A Survey on Plant Classification Based on Multi Organ Features Using HGO-CNN

G.Kousalya[1], Dr. P.D. Sheba Kezia Malarchelvi[2]
M.E. Student[1], Professor & HOD [2],
Department of Computer Science and Engineering, JJ College of Engineering and Technology, Trichy, Tamil Nadu, India

Abstract: - **A good understanding of plants is essential to help in identifying new or rare plant species in order to improve the drug industry, balance the ecosystem as well as the agricultural productivity. Categorizations of plants are still remains a tedious task due to limited knowledge and information of world's plant families. Due to the intra or interspecies diversity of plants in nature, some species are difficult or impossible to differentiate from one another using only the leaf organ. Median Filtering is a noise removal algorithm that simultaneously reduces noise and preserves edges of input image. Here first propose a HGO-CNN (Hybrid Generic Organ – Convolutional Neural Network) model to automatically learn the generic and organ features representation for plant categories, replacing the need of designing hand-crafted features as to previous approaches. After having both organ and generic features migrate its convolutional layers to learn the fusion features. Second, we propose a new framework of plant structural learning based on recurrent neural networks (RNN), namely the Plant-StructNet. After classification of plant, the specific features and uses of the plant will be analyzing through this project.**

Keywords:-**Multi-organ, Plant classification, deep learning, CNN-HGO.**

I. INTRODUCTION

Plants play the vital role that provides the food and oxygen to all species in the world. Understanding the plants is essential to help for identifying new or rare plant species in order to develop the drug industry, to balance the ecosystem and also the agricultural productivity, sustainability. All botanists use variations on leaf characteristics as a comparative tool for their study on plant i.e., leaf characteristic are available to be experiential, annual plants or year-round in evergreen perennials and examined throughout the year in deciduous**.**

To identify the plant for the botanist computer makes it possible and easier task. The majority of computer vision selects leaf to identify, as leaf characters have been predominantly used to clarify plants. Characters such as size, texture, shape and venation are the common feature that is generally used to define the leaves in different species. Other than that, due to the interspecies or intra diversity in nature of plants, it makes us difficult to differentiate the plant species from one another by using the leaf organ.

In this paper the HGO-CNN model is used based on the model proposed with ILSVRC2012 dataset used for pre-training. Instead of training a new HGO- CNN architecture, re-used the pre-trained network due to a) our training set is not large as the ILSVRC2012 dataset indicated in the performance of the HGO-CNN model is highly depending on the quantity and the level of diversity of training set, b) recent work reported that the features extracted from the activation of a HGO- CNN trained in a fully supervised manner on large-scale object recognition works can be re-purposed to a novel generic task and c) training a deep model requires skill and experience. Also, it is time-consuming.

II. RELATED WORK

Angie K. Reyes [1] this research describes the contribution of the ECOUAN team in the Life CLEF 2015 challenge. Using a deep learning approach where the complete system was learned without hand-engineered components. This paper obtains a system for plant recognition based on Deep Convolution Neural Networks. Without involving techniques that are specific to plants the training strategy that allows the system to learn all layers end-to-end from data. This involves more domain knowledge in the design of the system which is beneficial to improve accuracy. The modification strategy explained to be a fair solution to transfer erudite recognition capabilities from general domains to the specific challenge of Plant Identification task. It is useful to take advantage of big visual data contains on the Internet, and then change the general recognition ability to specific domains.

Jana Wäldchen [2] to protect the biodiversity knowing the species knowledge is essential. It is difficult to identify the plant using the conventional keys also, more time consumption, due to the specific botanical terms that are annoying for non-experts. To the studied plant organ, and the studied features the method that is applied will categorize the plant, i.e., texture, shape, margin vein structure, and colour. In this study methods are compared based on classification accuracy achieved on publicly datasets available. The obtained results are based on researches in ecology as well as computer vision for their ongoing research. The systematic and concise overview will also be helpful for the starter in those research fields, as they can use the comparable analyses of applied methods as a guide in this complex activity.

Ivica Dimitrovsk [3] in this paper Life CLEF 2014 Plant Task runs on three. The bag-of-visual-words approach using the image descriptors for all three runs are obtained. For the leaf, scans are used in multiscale triangular shape descriptor and for the other plant organs, Opponent SIFT extracted around points of interest obtained using Harris-Laplace detector. To cluster these descriptors in large number of clusters/visual words (approximately 200K) Approximate k-means (AKM) algorithm is used. Each image in the test dataset and training is referred as a sparse high-dimensional histogram of term (visual word) occurrences. L2 distance over the obtained histograms is defined as the similarity between two images.

