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Medical Herb Identification and It's Benefits

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Abstract - *Medical herb identification is the systematic process of recognizing and distinguishing various plant species based on their botanical characteristics, ensuring accurate use in herbal remedies. It is an essential skill for herbalists, holistic healthcare practitioners, gardeners, and individuals interested in harnessing the healing power of nature. The benefits of this knowledge are far-reaching. Medicinal herbs offer a natural and holistic approach to healing, addressing not only symptoms but also the underlying causes of health issues. They have a rich cultural heritage, with traditional wisdom passed down through generations. Medicinal herbs provide versatile applications, from alleviating minor ailments to supporting chronic conditions. They can complement conventional medical treatments and offer a more personalized approach to health and well-being.*

Key Words: Botanical Identification, Herbal Monographs, Herbal Formulations, Medicinal Plant Conservation, Convolutional Neural Network (CNN).

1.INTRODUCTION

Medicinal herbs have been a cornerstone of healthcare and healing practices across cultures and centuries. Identifying medicinal herbs is a critical skill for those interested in herbal medicine. Medicinal plants encompass a wide array of species that possess therapeutic properties, ranging from treating common ailments to addressing more complex health issues. The exploration and documentation of these botanical resources involve a multidisciplinary approach, incorporating elements of botany, pharmacology, ethnobotany, and traditional knowledge. Different herbs can look quite similar, and the wrong identification can lead to ineffective or potentially harmful remedies. Proper identification involves studying the plant's characteristics, such as its leaves, stems, flowers, roots, and even its habitat. For accurate identification, one may need to consult field guides, botanical experts, or use smartphone apps designed for this purpose. This model, rooted in the convolutional neural network (CNN) algorithm, holds the potential to revolutionize medicinal herb detection. This introduction sets the stage for a comprehensive exploration of the methods, tools, and significance of identifying medicinal plants. As we embark on this journey, we aim to provide a nuanced understanding of the diverse plant kingdom and its potential contributions to the field of medicine while ensuring that the information presented is rooted in original research and respect for intellectual property.

2. PROPOSED WORKFLOW

In this module, there are n number of users present. User should register themselves before doing any operations. Once the user registers, their details will be added to the database. We take image as an input and Pre-process it. The next step is Feature Extracting, here we use the CNN algorithm for identification purpose and give the output. In this Web Application, we traversed that information when presented in an efficient and well-designed manner, can be easily understandable by any kind of user.

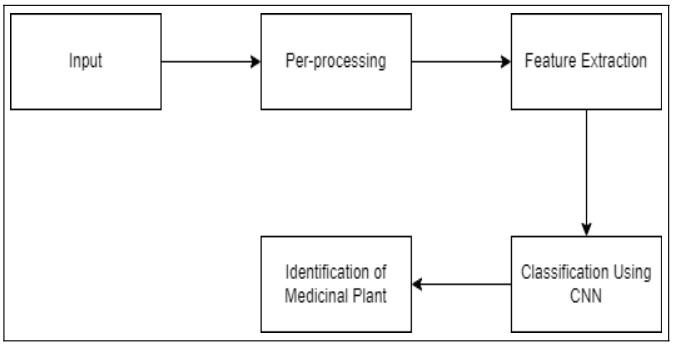

Fig -1: Flow Diagram

3. INNOVATION

Develop the ability to accurately identify a wide range of medicinal herbs based on their botanical characteristics. Acquire a comprehensive understanding of the scientific classification, taxonomy, and plant families of medicinal herbs. The "benefits" part is new in this project which increases the scope of this project. We also aim to achieve higher accuracy by training data set and implementing different algorithms.

4. DEEP LEARNING ARCHITECTURE

In the ever-evolving landscape of artificial intelligence, deep learning stands out as a transformative paradigm that has significantly advanced the capabilities of machines to emulate human-like intelligence. At the core of this revolutionary progress lies the intricate architecture that powers deep learning models. The architecture serves as the blueprint, orchestrating the interplay of layers, nodes, and weights to enable machines to learn and make decisions autonomously.

