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# Comparison of CNN Frameworks for Medicinal Herbs Identification

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**A B S T R A C T**

The study explores the application of Convolutional Neural Networks (CNN) for medicinal plant identification using various established frameworks such as VGG 16, ResNet-50, ResNet-101, Inception V3, DenseNet-121, Xception, AlexNet and MobileNet. The study highlights the importance of medicine in human life and highlights its various contributions including Ayurveda, medicine and many different factors. The study emphasizes the importance of leaf characteristics - color, shape, texture, leaf size, size and structure - in identifying medicinal plants. In addition, the research examines and optimizes leaf characteristics to maximize plant recognition speed. The purpose of determining medicinal herbs is useful for botanists, researchers, professionals, as study material for students, etc.

**Keywords:** VGG16, RESNET50, InceptionV3, DenseNet121, Xception and MobileNet.

## Introduction

Medicinal plants have gained considerable popularity due to their cost-effectiveness and minimal side effects compared to synthetic drugs, and they provide a wide range of beneficial compounds such as hepatotoxic, antibacterial and anti-inflammatory agents. The global dependence of these plants for pharmaceutical production, accounting for a quarter of all prescription drugs, underlines their central role in health care, especially since 65 to 80 percent of the population uses them for healing. However, the lack of identification experts and the time-consuming manual identification process highlight the urgent need for an automatic classification system for medicinal plants.

This need has led to research on machine learning and deep learning algorithms for classification of medicinal plants, focusing on feature extraction, training/testing of classification steps, and their impact on performance. The importance of leaves in plant identification is emphasized due to their 2D nature and uniform characteristics, which supports their use as a primary image source. In addition, the introduction of convolutional neural networks (CNN), particularly Densenet121, has shown promise for accurate identification of medical pages. The aim is to support botanists, taxonomists and pharmaceutical manufacturers to improve the quality of medicines and reduce the side effects of error detection.

It also highlights the critical importance of plants as a source of food and medicine for the world and its population, the importance of correct classification of plants for drug development, and the industry's challenges due to manufacturing misspecification and quality control issues in this context. Finally, advances in computer vision methods, especially CNN models such as Resnet50, ResNet101 and DenseNet, have shown significant potential to improve the accuracy of datasets such as VNPlant-200, thus contributing to the development of automated plant detection systems.

Valued for their cost-effectiveness and low side effects, medicinal plants make an important contribution to global healthcare, accounting for a quarter of all prescribed medicines. With 65-80% of the population trusting them, their importance is obvious. However, the lack of an expert to identify plants requires an automatic system. The solution comes from machine learning and deep learning, which focus on magazines as the most important identifiers. Convolutional neural networks like Densenet121 show promise and help botanists and drug manufacturers. The need for accurate classification of plants, considering their role in medicine and food, highlights the urgency, and advances in computer vision, especially Resnet50 and DenseNet, show progress in automatic identification systems.

The increasing popularity of medicinal herbs is due to their economic viability and few side effects, which makes them central to global health care, where they constitute a significant proportion of prescribed medicines. With a significant majority, 65 to 80 percent of the population, involving them in treatment efforts, the need for an automated classification system for these facilities has become increasingly urgent. This led to the study of machine learning and deep learning algorithms, especially on leaves, which are optimal sources for image acquisition due to their uniform characteristics and 2D nature.u

## Methodology

The Methodology for comparing CNN-frameworks for medicinal plant identification will depend on the specific CNN-frameworks being compared and the characteristics of the data. Here are a few general steps that might be involved in this process.

