Jalan Kebun in Shah Alam, and twelve plants were captured with ten images each using a cell phone. A new leaf dataset of various natural plants found in Malaysia has been constructed, and the results of the study are nearly 99 percent accurate.

Samreen Naeem et al. [6] developed a machine learning-based classification of medical plant leaves. The Department of Agriculture, The Islamia University of Bahawalpur, Pakistan, provided a dataset based on six kinds of natural plant leaves. These plants are Tulsi, Peppermint, Bael, Lemon Balm, Catnip, and Stevia. The author conducted a comparison research on five AI-based classifiers, including multi-layer perceptron (MLP), LogitBoost (LB), Bagging (B), Random Forest (RF), and Simple Logistic (SL), with accuracy of 99.01 percent, 98.01 percent, 97.02 percent, 96.03 percent, and 95.04 percent. Using six therapeutic plant leaf, the multi-layer perceptron classifier had a unique prediction performance of 99.01 percent.

J. Samuel Manoharan[7] proposed the TSA (Two Stage Authentication) method for increasing the recognition of herbal plant leaves. Furthermore, it improves detection rate and minimises classification error. It has two-stage authentication to improve classification accuracy. TSA also includes stages one and two. The first phase is associated with edge-based natural plant identification, while the second phase is concerned with categorisation of herbal plant detection. This proposed TSA approach improves recognition accuracy. In this study, there are 250 leaf samples with the front and back of the image, as well as the dataset may be separated into 80 percent and 20 percent for training and testing purposes, respectively. The proposed TSA algorithm achieves 92 percent accuracy.

Anh H. Vo et al. [8] created a system for automatically recognizing herbal plants. An in-depth VGG16-based learning model with five remaining basic building blocks is used to extract characteristics from images. They amassed a dataset of 10279 images of 10 herbal plant species in Vietnam. A comparison of seven classification methods, including Random forest, Support Vector Machine (SVM), Logistic regression, Extreme gradient boosting (XG boosting), Adaboost, K-nearest neighbours (KNN), and Light gradient boosting machine (Light GBM), that use the same deep convolutional feature extraction method is presented, with accuracy of 88 percent, 76.5 percent, 90.8 percent, 91 percent, 92.6 percent, 93 percent, and 93.6 percent. LightGBM is the best classifier when used with deep convolutional features, with an accuracy of 93.6 percent.

Haryono et al. [9] used artificial intelligence, specifically the Convolutional Neural Network (CNN) on the Raspberry Pi, to build a system for recognising ayurvedic medicine leaves. CNN does not require feature extraction because it includes an automatic feature extraction technique. They must collect ten different varieties of medicinal plant leaves, which are divided into two-thirds training data and one-third testing data, and these types are authenticated using a CNN model with a 90% accuracy.

R.Janani et al. [10] created a system for extracting colour, texture, and form data from herbal leaf photos and trained an artificial neural network (ANN) algorithm to identify the specific species of medicinal plant leaf image. The main challenge is determining the best image input feature to achieve maximum efficiency while minimising time complexity. They validated their work by combining various input features. They tested the method on 63 leaf photos of various species and discovered that it delivers 94.4 percent accuracy with a minimum of 8 input leaf attributes. This strategy is more common in herbal plant leaf identification systems that require minimal input and require less time complexity.

Umme Habiba et al. [11] proposed a system for automatic classification of herbal plants, presenting a Multichannel Modified Local Gradient Pattern (MCMLGP), a new texture-based feature descriptor that uses colour images to extract more significant features to improve the efficiency of classification of 10 different herbal plant species. The author conducted a comparison using an SVM classifier with various kernels such as linear, polynomial, and HI. Furthermore, by running the experiment on their own medicinal plants dataset, they were able to compare studies using MCMLGP using many shape features. The proposed method achieves higher accuracy (96.11 percent) than other strategies and is extremely useful for medicinal plant includes organizational and evolution.

Vijayashree.T et al. [12] proposed an image-processing-based paradigm for detecting evidence of medicinal leaves. They collected 127 leaves from four different homegrown plant species to construct a data set. To create a data collection, 11 surface boundaries are used: Sum of Variance, Inverse Difference Moment, Aspect Proportion, Correlation, Sum Entropy, Mean, and Sum Average. The dark level co-event mechanism (GLCM) is used to calculate limits such as entropy, homogeneity, differentiation, and energy. To determine the differentiation only with extricated constraints, an anomalous test image is obtained and particularly in comparison to the given data. It is identified as a leaf with a minor variation, and the result is shown.