Deep learning is not a one-size-fits-all approach, and various architectures have been tailored to address specific tasks and challenges. Convolutional Neural Networks (CNNs) excel in image recognition, recurrent neural networks (RNNs) capture temporal dependencies in sequential data, and transformer architectures have revolutionized natural language processing tasks. Each architecture brings its unique strengths to the table, contributing to the versatility of deep learning in diverse domains.

4.1 CONVOLUTIONAL NEURAL NETWORK (CNN)

CNNs offer various benefits, including being more similar to the human visual processing system, having a structure that is well tuned for processing 2D and 3D pictures, and being good in learning and extracting abstractions of 2D characteristics. Convolution, max-pooling, and classification are the three layers that make up the CNN architecture. Convolutional layers and max-pooling layers are the two types of layers in the network's bottom and middle levels.

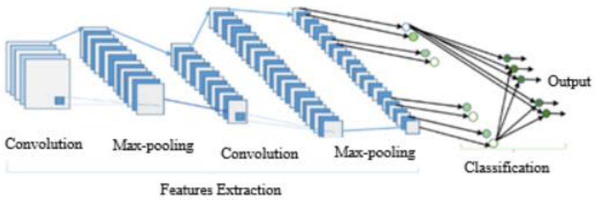

Fig -2: Architecture of CNN

4.1.1 VGG-16 AND VGG-19

VGG-16 consists of 16 layers and VGG-19 comprises 19 layers based on VGG architecture. In general, VGG Net is a simple architecture composed of five sets of convolution layers that use (3 × 3) kernels. The activation function ReLU (Rectified Linear Unit) is applied after each convolution layer and max pooling use (2 × 2) kernels after each set to reduce spatial dimension. At the end are the three fully connected layers where the first two layers have 4096 units and the final layer with 1000 fully connected softmax. Some of the limitations of both VGG-16 and VGG-19 includes more memory usage, more parameters and expensive evaluation.

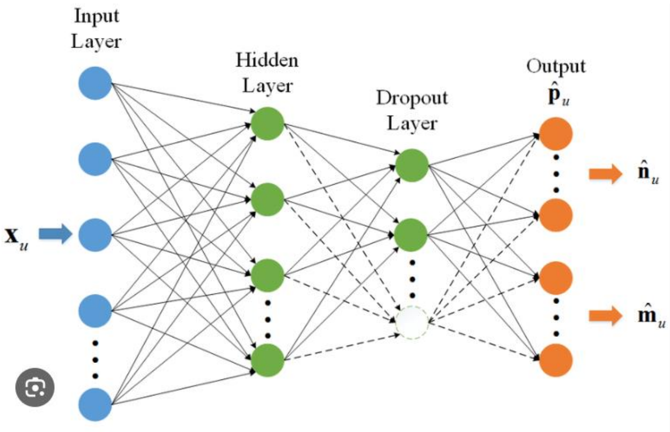

Fig -3: Architecture of VGG16

4.1.2 INCEPTION V3 AND XCEPTION

Inception network V3 is ideally a convolution extractor of the features and learns complex representations with few parameters. Here, one convolution kernel can map simultaneously the spatial and cross channel correlations by factoring explicitly into a series of operations. The Xception architecture is one of the latest and accurate models developed in 2017. The vital concept of the model is based on depthwise separable convolutions and residual connections. It is stimulated by the Inception architecture, where the modules in inception are replaced by depthwise seperable convolutions. Here, the modified depthwise convolution in Xception means(1 × 1) convolution (pointwise convolution) is followed by channel-wise spatial convolution (n×n). The model is much lighter with few connections. Xception stands for "Extreme Inception" and outperforms Inception V3 on the ImageNet database exclusively for image classification. The parameters used are very similar in both models. Xception consists of 36 convolution layers structured into 14 modules and three major flows known as entry flow, middle flow and exit flow.

