ABSTRACT

Plant species detection aims at the automatic identification of plants. Although a lot of aspects like leaf, flowers, fruits, seeds could contribute to the decision, but leaf features are the most significant. As a plant leaf is always more accessible as compared to other parts of the plants, it is obvious to study it for plant identification. The present paper introduced a novel plant species classifier based on the extraction of morphological features .First, a two-layer plant taxonomy is constructed to organize large numbers of plant species and their genus hierarchically in a coarseto-fine fashion. Second, a deep learning framework is developed to enable path-based tree classifier training, where a tree classifier over the plant taxonomy is used to replace the flat softmax layer in traditional deep CNNs. A path-based error function is defined to optimize the joint process for learning deep CNN and tree classifier, where back propagation is used to update both the classifier parameters and the network weights simultaneously.

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CHAPTER 1
INTRODUCTION

1.1 INTRODUCTION

In this system, we present multi-path multi deep convolutional network for the identification of plant species which feeds different versions of plant images, thus resultant model has better image presentation than traditional Ensemble Learning. Comprehensive experimental evaluation on benchmark plant datasets showed that without using any pre-trained models, our proposed shallow network demonstrate very competitive performance for plant species identification.

1.2 OVERVIEW

Shape is the most common feature that have been used to develop plant identification systems. The features that are commonly used to evaluate shape are, ratio between slimness, roundness, compactness, rectangularity, and other aspects. Texture is one of the important features of the plant identification system, which can be used to characterize the leaves based on the surface structure of the leaves. It is a non-consistent spatial distribution pattern of different image intensities.

1.3 SCOPE OF THE PROJECT

The main contributions of this project are:

1. Data Analysis
2. Dataset Preprocessing
3. Training the Model
4. Testing of Dataset

1.4 DOMAIN OVERVIEW

1.4.1 Deep Learning

Deep learning is a computer software that mimics the network of neurons in a brain. It is a subset of machine learning and is called deep learning because it makes use of deep neural networks.

Deep learning algorithms are constructed with connected layers.

- The first layer is called the Input Layer
- The last layer is called the Output Layer
- All layers in between are called Hidden Layers. The word deep means the network join neurons in more than two layers.

A deep neural network provides state-of-the-art accuracy in many tasks, from object detection to speech recognition. They can learn automatically, without predefined knowledge explicitly coded by the programmers

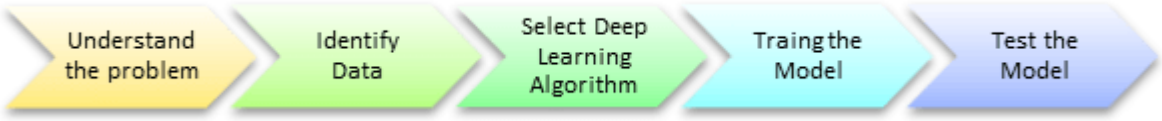

Fig.1.4.1.1 PROCESS OF SOLVING PROBLEM USING DEEP LEARNING

To grasp the idea of deep learning, imagine a family, with an infant and parents. The toddler points objects with his little finger and always says the word 'cat.' As its parents are concerned about his education, they keep telling him 'Yes, that is a cat' or 'No, that is not a cat.' The infant persists in pointing objects but becomes more accurate with 'cats.' The little kid, deep down, does not know why he can say it is a cat or not. He has just learned how to hierarchies complex features coming up with a cat by looking at the pet overall and continue to focus on details such as the tails or the nose before to make up his mind.

A neural network works quite the same. Each layer represents a deeper level of knowledge, i.e., the hierarchy of knowledge. A neural network with four layers will learn more complex feature than with that with two layers.

The learning occurs in two phases.

1. The first phase consists of applying a nonlinear transformation of the input and create a statistical model as output.
2. The second phase aims at improving the model with a mathematical method known as derivative.

The neural network repeats these two phases hundreds to thousands of time until it has reached a tolerable level of accuracy. The repeat of this two-phase is called an iteration

Classification of Neural Networks

1. Shallow neural network: The Shallow neural network has only one hidden layer between the input and output.
2. Deep neural network: Deep neural networks have more than one layer. For instance, Google LeNet model for image recognition counts 22 layers.

The computational models in Deep Learning are loosely inspired by the human brain. The multiple layers of training are called Artificial Neural Networks (ANN).