Venkataraman et al. [13] created a model that uses the Support Vector Machine algorithm to identify and categorize herbal plants. It also has therapeutic properties, which aid in the natural treatment of various disorders. In this method, lemon and karpooravalli are misclassified. This work describes the collecting of datasets from four different kinds of herbal plant leaves, feature extraction with texture and HOG (Histogram of Oriented Gradients), and classification with SVM.

A.Gopal et al.[14] create a framework for programmed differentiating evidence of restorative plant leaves by using image handling with images of the plant leaves as a pillar of grouping. Their recommended calculation is used, and the productivity of the framework is determined by testing ten different plant species. The framework is built with 100 leaf

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photos (ten of each plant type) and tested with 50 homegrown plant leaves (various plant species). During the testing, 46 leaf images were found to be correctly grouped. Their recommended calculation is 92% accurate.
Normalizing feature values and reduces the misclassification error. Need to include the few more medicinal herbs that are not implemented yet by using CNN with the real time Indian database. Low accuracy and efficiency. Time consuming. Ineffective for real-time predictions.

III. PROPOSED METHODOLOGY

The created herbal plant dataset can be divided into 8:2 training and testing sets. The training set contains 200 images, and the testing set contains 200 pictures of four different types of herbal plants, including cinnamon, henna, marigold, and turmeric.
Our system was built in Python IDLE using the Flask framework on a computer with an Intel Core i5 processor and 8GB RAM.

We aimed to evaluate the features of 4 different herbal plants with the CNN classifier. CNN classifier is the best for the image classification of the herbal plant leaves and flowers. In average CNN achieves the 95% accuracy.

A. Data Acquisition(Dataset Collection)

For herbal plants identification, we need to make our own dataset. In India, gathering a wide range of natural plants is exceptionally hard these days. Since a few home grown plants are extremely interesting to find and some of them become terminated. Nonetheless, I figure out how to gather 4 unique natural plants pictures from various agricultural land, botanical garden and nurseries. To catch pictures of these plants, we have used Vivo 1606 and Redme 8 Smart Phones with camera goal 2448 X3264 pixels.
Thereafter, I need to resize each picture into a more modest size for our exploratory reason like 400X300 pixels.

Plant Name	Logical Name	No. of Pictures
Cinnamon	Cinnamomum verum	100
Henna	Lawsonia inermis	139
Marigold	Tagetes erecta	99
Turmeric	Curcuma longa	98

Table 1. Overview of Herbal Plant Dataset

B. Stages in feature extraction of Herbal plants

Functional requirements describe the features, functioning, and usage of a product/system/software from the perspective of the product and its user.

1. Pre-processing.
Image pre-processing is used for operations on images at the most basic level of abstraction. The images are pre-processed to remove noise and improve the quality of edge detection.
2. Image Segmentation.
One of the most important aspects of image processing is segmentation. It aims to divide an image into parts that are strongly related to objects. We must use this model to segment herbal plant parts like leaves and flowers in order to extract features like shape, colour, texture, as well as leaf and flower boundary.
3. Feature Extraction.
Feature extraction is simply the transformation of input data into a set of features. If the extracted features are carefully chosen, it is expected that the features set will extract the features from the input data. It occurs in order to perform the desired task using a reduced representation rather than the full size input.
4. Feature Matching or classifiers.
Correlation is carried out in this section. Correlation is used to determine the similarity of images and image parts. When an image contains some objects and regions and there is an image name template, the template is used to search for the object in the origin image. As a result, correlation can be used to determine whether an object is visible in the image. In this project, we employ the CNN classifier.

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C. CONVOLUTIONAL NEURAL NETWORK

CNN is used for herbal plant image identification because of its high accuracy.
Convolutional Neural Networks specialized for applications in image & video recognition. CNN is mainly used in image analysis tasks like Image recognition.
Convolutional Neural Networks consists of three kinds of layers, they are:
1) Convolutional Layer: Each knowledge neuron in a traditional brain network is linked to the next secret layer. Only a small subset of neurotransmitters in the input patch respond of nodes in the input layer in CNN.
2) Pooling Layer: This layer is used to reduce the component map's dimensionality. There will be multiple actuation as well as pooling layers within in the CNN's hidden layer.
3) Fully-Connected layer: The group's the last two layers have always been structured by Fully Connected Layers. The contribution to the fully connected layer is the result of the previous Pooling or Convolutional Layer, which is smoothed and then handled into the totally associated layer. Here Figure 1 depicts the layers involved in CNN algorithm for Herbal plants Identification.

