Medicinal Plant Identification Using Convolutional Neural Networks

M.Anitha[1],L.Sravani[2]
#1 Assistant Professor & Head of Department of MCA, SRK Institute of Technology, Vijayawada.

#2 Student in the Department of MCA, SRK Institute of Technology, Vijayawada

ABSTRACT_ Nutrients that are good for health may be found in herbs and medicinal plants. Unlike the organic, live human organism, chemically manufactured medications have no biological basis. Consequently, chemical drugs are not only inappropriate for human ingestion, but their long-term usage can be detrimental to health. While certain disorders may have more transient or symptomatic treatments, others need patients to undergo persistent pharmaceutical medications. Therefore, there should be a mechanism in place to assist the community in identifying medicinal plants, especially those whose main goal is the introduction of medical leaves. Researchers used a Convolutional Neural Network technique to determine which medicinal plant leaves were included in the research. The goal of this project is to find a mechanism to identify medicinal plant leaves using convolutional neural networks (CNNs). The method of using data learned on computers to categorize medicinal plant leaves according to their advantages; this data is then integrated into mobile applications.

1.INTRODUCTION

Herbs and medicinal plants contain chemicals that have beneficial impacts on health. Some parts of the medicinal plant may have the potential to cure, relieve, or at least reduce the severity of a specific health issue. Of Indonesia's 30,000 plant species, 7,000 are used to make herbal medicines. Not only are medicinal plants more accessible than pharmaceutical therapy, but their all-natural components also make them safer. Utilizing phytochemical screening techniques to determine the composition of medicinal plants allows one to discover the active components found in certain plants that could have medical benefit. Unlike the organic, live human organism, chemically manufactured medications have no biological basis. That being said, chemical drugs aren't good for people to ingest, and using them for an extended period of time may be harmful. While certain disorders may have more transient or symptomatic treatments, others need patients to undergo persistent

pharmaceutical medications. Despite the abundance of therapeutic plants, the public's understanding of their benefits lags behind their availability, thus many people turn to artificial medications instead. Therefore, there should be a mechanism in place to assist the community in identifying medicinal plants, especially those whose main goal is the introduction of medical leaves. Neural networks are only one of many approaches to picture leaf identification that take into account size, shape, texture, and color[8,9, 10].

Several methods, including Support Vector Machines, Multilayer Perceptron, Local Binary Patterns, ANN Gray Level Co-occurrence Matrix, K-Nearest Neighbor Algorithms, and others, can now identify medicinal plants given photos of their leaves. Keep in mind that hypertension medication often makes use of medicinal plant leaves, including those of bay, avocado, celery, soursop, acacia, starfruit, grass jelly, and betel. Since hypertension is a major public health issue, researchers looked into the potential medicinal uses of these leaves.

Researchers used a Convolutional Neural Network technique to determine which medicinal plant leaves were included in the research. Convolutional Neural Networks (CNN)[16] are one method from the Machine Learning subfield that deal with two-dimensional data, such as images, by using Deep Learning, a variation of the Multilayer Perceptron. Neural Networks (ANNs) are a cornerstone method in this area. The use of convolutional neural networks (CNNs) trained using backpropagation type input allows for the identification and recognition of objects in pictures [17]. Network propagation in CNN and MLP is two-dimensional, however CNN's weight and linear operational parameters are different. The goal of this study is to use Convolutional Neural Networks to create a system that can differentiate between nine different kinds of hypertensive medicinal plant leaves. The recognized technology will be integrated into an Android-based smartphone app that will make it easy for users to identify various medicinal plant leaves and their advantages.

2.LITERATURE SURVEY

[1] TITLE: A Leaf Recognition Algorithm for Plant Classification Using Probabilistic Neural Network

AUTHOR: Forrest Sheng Bao; Eric You Xu; Yu-Xuan Wang; Yi-Fan Chang; Qiao-Liang Xiang

In this paper, we employ probabilistic neural network (PNN) with image and data processing techniques to implement a general purpose automated leaf recognition

for plant classification. 12 leaf features are extracted and orthogonalized into 5 principal variables which consist the input vector of the PNN. The PNN is trained by 1800 leaves to classify 32 kinds of plants with an accuracy greater than 90%. Compared with other approaches, our algorithm is an accurate e artificial intelligence approach which is fast in execution and easy in implementation.

