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Tree Species Identification and It's Diseases using Machine Learning

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Abstract **- Tree species identification is crucial for forest management. From the perspective of plant taxonomy, leaves, flowers, roots, and fruits all carry important information to distinguish different species. Roots, however, are buried in the ground and not easy to obtain. When the leaf image is uploaded to PC and then its essential features are identified and recorded And it's diseases using image processing methods. Feature extraction is a critical stage because the ability of a system to discriminate various types of leaves depends on the features extracted. The features have to be stable in order to make the identification system robust. Subsequently the plant leaf is recognized using techniques of machine learning. We will provide an effective approach to automatically identify tree Species and its diseases machine Learning. The convolution neural network is a widely-used classifier, and provides an alternative for the traditional image recognition approach. The work will identifies tree species by analyzing tree leaves, which have multi-dimensional features such as color, shape, and leaf vein signatures. Since it is difficult to find a single leaf feature to accurately identify tree species and it's diseases, convolution neural networks are employed to integrate multi-dimensional leaf features.**

Keywords- **Tree species identification; Machine Learning Techniques; classification; Convolution Neural Network (CNN).**

I. INTRODUCTION

On earth have different type of plant species. Now a day it is important to identify the correctly and quickly plant species in order to understand, manage and archive them before it's too late. However, correctly identifying plant species requires expert knowledge only botanists can provide. Due to the limited number of botanists, it is necessary to acquire some of their knowledge and automate the recognition process. Many times people don't know the tree and its value. Using identification of tree species from image we can easily identify tree name and importance of that tree. leaf can be classified according to their future (shapes, colors, textures and structures)due to the rapid development in computer technologies, there are now opportunities to improve the ability of leaf species identification[2]

1. Motivation

Tree species classification is significant for a lifetime forest ecosystem. It is important in sustainable forest management. In forest has a lot of tree but workers cannot identify each and every tree, some tree have a high value in market. Also some tree is used as medicine but unfortunately these trees cut it. So we want to save that tree. Identification of tree species is taught to students in the elementary and in the secondary school. And also Normal human can't recognize each and every trees. Some tree leafs are same so identification of that trees are so difficult.

2. Need

We want to identify of trees easily. Many times forest worker doesn't know the tree and its value. Using identification of tree species from image we can easily identify tree name and importance of that tree. Now a day only expertise identifies the medicine tree but using this system Normal human identifies also identifies medicine and other system.

3. Objective

To collect Data, since the photos are taken with any device the system has to deal with image resolution which can vary from model to model. Furthermore due to different lighting conditions during the moment of the photo taking and different specifications of the cameras the color can differ. To Study and analyze different algorithms used for tree identification and classification. Investigate and implement the algorithm which will convolution neural network algorithm. Identify the tree species with image processing and

II. LITERATURE REVIEW

S.N	Author	Paper Title	Publisher	Dataset	Methodology	Drawbacks
1	Hong Zhau	Tree Species Identification Based on	IEEE, pp.103-106,	Leaf snap	Convolution Neural	Based on only 25 tree species from leaf snap
		Convolution Neural	2016			dataset
		Networks				
2	Abdul Kadir	Leaf Identification Using Fourier	Gt CVPR, vol. 1,	Medical herbal	Feature Extraction	This accuracy is 80.03% when
		Descriptors and Other	pp.3-7,	leaves	Fourier	To other feature
		Shape Features,	2015		Descriptors	Extraction
					Classification	future work, it
					Bayes Classifier	With margin feature
						and other feature

S.N	Author	Paper Title	Publisher	Dataset	Methodology	Drawbacks
						Increase.
3	Valliammal	An Optimal Feature	IAJIT,	-	Feature	
	Narayan	Subset Selection Using	Vol. 11,		Extraction	
		GA for Leaf Classification	pp.447.451 , 2014		Genetic Algorithim	
					Classification	
					Neighbor	
					Classifier	
4	Hong	Plant Leaves	IJCSI,	Dracaena	Feature	The HU invariant
	Huijie Li	Recognition	Vol. 11,	sanderiana	Extraction :-HU	moment is not a total
		And Classification	pp.100-104,			portrayal of the sorts of
		Model	2014			leaf features, on

6					5					
AnantBhar dw				Kadir	Abdul					
Recognitio n of by Leaf Image	Features	Lacunarity And Shen	Using GLCM,	entification System	A Model of Plant			Network	Features and Neural	Based on Image
IJIAS Volume 3,		2014.	pp. 1-10,	Vol. 5(2),	RJPBCS,					
		dataset	Foliage	dataset,	Flavia					
Feature Extraction:					Bayesian classifier					
GLCM is very sensitive to the	toimprove performan ce	Shen features in	GLCM, lacunarity and	still needed to combine	Some experiment s are	Characteri stics.	attributive	colossal inactive	types of plants	grounds various