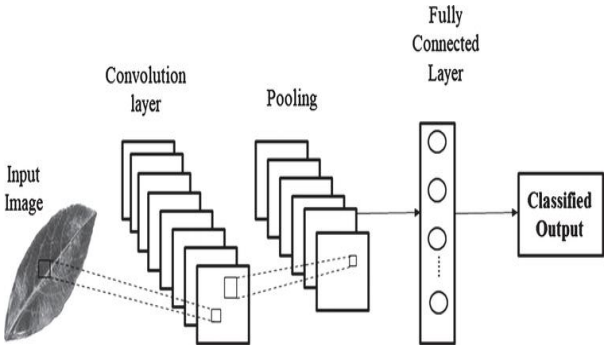

Figure 1. Architecture of Automatic Herbal plant Identification System

IV. EXPERIMENTAL RESULTS AND DISCUSSION

1. Identification of Cinnamon

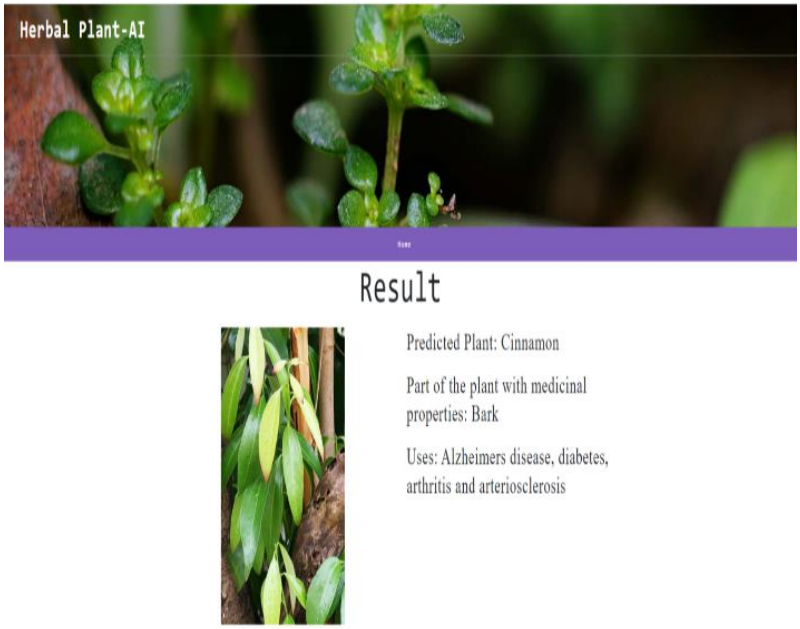

Figure 2. Identify Input image as Cinnamon

Figure 2 depicts the Identification of Cinnamon with its medicinal properties and its uses. Here we have to Input Cinnamon leaves to obtain the which part of the cinnamon has medicinal value and for which diseases these medicines are going to use is very essential to mankind.