[2] TITLE: **Vnplant-200–a public and large-scale of vietnamese medicinal plant images dataset**

AUTHOR: Trung Nguyen Quoc and Vinh Truong Hoang.

Plant identification is an essential topic in computer vision with various applications such as agronomy, preservation, environmental impact, discovery of natural and pharmaceutical Product. However, the standard and available dataset for medicinal plants have not been widely published for research community. This work contributes the first large, public and multi class dataset of medicinal plant images. Our dataset consists of total 20,000 images of 200 different labeled Vietnamese medicinal plant (VNPlant-200). We provide this dataset into two versions of size 256 × 256 and 512 × 512 pixels. The training set consists of 12,000 images and the remainder are used for testing set. We apply the Speed-Up Robust Features (SURF) and Scale Invariant Feature Transform (SIFT) for extracting features and the Random Forest (FR) classifier is associated to recognize plant. The experimental results on the VNPlant-200 have been shown the interesting challenge task for pattern recognition.

[3] TITLE: **Local binary pattern based on image gradient for bark image classification**

AUTHOR: Tuan Le-Viet and Vinh Truong Hoang.

In this work, we present a discriminative and effective local texture descriptor for bark image classification. The proposed descriptor is based on three factors, namely, pixel, magnitude and direction value. Unlike most other descriptors based on original local binary pattern, the proposed descriptor is conducted the changing of local texture of bark image. The performance of the proposed descriptor is evaluated on three benchmark datasets. The experimental results show that our approach is highly effective.

[4] TITLE: **Bark texture classification using improved local ternary patterns and multilayer neural network**

AUTHOR: Shervan Fekri-Ershad

Tree identification is one of the areas that are regarded by researchers. It is done by human expert with high cost. Experts believe that tree bark has a high relation with species in comparison with other phenotype properties. Repeated textures in the bark is usually various with slight differences. So, lbp-like descriptors used in most recent works. But, most of them do not provide discriminative features. Also some texture descriptors are sensitive to noise and rotation. Local ternary pattern is one of the operators that are resistant to the noise with high discrimination. In most of descriptors, histogram of patterns is used to extract features. But, it is rotation sensitive with high computational complexity. In this paper, the main contribution is to propose a method for bark texture classification with high accuracy based on the improved local ternary patterns (ILTP). In the proposed ILTP, the ternary patterns are coded into two binary patterns, and then each one is classified into two uniform/non-uniform groups. The extracted patterns are labeled according to the degree of uniformity. Finally the occurrence probability of the labels is extracted as features. Also, a multilayer perceptron is designed with four theories in the number of hidden nodes. Experimental results on two benchmark datasets showed that our proposed approach provides higher classification accuracy than most well known methods. Noise-resistant and rotation invariant are other advantages of the presented method. The proposed bark texture classification, because of its high classification accuracy, can be applied in real applications and reduce the financial costs and human risks in the diagnosis of plant species

3. PROPOSED SYSTEM

The suggested method uses Convolutional Neural Network technology to identify medicinal plants and/or leaves. CNN is a machine learning technique that makes use of Artificial Neural Networks (ANN) together with a Deep Learning extension. Deep learning extends the Multilayer Perceptron (MPL), which is used to interpret two-dimensional input, such photos. CNN uses learnt models to find and identify objects in picture data

3.1 IMPLEMENTATION

UPLOAD DATASET

Using this module we can load medicinal plant dataset from the location of the project to

Train the CNN algorithm

GENERATE TRAINING AND TESTING IMAGES

ImageDataGenerator: that rescales the image, applies shear in some range, zooms the image and does horizontal flipping

with the image. This ImageDataGenerator includes all possible orientation of the image.

train_datagen.flow_from_directory is the function that is used to prepare data from the train_dataset directory Target_size specifies the target size of the image.

test_datagen.flow_from_directory is used to prepare test data for the model and all is similar as above.

fit_generator is used to fit the data into the model made above, other factors used are steps_per_epochs tells us about the number of times the model will execute for the training data.

epochs tells us the number of times model will be trained in forward and backward pass.

