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IDENTIFICATION OF AYURVEDIC MEDICINALPLANTS USING MACHINE LEARNING

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Abstract:

Identification of the correct medicinal plants that goes in to the preparation of a medicine isvery important in ayurvedic medicinal industry. The main features required to identify a medicinal plant is its leaf shape, colour and texture. Colour and texture from both sides of the leaf contain deterministic parameters to identify the species. This paper explores feature vectors from both the front and back side of a green leaf along with morphological features to arrive at a unique optimum combination of features that maximizes the identification rate. A database of medicinal plant leaves is created from scanned images of front and back side of leaves of commonly used ayurvedic medicinal plants. The leaves areclassified based on the unique feature combination. Identification rates up to 99% have been obtained when tested over a wide spectrum of classifiers. The above work has been extended to include identification by dry leaves and a combination of feature vectors is obtained, using which, identification rates exceeding 94% have been achieved.

Introduction:

India and has its roots in the Vedic times, approximately 5000 years ago. The main constituents of ayurvedic medicines are plant leaves and other parts of plants like root, bark etc. More than 8000 plants of Indian origin have been found to be of medicinal value.Over 80% of plants used in ayurvedic formulations are collected from the forests and wastelands whereas the remaining are cultivated in agricultural lands. In the ancient past, the Ayurvedic physicians themselves picked the medicinal plants and prepared the medicines for their patients. Today only a few practitioners follow this practice. The manufacturing and marketing of Ayurvedic drugs has become a thriving industry whose turnover exceeds Rs 4000 crores. . Incorrect use of medicinal plants makes the Ayurvedic medicine ineffective.

It may produce unpredictable side effects also. In this situation, strict measures for quality control must be enforced on Ayurvedic medicines and raw materials used. A trained Botanist looks for all the available features of the plants such as leaves, flowers, seeds, root and stem to identify plants. Except for the leaf, all others are 3D objects and increase the complexity of analysis by computer. However, plant leaves are 2D objects and carry sufficient information to identify the plant. Leaves can be collected easily and image acquisition may be carried out using inexpensive digital cameras, mobile phones or document scanners.

Keywords: Ayurvedic, Medicinal plants

Related Works:

A.Gopal et.al [1] implement a system using image processing with images of the plant

leaves as a basis of classification. The software returns the closest match to the query. The proposed algorithmis implemented and the efficiency of the system is found by testing it on 10 different plant species. The software is trained with100 (10 number of each plant species) leaves and testedwith 50 (tested with different plant species) leaves. The efficiency of the implementation of the proposed algorithms is found to be 92%.

Venkataraman et.al [5] a system is developed which would provide a solution for identifying the plant and providing it's medicinal values, thereby helping in the cure of many ailments in a natural way. This paper discusses about the dataset collection, feature extraction using texture and HOGand thereby classifying based on Support Vector Machine algorithm.

C.Amuthalingeswaran et.al [8] had built a model (Deep Neural Networks) for the identification of medicinal plants. To train the model auther used around 8,000 images belonging to four different classes. Finally, arrived with good accuracy of 85% when testing with images taken from the open field land areas.

Existing System

Medicinal plants are used as traditional herbal remedies for some illnesses and disorders such as diabetes, sweating and bleeding, regulation of the menstrual cycle, and reduction of extensive hemorrhage, stomach pain, inflammation, and toothache medicines take too much time to act,and the entire process is very slow. They contain various ingredients which sometimes causes allergic reactions. Herbal medicines are not good for serious cases such as heart attack and broken bones. These medicines are also ineffective in sudden illnesses and accidents.

Disadvantages

1) Identification of leaves can be time consuming and botanical names are hard to remember for the naive users.
2) This creates a hurdle for the users interested in acquiring the knowledge of plant leaves.
3) Plants can be identified by its multiple features likes leaves, flowers, fruits, stems, etc. Flowers and fruits are seasonal in nature and cannot is a viable factor for identification during off seasons.