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2. Identification of Henna

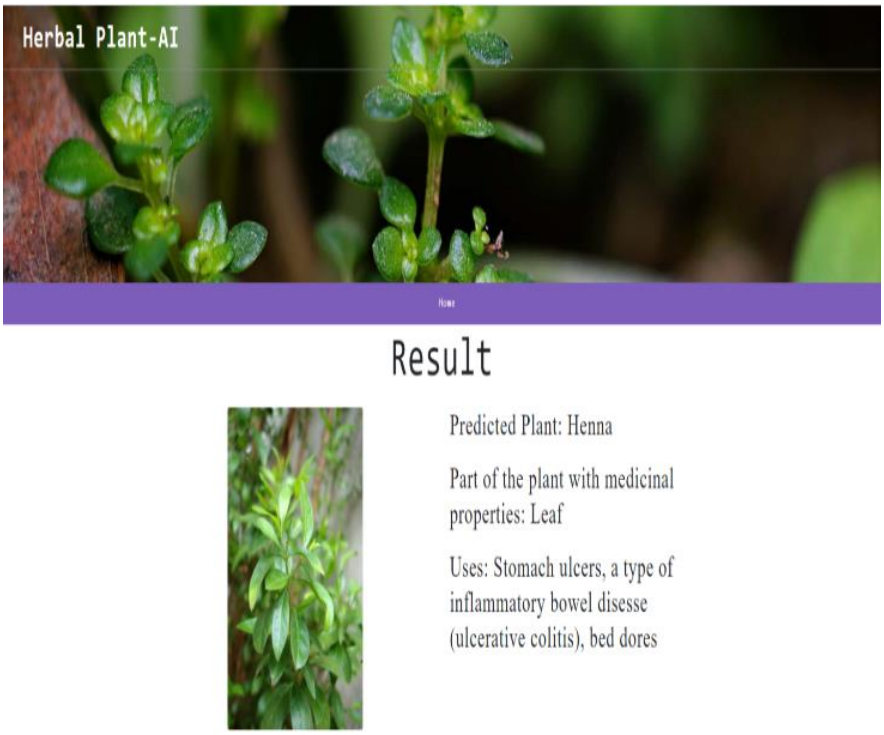

Figure 3. Identify Input image as Henna

Here Figure 3 denotes the identification of Henna plant for the identification we input henna leaves to obtain which part of the henna plant has medicinal value and these medicinal values are used to cure which diseases.

3. Identification of Marigold

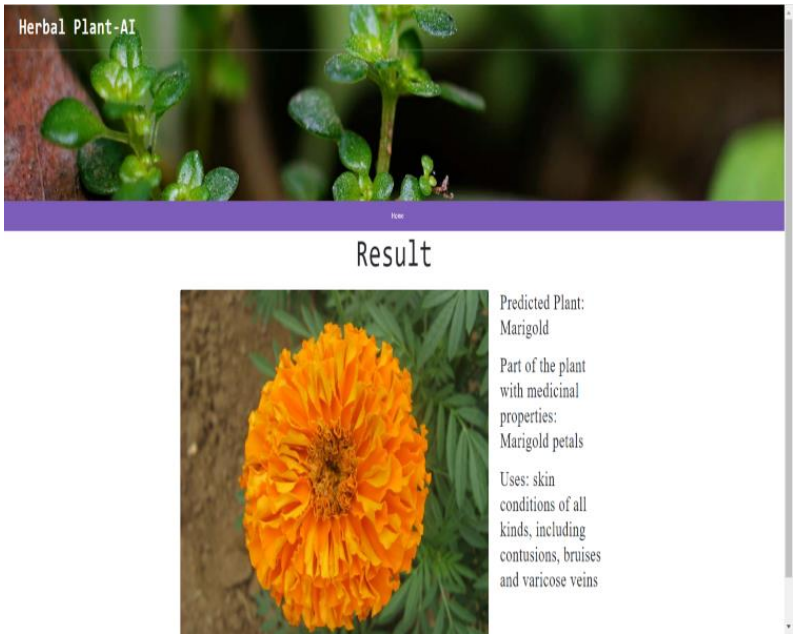

Figure 4. Identify Input image as Marigold

For experimental result we have to input marigold flower and leaf to detect which part of the marigold plant has medicinal value and for which diseases these medicines are going to use as shown in the Figure 4.

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4. Identification of Turmeric

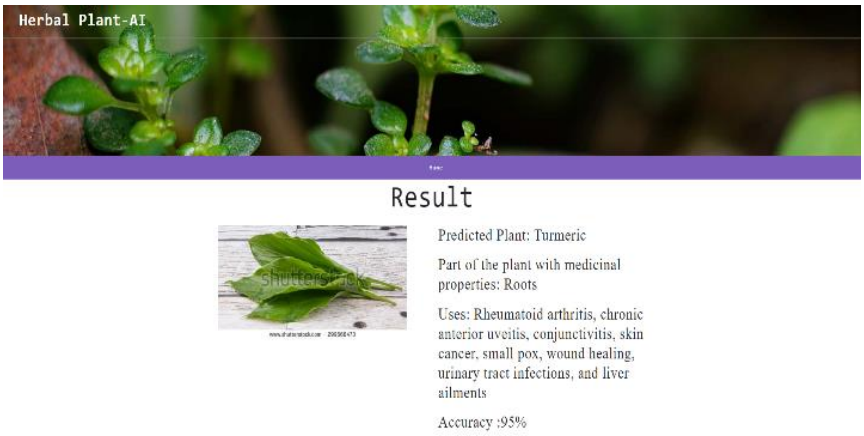

Figure 5. Identify input image as Turmeric

Here Turic plant leaves are given as input to obtain the which part of the turmeric plant has medicinal values and for which diseases these medicines are used as shown in the Figure 5.