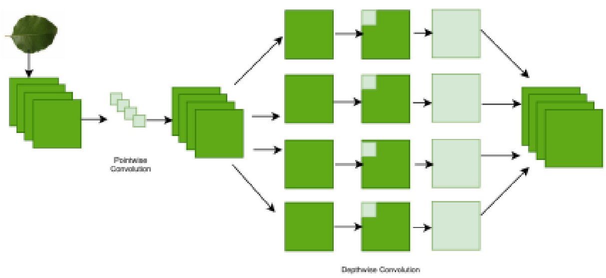

Fig -4: Architecture of XCEPTION

The images in the training set are forwarded first to the entry flow, which generates the feature maps. The feature maps are further fed to the middle flow (repeated eight times). Lastly, the feature maps in exit flow generate 2048 – dimensional vectors. The separable convolutions are followed by batch normalizations. The implementation of this architecture is much simpler in Keras.

4.1.3 SUPPORT VECTOR MACHINE

The SVM is a classical supervised learning method with high capability in dealing with bigger dimensional space and nonlinear data points. SVM aims to keep the maximum marginal distance between the data points of the classes to be classified. This marginal distance indicates the farthest distance from the decision boundary. The position of the separating hyperplane is decided by the data points lying closer to the hyperplane. In the research, two models are developed using an SVM classifier, where one model consists of an SVM classifier without application of Bayesian optimization technique and another model optimizes SVM hyperparameters (kernel and values) using the Bayesian algorithm on the featured data to improve the accuracy and the execution speed. The parameter, known as cost parameter controls the compromise between the correct classification of training data points and the smooth decision boundary. To provide the best predictive power of the model, the hyperparameter tuned for SVM

5. METHODOLOGY

1. When identifying medicinal herbs in the field, it's essential to use field guides, smartphone apps, and botanical keys to narrow down the possibilities.

2. To enhance efficiency, carry a checklist or a reference guide specific to the region you are exploring.

3. When in doubt, consult with experts in botany, ethnobotany, or herbalism. They can provide valuable insights and help you identify herbs accurately.

4. Utilize modern technology, such as smartphone apps and online databases, to assist in herb identification.

5. Tap into traditional knowledge, such as indigenous or local wisdom, to identify medicinal herbs.

6. Maintain detailed records of the herbs you encounter, including photographs, descriptions, and habitat information.

6. LITERATURE SURVEY

Title	Author	Methodology
A CNN Model for Herb Identification Based on Part Priority Attention Mechanism	Yangyang Zhao, Zhanquan Sun, Engang Tian	This project utilizes Gather a comprehensive dataset of images and information related to various medicinal plants, including leaves and flowers. Here first introduce the proposed staged training strategy, which is used realize the priority attention mechanism. Then, the details of PPM and SCM are discussed. The data sensitivity and label smoothing technology are introduced at last subsection.
Identification of Medicinal Leaves Using State of Art Deep Learning Techniques	Leena Rani A, Devika G. Vinutha H. R, Asha Gowda Karegowda	Annotate each image with the corresponding medicinal plant species and other relevant information, such as geographical origin and medicinal properties.
Identification of Medicinal Plants by Visual Characteristics of Leaves and Flowers	A.D.A.D.S. Jayalath, T.G.A.G.D Amarawanshaline, D. P. Nawinna	Gather a comprehensive dataset of images and information related to various medicinal plants, including leaves and flowers.
DeepHerb: A Vision Based System for Medicinal Plants Using Xception Features	S. ROOPASHREE , AND J. ANITHA3	A diverse dataset of high-quality images of medicinal plants, covering various species and variations. Ensure the dataset is well-labeled with accurate plant species information. Here research focuses on automated identification of medicinal herbs using transfer learning technique in deep learning. The previous studies and review of the latest works prove that the use of transfer learning is a better approach to classify any images when the target dataset is limited in size.
Prediction of Herbs with its Benefits using Deep Learning Techniques	SHARMILA BEGUM. M, HARIS. R, VETRIMARAN. V	Design a deep neural network architecture for herb recognition and benefits prediction.

7. CONCLUSIONS

In conclusion, the study of medical herb identification and its benefits is a fascinating and valuable journey that offers a wealth of knowledge and practical applications. Understanding the identification and uses of medicinal herbs empowers individuals to take control of their health, embrace natural healing, and connect with cultural traditions.

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