Proposed System

It was easy for people in the earlier times to identify these leaves and map them to ailments. Using the latest technologies like Machine Learning and Deep Learning, we have explored a technological way of identifying these leaves for all the naive users. In this paper, we have described the implementation of Convolutional Neural Networks (CNN) for the identification of Indian medicinal leaves.

Advantages

1) CNN is fast and accurate
2) CNN architecture that extracts features using a combination of linear and non – linear techniques, including convolution and activation functions.

IMPLEMETATION DETAILS

CONVOLUTION NEURAL NETWORK

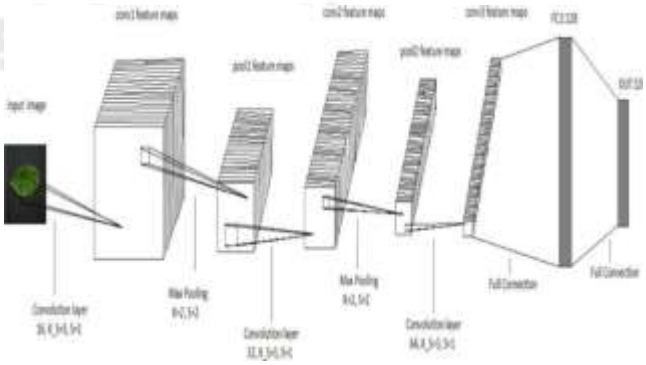


Figure: Convolution Neural Network

CNN is one of the types of neural networks which are widely used in computer vision

area. Its name stems from the form of secret layers it consists of. Usually a CNN's concealed layers comprise of convolutionary layers, pooling layers, completely linked layers, and layers of normalization. Here it simply means that convolution and pooling functions are used as activation functions.

LAYERS IN CNN

CNN is a controlled methodology in deep learning, and has developed a ground breaking influence on numerous applications focused on machine vision and images. The fields of which CNN is commonly employed include facial recognition, target identification, analysis of videos, etc. CNN platform components involve convection layers, pooling layers, completely linked layers, activation functions, etc.

1. **Convolution Layer:** For more processing the layer provides an RGB picture or an output ofanother layer as data. The obtained information is referred to as image pixels to produce a function map reflecting characteristics of low levels, such as edges and curves. Special characteristics at the higher level can be defined via a sequence of further convolution levels.

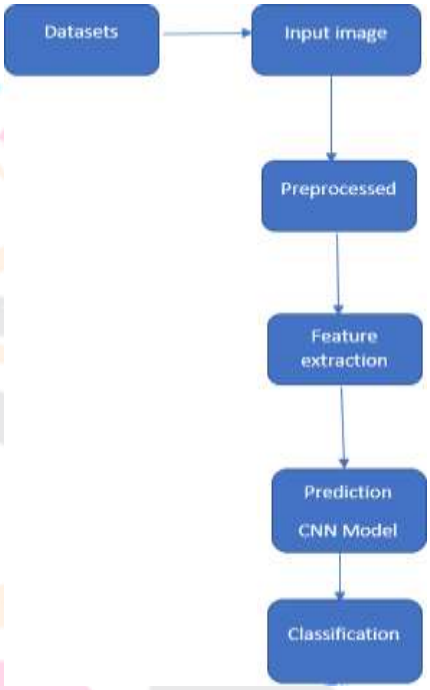
2. **Activation Layer :** Non linearity makes a network of neurons deeper. A Nonlinear activation layer shall be added directly after each layer Convolution stratum. Specific nonlinear mechanismsare used for Add non linearity.

3. **Rectified Linear Unit:** It improves the model's nonlinear property by altering the convolution layer's receptive field by altering all the lower values to 0.

4. **Pooling Layer :** After the activation layer a down sampling layer was added to raising the spatial aspect without any alteration in size. Typically, a size 2x2 input filter is applied to produce an output based on the pooling process. It may be expressed either by peak pooling or by average pooling where the limit or average value is calculated for each sub-region used in the filter.