4.RESULTS AND DISCUSSION

Generating images as training and testing

1. GENERATE CNN MODEL

In this module we are generating CNN Model with train_datagen and test_datagen generated by ImageDataGenerator class.

Here we have training this CNN algorithm multiple time to get the better accuracy using epochs.

Finally we will get the best CNN model with average accuracy above 90%

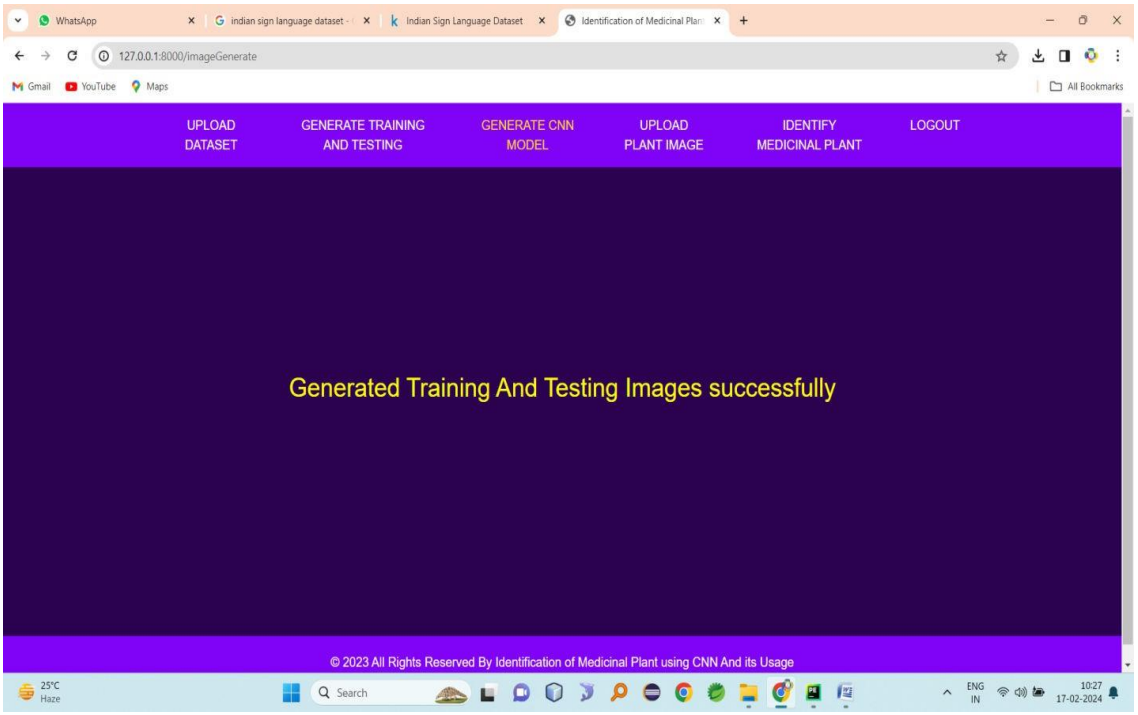
2. UPLOAD TEST IMAGE

Using this module we can upload test image AND pass the test image to the model to identify medicinal plant