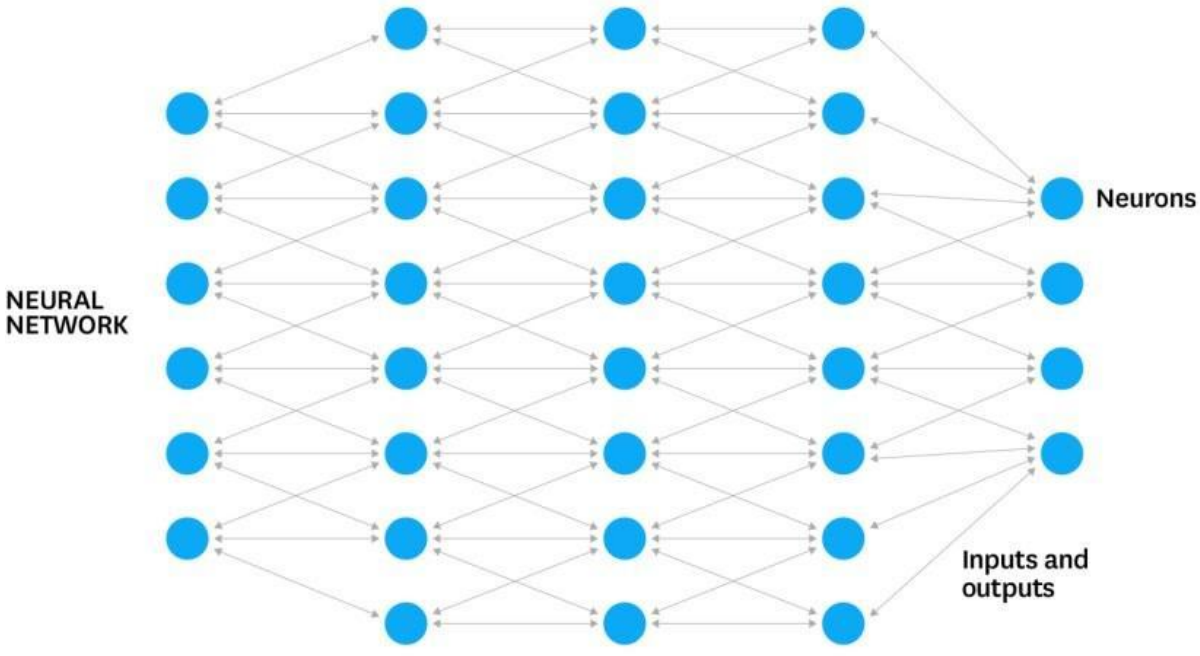

Fig.1.4.1.2 NEURAL NETWORK

Neuron: Artificial Neural Networks contain layers of neurons. A neuron is a computational unit that calculates a piece of information based on weighted input parameters. Inputs accepted by the neuron are separately weighted.

Inputs are summed and passed through a non-linear function to produce output. Each layer of neurons detects some additional information, such as edges of things in a picture or tumors in a human body. Multiple layers of neurons can be used to detect additional information about input parameters.

Nodes: Artificial Neural Network is an interconnected group of nodes akin to the vast network of layers of neurons in a brain. Each circular node represents an artificial neuron and an arrow represents a connection from the output of one neuron to the input of another.

Inputs: Inputs are passed into the first layer. Individual neurons receive the inputs, with each of them receiving a specific value. After this, an output is produced based on these values.

Outputs: The outputs from the first layer are then passed into the second layer to be processed. This continues until the final output is produced. The assumption is that the correct output is predefined.

Each time data is passed through the network, the end result is compared with the correct one, and tweaks are made to their values until the network creates the correct final output each time.