5. **Fully Connected Layer** : This layer defines characteristics that are at a very large quality correlates to class or object. Entering a fully connected field layer is a collection of features for picture recognition without requiring to taking into consideration the spatial context of the pictures.

Methodology



1. The input test image is acquired and preprocessed in the next stage and then it is converted into array form for comparison.
2. The selected datasets is properly segregated and preprocessed and then renamed into proper folders.
3. The preprocessed input image is used by the feature extraction network. Feature extraction is very much important for the initialization of processing & extracted features of medicinal leafs and provides the result by comparing these features.

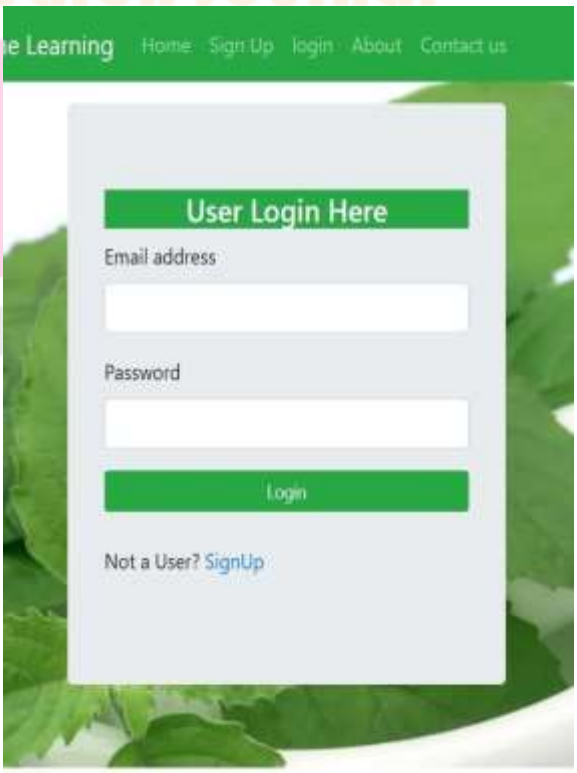
4. The model is properly trained using CNN and then classification takes place.
5. The comparison of the test image and the trained model take place followed by the displayof the result.

OUTCOMES

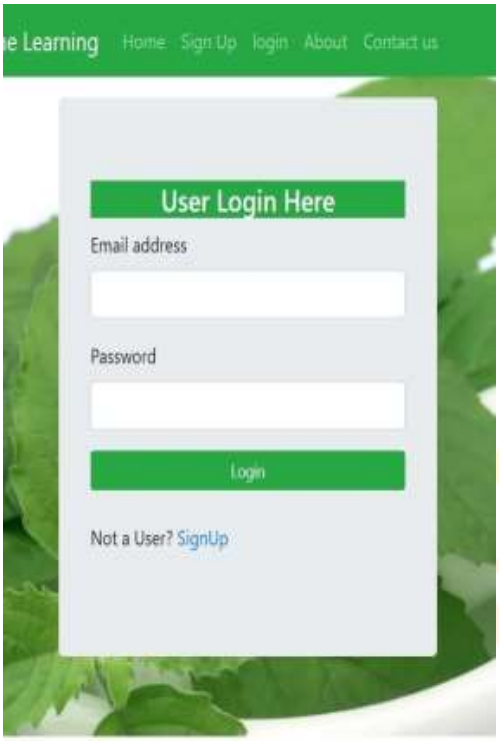
a. Home page

b. User Sign Up Page

c. User Login Page



d. Result



Conclusion:

A novel method for identification of Ayurvedic medicinal plants from images of front and back side of leaf has been proposed. The work is based on a database of leaf images of medicinal plants created by the authors. Unique combinations of morphological, colour and texture feature have been identified that maximizes identification rate of green leaves. a unique methodology for identification of Ayurvedic medicinal plants from images has been proposed. This CNN (Convolutional neural network) application aims to provide individuals with knowledge about Ayurvedic plants that can be discovered locally so that they can use them more effectively.

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