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# PLANT DETECTION USING DEEP LEARNING

**Ms. Alfonsa K James[1], Mr. Ashwin Babu[2], Mr.Rimold Rynold [3], Mr. Sarath E John[4],**

**Mr. Ritesh Kumar[5]**

*[1,2,3,4]Students, Dept. of CSE, Yenepoya Institute of Technology, Moodbidri, India-574225*
*[5]Assistant Professor, Dept. of CSE, Yenepoya Institute of Technology, Moodbidri, India-574225*

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**Abstract -** *The nature is so diverse by different species of plants. All these plants has different features that makes it resourceful for food and other needs. But identifying the plants is a key part to understand our surrounding environment and for effective utilisation of these plant resources. Plants are best identified by observing the colour, shape and other properties of plant parts.*

*But it is difficult to acquire knowledge about all the plants to observe and identify them. Therefor in this work, is submitted a neural network based application which can effectively observe images and identify them easily*

## 1. INTRODUCTION

There are extremely huge number of plant species in the Earth. They are globally wide spread in among different regions around the world. The plant species in the earth is so diverse such that, out of the estimated 50 million species, only 1.4 million species plants has been yet identified.

It clearly shows us the hint that the human beings are not enough aware of their surrounding environment. Most of these plant species has valuable properties which makes it useful for food, medicinal purposes and so on.

The biggest barrier for this problem is that most of the humans are not able identify the plants easily. Identifying the plants just by observing them seems like a easy process but it requires great knowledge about each plants to identify them by simply observing.

Also it is not practical to identify them from internet by using the observed plant details.

Botanists and other professionals use tools such as plant bibliography to identify plant species. But it is not practical to carry them around for all time. Also it requires expertise to identify plants from using such tools. Therefore it is not useful for normal people.

Therefor this paper presents an new approach to this problem by using deep neural networks. Neural networks has been proved highly efficient in supervised multiclass classification problems. The convolutional neural network (CNN) has strong feature extraction capability which makes it most successful in image classification problems and other computer vision tasks.

## 2. EXISTING SYSTEM

The current methods available for accurate identification of plants includes

### 2. I. Plant Bibliography

Plant Bibliography are books that contains details about different plant species details and there unique features which can be used to identify them on observance. Such books are well indexed and classified for ease of use. But still it requires some expertise and knowledge to effectively use such books. Since it is not practical to include details about all species of plants in a single book, different bibliographies exist for different regions.

### 2.2. Plant Information Databases

Such databases are used to store digitally store plant information's. It is similer to plant bibliography but the key advantages are that there is no limit for data that can be stored and these data can be easily quieried and managed. But still it is not accurate to find the plant that matches according to the observed data

## 3. LITERACY SURVEY

The paper "Plant Species Classification Using Deep Convolutional Neural Network" by Mads Dyrmann, Henrik Karstoft , Henrik Skov Midtiby put forwards about using the implemention of neural networks to plant species detection. This study presents a method that is capable of recognising plant species in colour images by using a convolutional neural network. This includes images taken under controlled conditions with regard to camera stabilization and illumination.

Another paper "Real-world plant species identification based on deep convolutional neural networks and visual attention"

implements a improved method. In tradition plant species identification the samples are scanned specimen and the background is simple. However, real-world species recognition is more challenging. To deal with the challenging task, first crop the image in terms of visual attention before general recognition. This approach is known as attention cropping (AC).

Another paper "Strategies and Best Practices for Neural Network Image Classification" by I. Kanellopoulos & G. G. Wilkinson provides a deep understanding of neural architectures and its optimization. This paper attempts to do precisely this, and, can be considered to be the culmination of a number of experiments leading towards the goal of high accuracy image classification. The paper examines best practice in such areas as: network architecture selection, use of optimization algorithms, scaling of input data, and avoidance of chaos effects, use of enhanced feature sets, and use of hybrid classifier methods. It concludes that a vast body of accumulated experience is now available, and that neural networks can be used reliably and with much confidence in different types of tasks.

## 4. PROPOSED SYSTEM

The proposed system is an application based on Deep learning model.

The idea here is to mimic the human observation skills using neural networks to extract plant features from images and identify them.

An application is designed for users to capture and submit the image.

The application can be any website or android application with any python backend framework such as Django or flask for deploying the deep learning model.

Through such application user can submit the picture of plant that is to be identified.

The submitted image is then classified using neural networks to identify the plant species.

Generation of deep learning model consists of five steps

### 4.1. DATA COLLECTION

The data which is required for training the model is collected from various sources. Huge number of images of each plant species is collected from various regions and is organized. The dataset consist of images of different plant parts such as fruit, leaf and flower captured in different light conditions, different noise levels and of different aspect ratios which are captured using different smartphone devices.

### 4.2. DATA PREPARATION

The image dataset also known as training dataset is then manually categorised and organised into different plant species. Then inappropriate, and highly noisy images are filtered out to produce better accurate model.

In order to avoid bias, only equal number of images or captured for each species.

The aspect ratio of images are then reduced to 256x256 to reduce training complexity.

The images are then normalised to 0 to 1 to again reduce training complexity

Finally the training dataset is again populated using data augmentation.

Data augmentation is the process populating the training data by duplicating and modifying the actual training data.

Here the data augmentation is applied by creating duplicates and applying different effects such as rotation and mirroring.

Reducing the background of images and focusing only on the main object helps to better accurate identification. This process is called as attention cropping.

Attention cropping is applied to training data by center cropping the images.

### 4.3. Model construction and training

The neural network architecture chosen is convolutional neural networks which are efficient for image classifications. The pretrained model Xception is the selected architecture. Xception is one among most efficient architectures for multiclass complex image classifications.

In this study, the deep learning model is constructed and trained using Google's tensorflow framework.

### 4.4. Prediction and testing

The trained model is tested using sample dataset also known as. The test data set consist of highly noisy images of different plant species

### 4.5. Hyper parameter tuning

In order to increase the prediction accuracy rate, the hyper parameter are tuned by trial and testing. By continues hyper parameter tuning, the best approached tuning parameters are

- Epoch : 20
- Learning rate: 0.0001
- Number of additional hidden layer: 2
- Input size: 256*256

## 5. RESULT AND CONCLUSION

The convolutional neural networks are highly efficient in computer vision tasks. With such neural networks it is possible to extract plant features identify the species. Comparing to the traditional approaches, it is super easy for common people to identify the plant species using neural networks.

Without specifying any details, people can easily identify plants just by submitting a picture.
The neural network will automatically extract features and identify the species accordingly.

The results are far more accurate than traditional approaches.

The implementation of neural networks for plant species identification also put forwards some challenges. The training cost of model increases as the dataset increases. Therefor it is difficult to train for all species on earth in a single neural network.
An alternative solution for this issue is to construct multiple neural networks and assign each of them each regions and train the neural networks with data of that region only. Again it is not an optimal solution since the space required for storing all the neural networks is huge.

The future aspect of this work is to solve these issues.

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