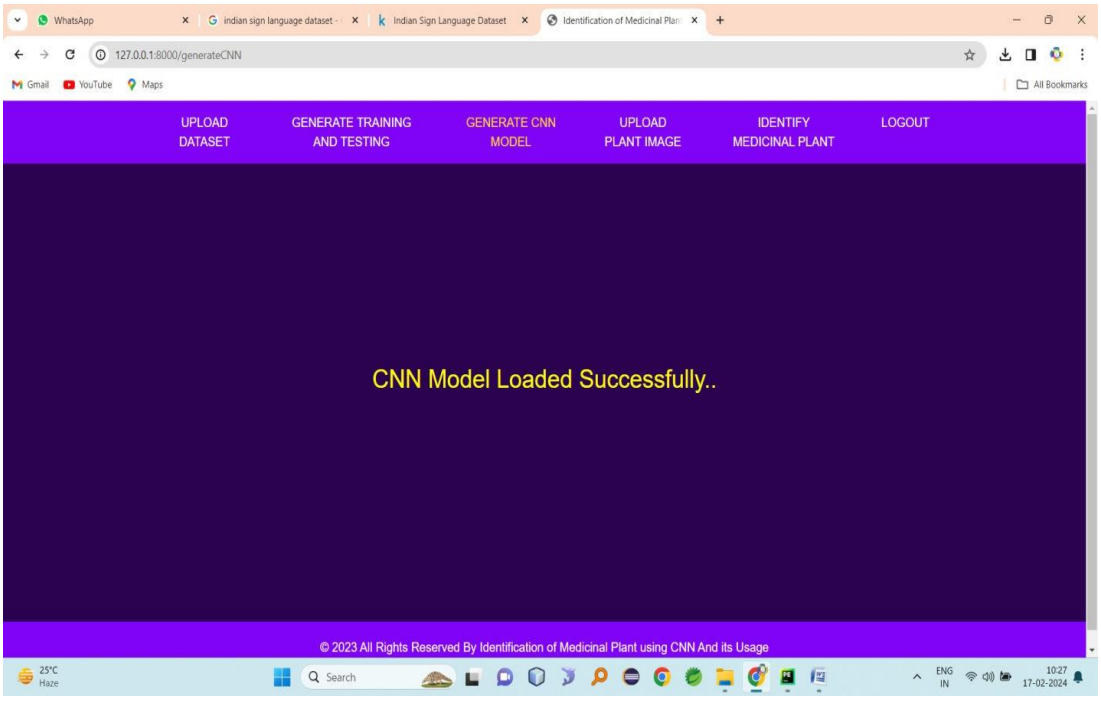
3. IDENTIFY MEDICINAL PLANT

Using this model will call the CNN Model which is already generated and take the image

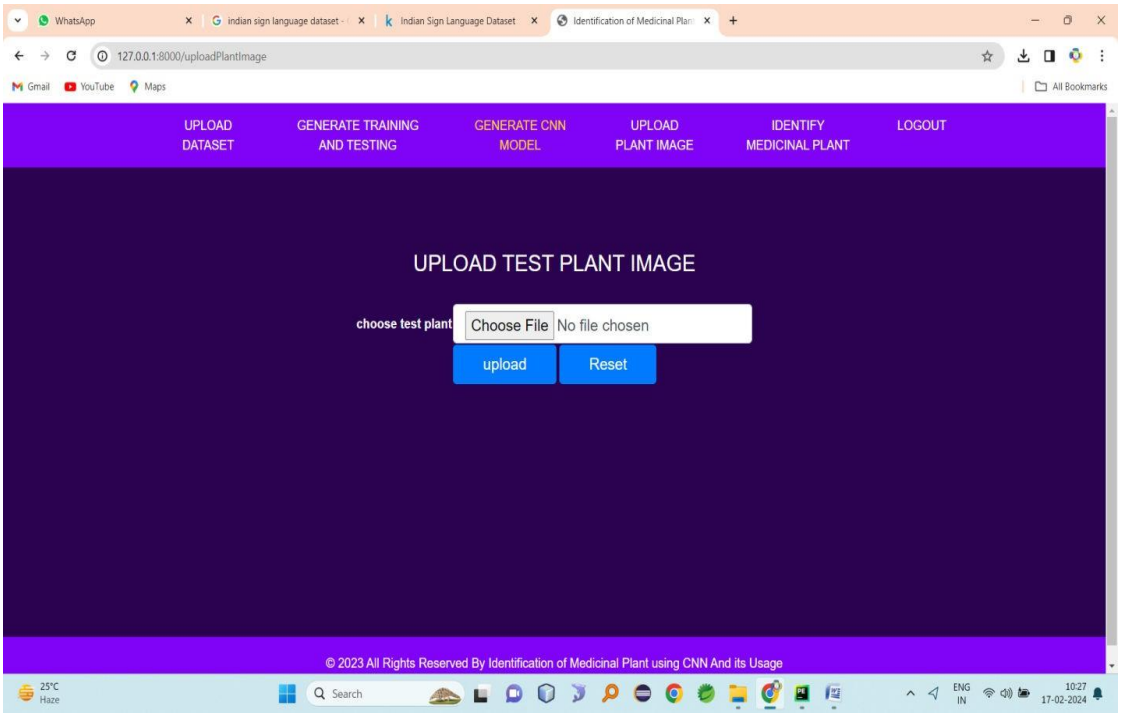
from the 4^{th} step and pass to model.Then the model will identify the medicinal plant.