V. CONCLUSION

"Herbal plant identification using CNN" focuses on detecting herbal plants from any surface using machine learning (CNN). We discovered that CNN is the best method for performing this type of image identification, with a 95% accuracy. Many diseases are diagnosed using medicinal plant parts such as leaves, flowers, bark, seeds, fruits, roots, and stems. Most farmers in India's villages are illiterate and have little knowledge of herbal plants. We believe that this work has the potential to transform the situation of herbal plant growth in India.

Lot of Scope for Further enhancement But less research is done in identification of medicinal plants using flowers and fruits/seeds . Because flowers and fruits are three-dimensional in nature and available only in specific seasons. In further this work can be extended for variants in herbal plant leaves and flowers.

REFERENCES

[1] Adams Begue, Venitha Kowlessur, Fawzi Mahomoodally, Upasana Singh, Sameerch and Pudaruth "Automatic Recognition of Medicinal Plants using Machine Learning Techniques" published in 2017 International Journal of Advanced Computer Science and Applications (IJACSA).

[2] RAJANI S, VEENA M.N "Study on Identification and classification of Medicinal Plants" published in 2018 International Journal of Advances in Science Engineering and Technology.

[3] Nayana G. Gavhale, Dr.A.P.Thakare "Identification of Medicinal Plant Using Machine Learning Approach" published in 2020 International Research Journal of Engineering and Technology (IRJET).

[4] Zaidah Ibrahi , Nurbaity Sabri, Nur Nabilah Abu Mangshor "Leaf Recognition using Texture Features for Herbal Plant Identification" published in 2018 Indonesian Journal of Electrical Engineering and Computer Science.

[5] Izwan Asraf Md Zin, Zaidah Ibrahim , Dino Isa , Sharifah Aliman, Nurbaity Sabri , Nur Nabilah Abu Mangshor "Herbal plant recognition using deep convolutional neural network" published in 2020 Bulletin of Electrical Engineering and Informatics.

[6] Samreen Naeem , Aqib Ali, Christophe Chesneau , Muhammad H. Tahir , Farrukh Jamal, Rehan Ahmad Khan Sherwani and Mahmood Ul Hassan "The Classification of Medicinal Plant Leaves Based on Multispectral and Texture Feature Using Machine Learning Approach" published in 2021.

[7] J. Samuel Manoharan "Flawless Detection of Herbal Plant Leaf by Machine Learning Classifier Through Two Stage Authentication Procedure" published in 2021 Journal of Artificial Intelligence and Capsule Networks.

[8] Anh H. Vo, Hoa T. Dang, Bao T. Nguyen, and Van-Huy Pham "Vietnamese Herbal Plant Recognition Using Deep Convolutional Features" published in 2019 International Journal of Machine Learning and Computing.

[9] Haryono,Khairul Anam and Bambang Sujanarko " Herbal leaf authentication using convolutional neural network on Raspberry Pi 3" published in 2020.

[10] R.Janani, A.Gopal "Identification of selected medicinal plant leaves using image feature and ANN" in the year 2013.

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DOI: 10.17148/IJARCCE.2022.11742

[11] Umme Habiba, Md. Rasel Howlader, Md. Aminul Islam, Rahat Hossain Faisal and Md. Mostafijur Rahman "Automatic Medicinal Plants Classification using Multi-channel Modified Local Gradient Pattern with SVM Classifier" in the year 2019.

[12] Vijayashree.T, Dr. A. Gopal "Leaf Identification for the Extraction of Medicinal Qualities Using Image Processing Algorithm" in the year 2017.

[13] D Venkataraman, Mangayarkarasi N "Support Vector Machine Based Classification of Medicinal Plants Using Leaf Features" in the year 2017.

[14] A.Gopal, S. Prudhveeswar Reddy , V. Gayatri "Classification of Selected Medicinal Plants Leaf Using Image Processing " in the year 2012.

[15] Kalananthni Pushpanathan, Marsyita Hanafi, Syamsiah Mashohor and Wan Fazilah Fazlil Ilahi " Machine Learning in medicial palnts recognition: a review" published in 2020 Springer.