Jyotismita Chaki [4] this paper work proposed a new way for recognition digital leaf images of plant species. A new Shape Feature Selection Template (SFST) is developed to select the shape features for different types of leaf. The selection of the shape feature depends on the aspect ratio of the leaf images. Rather than extract all shape features for all leaf shapes, different shape features are selected for the categorization of different types of shapes. Six types of aspect ratios are considered in this study. For this reason six combinations of shape features are developed for the classification of six types (Very Wide, Wide, Narrow, Square, Narrow and Very Medium) of leaf images. Efficacy of the proposed method is studied by using neuro-fuzzy controller (NFC) and Neural Network (NN). New SFST approach is developed to select the different leaf categories with the shape features. A approach is followed which consist of a pre-processing method for normalizing the scale and orientation of different leaves, a shape analysis methods involving shape based modeling of the leaf.

Alexis Joly [5] this paper present the accurate knowledge of the identity, the geographic distribution and the development of living species is essential for a sustainable development of humanity also for biodiversity conservation. In this study the taxonomic gap is helpful for bridging the context using multimedia identification tools. An advance in a network bandwidth, digital devices/equipment, information storage capacity and the production of multimedia big data has certainly become an easy task. In similar the creation of large and structured communities of nature observers (e.g. eBird, Xeno-canto, TelaBotanica, etc.) that have started to produce outstanding collections of multimedia records become the fostered in the appearance of citizen sciences and social networking tools.

Sue HanLee [6] in this paper a deep learning approach to quantify discriminatory leaf is proposed where the Shape is not a dominant feature for leaf but rather the different orders of venation. The transformation of leaf features from general to specific types is found in the research. To define the leaf characters, find archived fit with the hierarchical botanical. To improve plant recognition performance learning the feature is must. To identify the rare plant species to the botanist, computer vision plays the vital role. By this, numerous studies have aims on procedures or algorithms that elaborate the use of leaf databases for plant predictive modeling, but these results in leaf features which are liable to change feature extraction techniques and with different leaf data.

Matthew D [7] this paper the ImageNet benchmark gets the impressive performance on recently demonstrated classification large Convolutional Network models. An introduction to the novel visualization technique which gives insight in the operation of the classifier and the function of intermediate feature layers. It also performs an ablation study to discover the performance contribution from different model layers. This paper ImageNet model, when the softmax classifier is retrained; it convincingly beats the current art results on Caltech-101 that generalize well to other datasets and Caltech-256 datasets. To other datasets ImageNet trained model can generalize well. For Caltech-101 and Caltech-256, the datasets are similar to that can beat the best reported results, in the latter case by a significant margin. This paper performance might improve in permitting multiple objects per image if a different loss function was used.

Lakhvir Kaur [8] this paper propose a comparison of supervised plant leaves classification using different approaches, that are based on different representations of these leaves, and the chosen algorithm. As a Beginning, the representation of leaves by a Centric Contour Distance Curve shape signature, by a fine-scale margin feature histogram, or by an interior texture feature histogram in 64 element vector. For each one, after trying the different combination among these features to optimize results. This makes the work easy by the biometric features of plants leaf like venation. Leaf biometric feature are analyzed using computer based method like artificial neural network based classifier and morphological feature analysis. In KNN model, it takes leaf venation morphological feature as an input and classifies them into four different species.

Abdul Kadir [9] this paper several methods are used to identify plants that have been proposed by several researchers. Commonly, the methods will not capture color information, because color was not identified as an important feature to the identification. In this research, color, and texture, shape and vein, features were combined that are included to classify a leaf. In this case the classifier that is uses, a neural network called Probabilistic Neural network (PNN). the method for classification gives average accuracy of 93.75% when it was tested on Flavia dataset that contains 32 kinds of plant leaves shows as the experimental result in this paper.

Sungbin Choi [10] the LifeCLEF Plant identification task 2015 participation describes in this paper. various images of plant parts such as leaf, flower or stem are given this task, it is about identification of plant species given multi-image observation query. For individual image classification, and combined image classification GoogLeNet is utilized as the results for plant identification per observation. This paper

achieved the best performance in this task in LifeCLEF Plant identification task 2015. For training the finetuning on the plant training set an applied GoogLeNet pretrained on ImageNet dataset is used. To improve their performance Training multiple CNNs and combining output is used. In this study, the other CNN architectural design options are explored and different classification result combination methodologies.