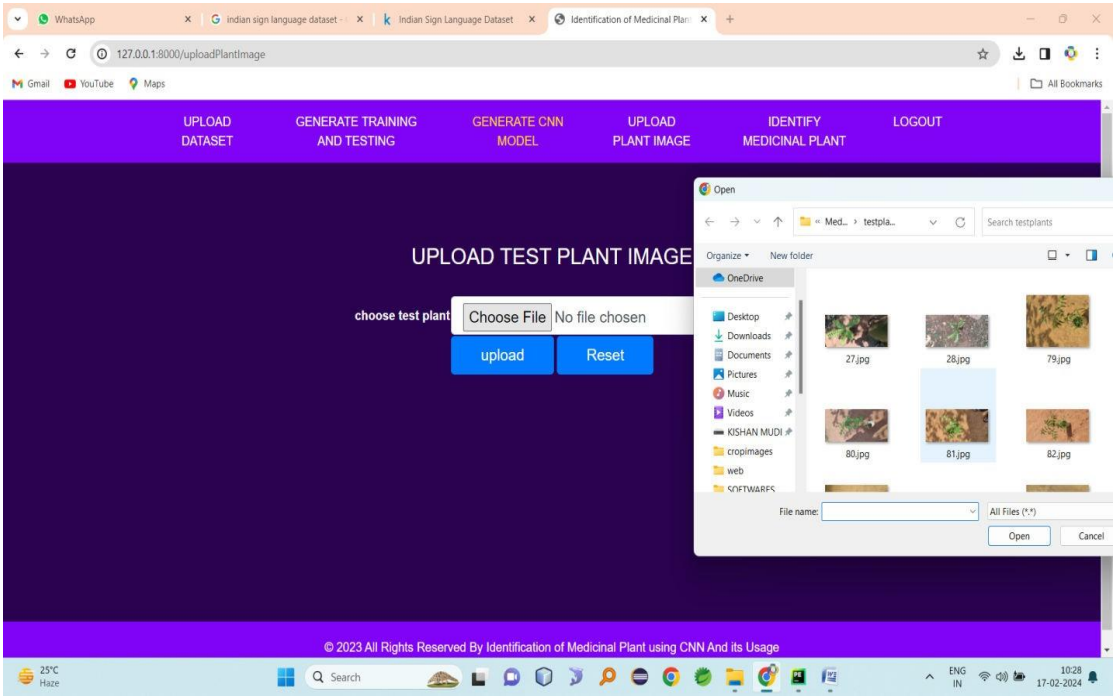
CNN model generate successfully with training and testing images