Some of the commonly used neural networks are as follows:

1. Artificial Neural Network (ANN)
2. Convolutional Neural Network (CNN)
3. Recurrent Neural Network (RNN)
4. Deep Neural Network (DNN)
5. Deep Belief Network (DBN)

CHAPTER 2

LITERATURE SURVEY

2.1 LITERATURE REVIEW

REVIEW NO 1:

AUTHOR : Fadzilah Siraj, Muhammad Ashraq Salahuddin and Shahrul Azmi Mohd Yusof

They proposed the system for classification of Malaysian blooming flower. In this paper they presents the application of NN and on image processing particularly for understanding flower image features. For predictive analysis, they have used two techniques namely, Neural Network (NN) and Logistic regression. The study shows that NN obtains the higher percentage of accuracy among two techniques. The Otsu's method was applied in order to compute a global threshold.The image is then converted to RGB color space again. In color extraction, the images were transformed from RGB color space to HSV color space the image texture is calculated based on gray-level co-occurrence matrix (GLCM) to obtain the contrast, correlation, energy and homogeneity of the image.The prediction accuracy of logistic regression is 26.8%. Therefore based on 1800 samples of Malaysian flower images, NN has shown a higher average prediction results vs. logistic regression. However this paper cannot present recognition of flower type, its only recognize flower features so in future studies can be focused on developed flower model system which can recognize Malaysian blooming flower or extending the dataset built and Verities sample of images can be captured for different flowers and recognize their types.

REVIEW NO 2:

AUTHOR : Pavan Kumar Mishral, Sanjay Kumar Maurya, Ravindra Kumar Singh and Arun Kumar Misral

They present a semi automatic plant identification based on digital leaf and flower images. They proposed an algorithm for identification using multiclass classification

based on color, shape volume and cell feature. Each stage further also divided into three steps. First stage comparison based on extracted features from RGB component. Second stage based on shape feature Area Convexity, Perimeter Convexity, sphericity and Circulatory. And last stage based on cell and volume fraction feature. Experiment is performed on a sample of diverse collection of 1000 leaf and flower and recognition rate is up to 85% on an average. In proposed system entire feature cannot be taken at a time because it will take lot of time for computation and space. So multi stage comparisons are used for identification of image.Its multi stage comparison so required more tables to stored results and its long process. They used Unsupervised learning algorithm which has less accuracy as compared to supervised classification algorithm.

REVIEW NO 3:

AUTHOR : Tanakorn Tiay, Pipimphorn Benyaphaichit, and Panomkhawn Riyamongkol

They proposed flower Recognition System Based on Image Processing.This system uses edge and color characteristics of flower images to classify flowers. Hu's seven moment algorithm is applied to acquire edge characteristics. Red, green, blue, hue, and saturation characteristics are derived from histograms. K nearest neighbor is used to classify flowers.The system returns the top three most similar flower images.The Canny edge detection algorithm is applied to the cropped image to receive edge data. The edge data will be the input into Hu's seven-moment algorithm. Classification: All characteristic values will be classified by the K-nearest neighbor algorithm. The three most nearest flower characteristics are selected; the most nearest flower information is displayed. This system is based on color model so the accuracy is high if their color are distinct. But if colors are same then it may mislead to classify the image. So this system can be further improved to yield more accuracy by combining other features, such as numbers of petals and flower texture. The accuracy of this system is more than 80%.

CHAPTER 3
AIM AND SCOPE OF THE PRESENT INVESTIGATION

3.1 AIM

The aim of the project is that to develop a program where it specify the species of the plant ,soil and weed by using deep learning method on image .As current rates of species loss triggered numerous attempts to protect and conserve biodiversity. Species conservation, however, requires species identification skills, a competence obtained through intensive training and experience. Field researchers, land managers, educators, civil servants, and the interested public would greatly benefit from accessible, up-to-date tools automating the process of species identification. Currently, relevant technologies, such as digital cameras, mobile devices, and remote access to databases, are ubiquitously available, accompanied by significant advances in image processing and pattern recognition. The idea of automated species identification is approaching reality. We review the technical status quo on computer vision approaches for plant species identification, highlight the main research challenges to overcome in providing applicable tools, and conclude with a discussion of open and future research thrusts.

3.2 SCOPE

The scope of the project is that system could help botanists and layman in identifying plant species rapidly. Deep learning is robust for feature extraction as it is superior in providing deeper information of images. In the existing system, a new CNN-based method named D-Leaf was proposed. The leaf images were pre-processed and the features were extracted by using three different Convolutional Neural Network (CNN) models. Leaves are commonly used in plant species recognition due to their availability throughout the year, especially, in the tropical areas. Many useful features can be acquired from a single leaf; such as, shape, texture, venation pattern, and colour. Each of these features could be extracted by different approaches; either through traditional morphometric measurement or machine learning methods. However, some approaches can be applied to obtain more than one feature, for