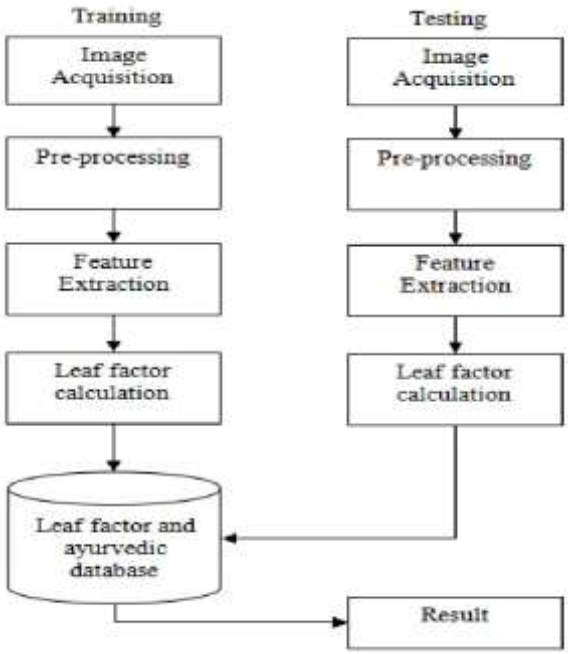


**Fig. 1 – Methodology Flow**

**Image acquisition:** means taking pictures or capturing visual data using cameras, scanners or sensors. These devices transform real things or scenes into digital images that computers can store, process or understand. There are several ways to do this: cameras use lenses to convert light into digital images, scanners convert physical things into digital ones, sensors detect things like infrared or ultraviolet light to make digital images, and even our phones and tablets have cameras. pictures This whole process is very important in fields such as medicine, monitoring, photography and other fields. How clear, detailed and accurate the images are is really important because it affects how well computers work with them later.

**Preprocessing:** means preparing things before working with them. Images or information are cleaned or organized to make them easier to use. This may include, for example, removing errors or unwanted parts, changing sizes or formats to prepare the data for analysis or further processing. It's like cleaning before you start working to make everything smoother and more understandable.

**Feature extraction:** At this point, several functions are extracted from the file segmented image and effective features are selected classification of additional crops. Extraction of different features techniques give different results and detection Improving proper functions is one of the critical tasks of the factory identification.

**Calculating the leaf factor:** Involves working out the details of specific pages. It is like measuring or studying different aspects of leaves such as size, shape or texture. This information helps in understanding and classifying leaves, especially identifying different plants based on their unique leaf characteristics. These leaf counts or measurements are important in studies related to plant identification or classification.

**Leaf Factor in Ayurvedic Database**: Focuses on understanding the properties of leaves. It examines characteristics such as shape, size, structure and other details characteristic of medicinal plant leaves. This information helps identify and classify plants based on their leaf properties, supports the classification and study of plants used in Ayurvedic medicine based on their medicinal properties.

## COMPARISON TABLE

The study thoroughly investigates the use of Convolutional Neural Networks (CNN) to identify medicinal plants in Vietnam. It evaluates well-known frameworks such as VGG16, RESNET50, InceptionV3, DenseNet121, Xception and MobileNet. The research highlights the vital role of vegetation in human life and highlights its multiple benefits such as oxygen production, food and medicinal resources. Leaf characteristics—color, shape, and texture—are emphasized because of their central role in defining medicinal plants. The study explores both sides of green leaves by assimilating morphological features to optimize the speed of plant identification, using a database of scanned leaf images to refine this identification process

.The table shows the results of these CNN frameworks trained and tested on a publicly available dataset. Precision, accuracy, and recall metrics were used to evaluate the performance of these algorithms, and the CNN frameworks achieved the highest precision, accuracy, and recall rates among the tested frameworks. Overall, the comparison table provides valuable information about the performance of different CNN-based frameworks for medicinal plant identification. This information can help researchers and practitioners make informed decisions about the selection of CNN algorithm-based frameworks for drug identification and management, ultimately leading to more effective and efficient control strategies for medicinal plant identification.

| Frameworks of CNN-Algorithms | Study | Datasets | Training/ Validation/ Test split | Accuracy | Precision | Recall | F1 Score | Other Details |
|---|---|---|---|---|---|---|---|---|
| ResNet-50, ResNet-101 | Rong Ding et al (2023) | 5700 images | 60-40 | (ResNet-101) 93.42% | 93.46% | 98.90% | 98.61% | UAV (Unmanned Aerial Vehicles) |
| Inception V3, AlexNet | Rajni S et al (2022) | 1500 images from 100 different species | Training and Testing is based on multiple dataset used | 98.7% | 95% | 92% | 99.4% | Flower images Used |
| DenseNet-121, VGG16 | R. Upendra Rao et al (2022) | 3777 images | 50-50 | 93.3% | N/A | N/A | N/A | Leaf, Shape, Color and Texture. |
| VGG16, ResNet-50, ResNet-101, Inception V3, Dense-121, Xception, MobileNet. | Trung Nguyen Quoc et al (2020) | VNPlant-200 20,000 images of 200 categories | 50-10-40 | (Xception) 88.26% | N/A | N/A | N/A | Deep CNN architecture used |