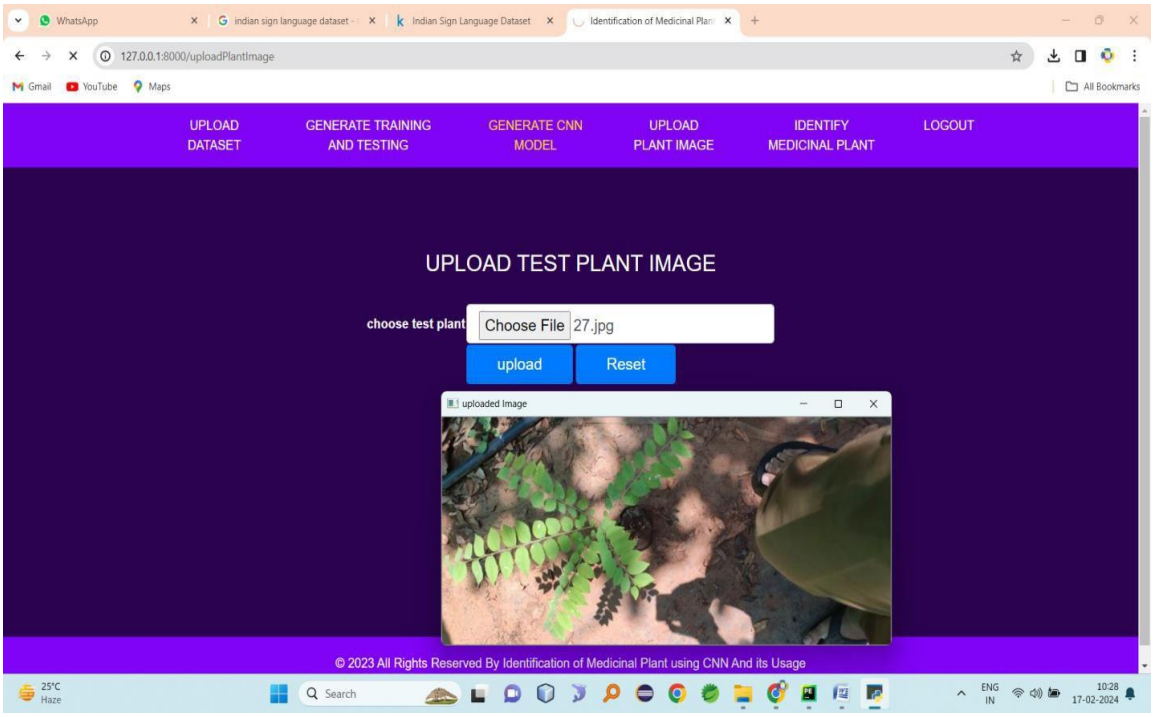
Choose test image and upload



Uploading test plant



Uploaed test plant



Upload status

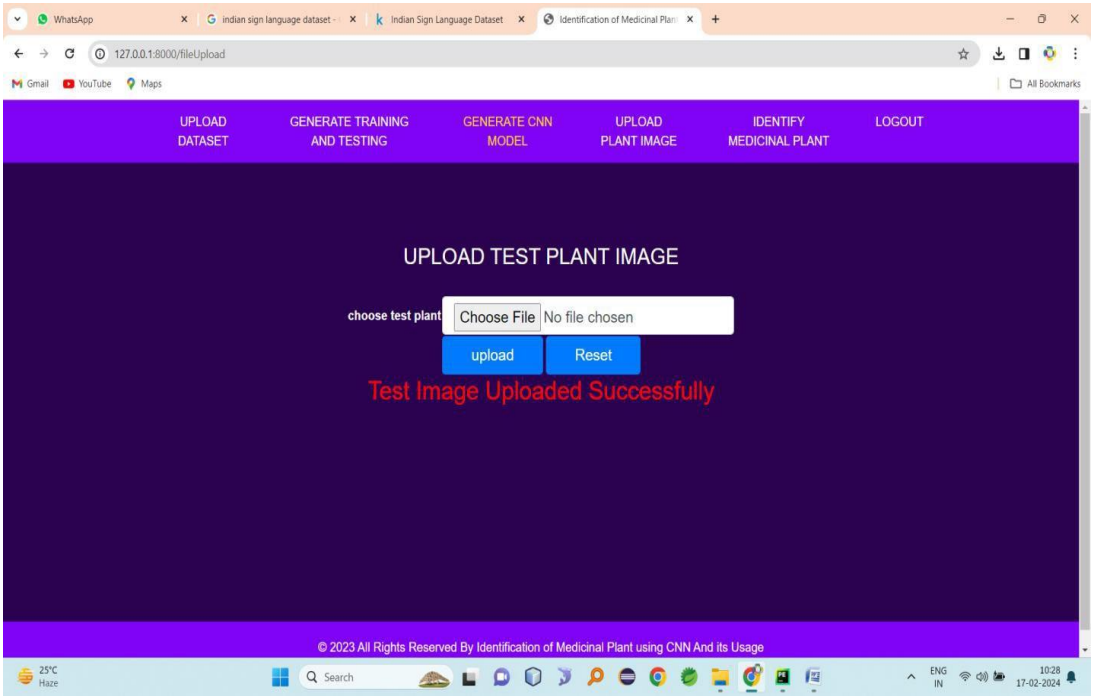


Image identified

5. CONCLUSION

This research has successfully implemented the Convolutional Neural Network method to extract features on medicinal plant and identify them into 40 classes of medicinal plant based on the closest value between the training data and test data.

REFERENCES

[1] Neeraj Kumar, Peter N. Belhumeur, Arijit Biswas, David W. Jacobs, W. John Kress, Ida C. Lopez, and Joao V. B. Soares. Leafsnap: A ˜ Computer Vision System for Automatic Plant Species Identification. In Andrew Fitzgibbon, Svetlana Lazebnik, Pietro Perona, Yoichi Sato, and Cordelia Schmid, editors, Computer Vision – ECCV 2012, volume 7573, pages 502–516. Springer Berlin Heidelberg, Berlin, Heidelberg, 2012. Series Title: Lecture Notes in Computer Science.

[2] Alexis Joly, Herve Go ´ eau, Pierre Bonnet, Vera Baki ¨ c, Julien Barbe, ´ Souheil Selmi, Itheri Yahiaoui, Jennifer Carre, Elise Mouysset, Jean- ´ Franc¸ois Molino, Nozha Boujemaa, and Daniel Barthel´ emy. Interactive ´ plant identification based on social image data. Ecological Informatics, 23:22–34, September 2014.

[3] O. Soderkvist, Computer Vision Classification of Leaves from Swedish Trees, Dissertation, 2001.

[4] Stephen Gang Wu, Forrest Sheng Bao, Eric You Xu, Yu-Xuan Wang, Yi-Fan Chang, and Qiao-Liang Xiang. A Leaf Recognition Algorithm for Plant Classification Using Probabilistic Neural Network. In 2007 IEEE International Symposium on Signal Processing and Information Technology, pages 11–16, Giza, Egypt, December 2007. IEEE.