			8						7		
alasila,	Viswanath	Kumar a	E. Sandeep					Dr.V.Kavit ha	Mythili.C and		
Identificati on	Automated	Approach	Leaf Features Based				Medicine	Leaf in	Recognitio n	Texture Analysis	Moment Invariant and
	2014.	pp. 210-214,	IEEE,			2014.	2, pp.6 1-69,	Volume 9, Issue	JCIT	2013	pp. 237-248,
		dataset	Medicine					dataset	Flavia		
	PNN	SVM	Classificati on :	S V	Classificati on :		ERKFCM	Extraction: -	Feature		
	system	80.55%		s a n p l	leaf image	species has 40 to 60	plants, where each	leaf images of 33	consists of 1907 color	of leaves were using this method	Changes in 14 images Classes different

9	l Z . N & M I P e G o d l u e m e a r n e n n a e t	Medicinal Plants	2 p I 0 p E 1 . E 1		G C L E F R l M x e	A C G i r U T c l R n e s h c a N o s e e u s N v u d

III. METHODOLOGY

1. Dataset

For our algorithm we used lea $\begin{cases} 0 \; if \; x < 0 \\ x \; if \; x >= 0 \end{cases}$ This dataset contains 184 different tree leafs images. This images are not taken at the same time or with same condition. Below figure shows dataset sample. We are using some tree species from the dataset to validate our algorithm.[1].

Fig.1. samples of Leafsnapdataset [1].

2. Convolution neural networks model:

1. Convolution
2. ReLU Layer
3. Pooling
4. Fully Connected

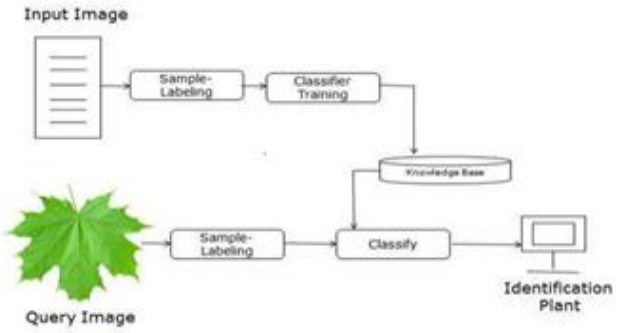

Fig.2.architectureofTree Species Identification Using Machine Learning.

INPUT [32x32x3] will hold the raw pixel values of the image, in this case an image of width 32, height 32, and with three channels R,G,B.

CONV layer will be compute the output of neurons that are connected to regions in the input, each computing a dot product between their weights and a small region they are connected to in the input volume. That result in volume such as [32x32x12] if we decided to use 12 filters.

$\sum$ *Input feature × Training image*

$\sum$ / total number of pixel

No. of leaf Images for Training	Accuracy	loss
50	69%	141%
100	83%	70%
200	89%	40%
500	94%	15%
1000	91%	8%

RELU layer will apply an element wise activation function, max (0,x). That leaves the size of the volume unchanged ([32x32x12]).

Activate Function f(x) =

POOL layer will perform a down-sampling along the spatial dimensions (width, height), resulting in volume such as [16x16x12].

FC (i.e. fully-connected) layer will compute the class scores, resulting in volume of size [1x1x10], where each of the 10 numbers correspond to a class score, such as among the 10 categories of CIFAR-

10. Every neuron in layer will connected to all the numbers in the previous volume.

Pros and Cons of Classifiers: Convolution Neural Network:-Pros-

1. Gives higher accuracy as 95% in image reorganization.
2. CNN are more useful in large dataset, large number of features and complex classification task.
3. Training of data again and again is not essential.
4. For Crop Disease application those contain noise in date still gives better results.
5. Low error rate.
6. CNN is designed to work better in image dada.

Cons-

1. High Complexity.
2. CNN require more training data.
3. Because of Complex Structure More powerful hardware requires.

IV. RESULTS

Performance Analysis Of classifiers:-

Classification analysis accuracy

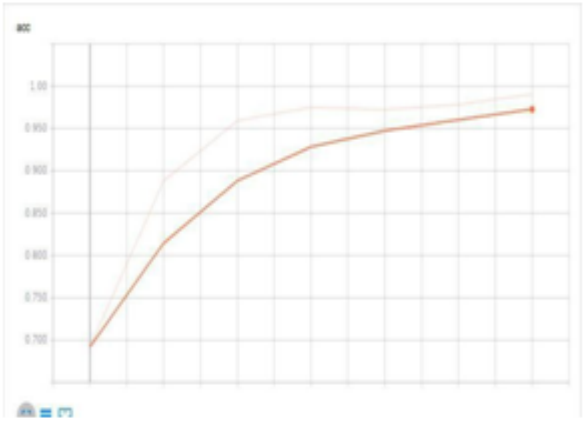

Fig.3. Classifier Analysis accuracy.

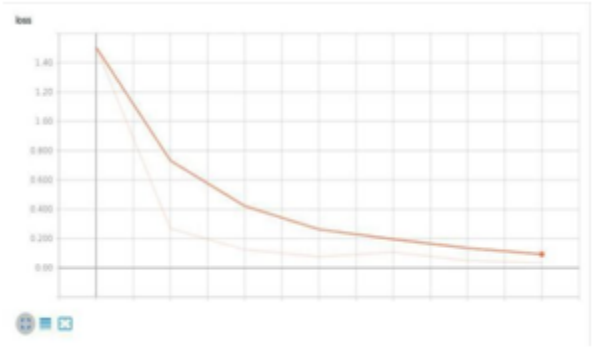

Fig.4. Classifier Analysis loss.