**Fig.2-Comparison Table**

Accuracy is an important metric to evaluate the performance of a deep learning algorithm. It is defined as the percentage of correctly predicted cases. In this study, the CNN algorithm framework Inception V3 and AlexNet achieved the highest accuracy of 98.7%, while the other frameworks showed lower accuracy compared to Inception V3 and AlexNet. Accuracy measures the proportion of true positives (correctly identified cases) from the total number of predicted positives. This is a useful metric for evaluation ability to identify real herbs without false positives. CNN algorithm frames showed the highest accuracy of 95 percent . Recall is another important metric that evaluates an algorithm's ability to detect true positive cases. It is defined as the ratio of true positives to total true positives. CNN algorithm frames again had the highest recovery of 98.90%. Frameworks for CNN algorithms in general outperformed other algorithmic frameworks in all metrics, demonstrating its effectiveness in identifying medicinal plants. However, it is important to note that the performance of these algorithmic frameworks may depend on several factors such as the size and quality of the dataset, the choice of evaluation metrics, and the complexity of the algorithm framework. Overall, the results presented in the table show that the CNN algorithm is a promising approach for medicinal plant identification, and further research in this field can improve the accuracy, precision and recovery of these algorithms and framework, ultimately leading to more efficient identification of medicinal plants.

## CONCLUSION

New smart computer techniques help predict how many plants will grow on plains. They use a special technology called ResNet-101 and better data to find plants accurately. They also try to sort plants by leaves or flowers using smart computers that learn, such as BOF and InceptionV3. People are also finding ways to quickly identify herbs using science and computers. These smart computer models like the VNPlant-200 are good, but could improve with more plant images. This combination of technology can make learning about different plants easier, but it still requires more work and larger collections of plant images to improve.

**References**

[1] Rong Ding,Jiawei Luo "Identifying and Mapping Individual Medicinal Plant Lamiophlomi's Rotata at High Elevations by Using Unmanned Aerial Vehicles and Deep Learning", Creative Commons Attribution 4.0 (2023).

[2] Rajni S, Veena M.N "Ayurvedic Plant Identification Based On Machine Learning and Deep Learning", Fourth International Conference On Emerging Research in Electronics CS and Technology (2022).

[3] R. Upendar Rao, M. Sai Lahari "Identification of Medicinal Plants Using Deep Learning", International Journal for Research in Applied Science and Engineering Technology(IJRASET) 2022.

[4] Stephen Opoku Oppong, Frimpong Twum "Medicinal Plant Identification Using Gabor Filters And DL Techniques" , Journal of Computer Science 17(12) 2021.

[5] Wenting Chen, Jiayun Tong "An easy method for identifying 315 categories of commonly-used Chinese herbal medicines based on automated image recognition using AutoML platforms", Informatics in Medicine Unlocked 25 (2021).

[6] Rosyani, Perani, A. Suhendi, D. H. Apriyanti, and A. A. Waskita. “Color Features Based Flower Image Segmentation Using K-Means and Fuzzy C-Means”, Building of Informatics, Technology and Science (BITS) 2021.

[7] Gopi, E. S. “An hierarchical approach for automatic segmentation of leaf images with similar background using kernel smoothing based Gaussian procress regression”, Ecocological Informatics 63 (2021).

[8] Sunyong Yoo, Hyung Chae Yang “A Deep Learning-Based Approach for Identifying the Medicinal Uses of Plant-Derived Natural Compounds”, School of Electronics and Computer Engineering, Chonnam National University, Gwangju, South Korea (2020).

[9] Yutao Shao, Kuo-Chen Chou “A CNN Model for Predicting Subcellular Localization of Virus Proteins by Deep Learning”, Scientific Research Publishing Inc (2020).

[10] Trung Nguyen Quoc, Vinh Truong Hoang “Medicinal Plant Identification in the wild by using CNN”, International Conference on Information and Communication Technology Conversions (ICTC) 2020.