IV. COMPARISION & DISCUSSION

AUTHOR	TITLE	PURPOSE	ALGORITHM	LIMITATIONS
Angie K. Reyes	Fine-tuning Deep Convolutional Networks for Plant Recognition	Used deep Convolutional Neural Networks (CNNs) to extract features and classify images at the same time. CNN is pre-trained in a large collection of generic web images and to recognize plants with the highest possible accuracy.	Convolutional neural networks	Result is 20% worse due to the absence of plant specific strategies in technique.
Jana Wäldchen	Plant Species Identification Using Computer Vision Techniques:	A fuzzy k-nearest neighbors classifier was proposed. Fuzzy k-NN synthetically considers the congeneric number and the similarity between the k-nearest neighbors and the unknown sample.	systematic literature review (SLR)	The identification of plants by conventional keys is complex. This creates a hard to overcome hurdle for novices interested in acquiring species knowledge.
Jyotismita Chaki	Classification of Medicinal Plants: An Approach using Modified LBP with Symbolic Representation	Modified Local binary patterns (MLBP) is proposed to extract texture features from plant leaves. The classification is facilitated using a simple nearest neighbor classifier.	Shape Feature Selection Template (SFST)	Storage complexity is high. Computation complexity is high.
Alexis Joly	Multimedia Life Species Identication Challenges	CNN Classifier for video matching. Achieved by grouping the temporally connected video segments classified by the CNN.	FishCLEF	It remains a very time-consuming process. A content-based approach can then be much more difficult to knowledge-based approaches.
Sue HanLee	How deep learning extracts and learns leaf features for plant classification Working notes of CLEF 2015	Extract useful leaf features directly from the raw representations of input data using Convolutional Neural Networks (CNN). Gain intuition of the chosen features based on a Deconvolutional Network (DN) approach.	Deep learning algorithms for k-means	Increase the difficulty of the classification problem by constraining the varieties of leaf data to be seen by the CNN during training.
Matthew D	A Review on Plant Leaf Classification and Segmentation Proceedings	They classify the plants based on flowering and associative phenomenon. KNN model take input as the leaf venation morphological feature and classify them into four different species.	ImageNet benchmark	It was found that this process was time consuming and difficult. Long training time.
Lakhvir Kaur	Leaf Classification Using Shape, Color, and Texture Features in Proceedings of the 2016 ACM on Multimedia	A neural network called Probabilistic Neural network (PNN) was used as a classifier. shape and vein, color, and texture features were incorporated to classify a leaf.	KNN model	It is insensitive to slight discontinuity in the shape, such as a crack in a leaf. The fractal dimension is not a good texture descriptor.

V. PROPOSED FRAMEWORK

In this proposal paper the users of this system are paddy farmers. the prototype will be develop by using MATLAB 2013 a. 3 samples each of the normal, brown spot disease, narrow brown spot disease and blast disease will be used in this project. User uploads the plant images from dataset. Plant image contain different organs of specific plant species. Features of different plant species are extracted and stored in dataset. Species feature extraction process: Organ Feature, Generic Feature, Future Fusion, Future fusion perform CNN classification CNN classification is an algorithm that performs plant identification. Guidance to user description about the classification plant. This will also used to identify the diseases in the plant.

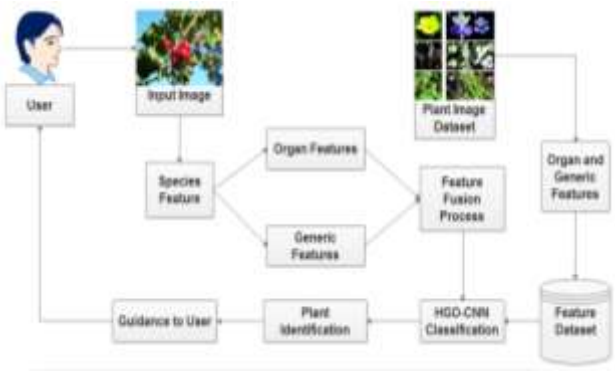

Figure: Plant classification based on multi organ features using HGO-CNN

VI. CONCLUSION

This paper studied a Multi-Organ Plant Classification approach to learn discriminative features from leaf images with classifiers for plant identification. This study on the justified that learning the features through CNN can provide better feature representation for leaf images compared to hand-crafted features. Further more, demonstrated that venation structure is an important feature to identify different plant species with performance outperforming conventional solutions.

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