Table III: Evaluation of classifier.

No. of trained Images	No. of tested Images	Correctly classified	Misclassified	Accuracy
1000	50	48	4	92%
1000	100	96	5	92%
1000	200	192	10	95%
1000	500	480	22	95.6%
1000	1000	960	45	95.6%

Analysis of Classifiers:
It can be easily represent Convolution Neural Network achieve highest accuracy (95.6%).Convolution Neural Network gives balanced classification.

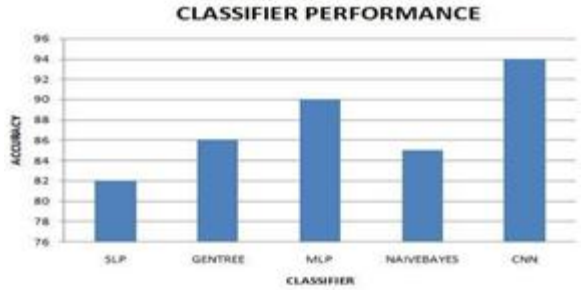

Fig.5. Classifier Performance.

V. CONCLUSIONS

Using the image processing and machine learning we identify leaf species and classification of it's disease using Machine Learning. CNNs are designed to work with image data .machine learning are mostly useful very large dataset, large number of feature and complex classification task. In our project we took a large dataset that's why we used Convolution neural networks and its give a better result than other machine learning and classification algorithm. The traditional system was only detecting leaf and identifies that tree. But in our system we identify that tree and give some information about that tree. In this project we got 95.6% accuracy.

REFERENCES

[1]. Hong Zhou, Huahong Huang," Tree Species Identification Based on Convolution Neural Networks", 2016 IEEE.
[2]. ZalikhaZulkifli, PutehSaad, Itaza AfianiMohtar," Plant Leaf Identification using Moment Invariants & General Regression Neural Network" 2011 IEEE.
[3]. IbtisamAbMajid, Zulkiflee AbdLatif, and Nor Aizam Adnan," Tree Species Classification Using Worldview-3 Data", 2016 IEEE.
[4]. Akhtar Jamil and BulentBayram," Tree Species Extraction and Land Use/Cover Classification From High-Resolution Digital Orthophoto Maps", 2017 IEEE.
[5]. Abdul Kadir, "Leaf Identification Using Fourier Descriptors and Other Shape Features," Gate to Computer Vision and Pattern Recognition-2015.
[6]. Hong Fang, Huijie Li, "Plant Leaves Recognition and Classification Model Based on Image Features and Neural Network", IJCSI International Journal of Computer Science Issues, March 2014.
[7]. Abdul Kadir, "A Model of Plant Identification System Using GLCM, Lacunarity and Shen Features", Research Journal of Pharmaceutical, Biological and Chemical Sciences, Volume 5, Issue 2, pp. 1-10, 2014.
[8]. Zhaobin Wang, Xiaoguang Sun, Yide Ma, Hongjuan, Zhang ,YurunMa,WeiyingXie, Zhaobin Wang, Yaonan Zhang, "Plant Recognition Based on Intersecting Cortical Model", IEEE –2014.
[9]. Bin Wang, Douglas Brown, YongshengGao, John La Salle, "MARCH: Multiscale-arch-height description for mobile retrieval of leaf images",Elsevier – 2014.
[10]. B. Yanikoglu, E. Aptoula , C. T irkaz, "Automatic plant identification from photographs", achine Vision and Applications • August 2014.
[11]. Hong Fang, Huijie Li, "Plant Leaves Recognition and Classification Model Based on Image Features and Neural Network", IJCSI International Journal of Computer Science Issues, March 2014.

[12]. Abdul Kadir, Lukito Edi Nugroho, AdhiSusanto and Paulus InsapSantosa, "Performance Improvement of Leaf Identification System Using Principal Component Analysis", International Journal of Advanced Science and Technology, July, 2012.
[13]. T .Vijayashree and A. Gopal, "Classification of T ulsi Leaves Based on T exture Analysis", Middle-East Journal of Scientific Research 23 (Sensing, Signal Processing and Security)-2015.
[14]. Abdul Kadir, "Leaf Identification Using Fourier Descriptors and Other Shape Features," Gate to Computer Vision and Pattern Recognition-2015.
[15]. Heba F Eid," Leaf Plant Identification system based on hidden naïve bays classifier" , 4th International Conference on Advanced Information Technology and Sensor Application-2015.
[16]. Anant Bhardwaj, Manpreet Kaur, and Anupam Kumar, "Recognition of plants by Leaf Image using Moment Invariant and Texture Analysis", International Journal of Innovation and Applied Studies, Volume 3, Issue 1, 2013, pp. 237-248.