[5] Trung Nguyen Quoc and Vinh Truong Hoang. Vnplant-200–a public and large-scale of vietnamese medicinal plant images dataset. In International Conference on Integrated Science, pages 406–411. Springer, 2020.

[6] Tuan Le-Viet and Vinh Truong Hoang. Local binary pattern based on image gradient for bark image classification. In Kezhi Mao and Xudong Jiang, editors, Tenth International Conference on Signal Processing Systems, page 39, Singapore, Singapore, April 2019. SPIE.

[7] Shervan Fekri-Ershad. Bark texture classification using improved local ternary patterns and multilayer neural network. Expert Systems with Applications, 158:113509, November 2020.

[8] Shanwen Zhang, Chuanlei Zhang, Zhen Wang, and Weiwei Kong. Combining sparse representation and singular value decomposition for plant recognition. Applied Soft Computing, 67:164–171, June 2018.

AUTHOR'S PROFILE

Ms.M.Anitha Working as Assistant Professor & Head of Department of MCA ,in SRK Institute of technology in Vijayawada. She done with B .tech, MCA ,M. Tech in Computer Science .She has 14 years of Teaching experience in SRK Institute of technology, Enikepadu, Vijayawada, NTR District. Her area of interest includes Machine Learning with Python and DBMS.

Ms.L.Sravani is an MCA Student in the Department of Computer Application at SRK Institute Of Technology, Enikepadu, Vijayawada, NTR District. She has Completed Degree in B.Sc(compuputer Science) from Triveni Mahila Degree College, Patamata Centre, MG Road, Vijayawada, NTR District. Her area of interest are Machine Learning with Python and java