

# Identifying Medicinal Plants and Their Fungal Diseases

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**Abstract**—Today, with the development of technology, most manual methods are replaced by automated computer systems for the easiness of human beings. Plant identification and disease classification are two major agricultural research areas, focusing on introducing computerized systems rather than manual methods. Many researchers used various identification and classification techniques using computer-based systems as human classification errors lead to risk and high cost. Medicinal plant identification needs an expert to correctly identify plants because misidentifying poisonous plants as medicinal plants causes fatal cases. Further, taking diseased medicinal plants to prepare medicines and herbal products may have adverse effects. Therefore, this study proposed a computerized method to identify medicinal plants and classify their diseases to overcome such shortcomings. In this work, a comparison is done with Convolutional Neural Network (CNN) architecture from scratch and Transfer Learning with several experiments. Transfer learning models achieved higher accuracy than CNN architectures for medicinal plant identification with 99.5 % accuracy and medicinal plant disease classification with 90% accuracy, respectively.

**Keywords**—CNN, Transfer Learning, Medicinal Plant Identification, Disease Classification

## I. INTRODUCTION

Millions of plant species are in the world and play a significant role in human life. Among all the types of plants, medicinal plants play an essential role in the traditional medical field because herbal plants can heal humans. Recently, WHO (World Health Organization) mentioned that 80% of people use herbal medicines to fill their health requirements, and approximately there are 21000 medicinal plants worldwide [1]. Apart from medicinal uses, herbs can be used in drug development, cosmetology, natural dye, pest control, perfume, tea, and so on [2].

Among Asian countries, Sri Lanka has 3000 years of huge history of conventional medicine. In Sri Lanka, the traditional medicine system contains four types: Ayurveda, Siddha, Unani, and Deshiya Chikitsa (or Indigenous medicine) [3]. Indigenous medicine is the endemic medicinal system of Sri Lankans. Thus, it is called "Sinhala wedakama" or "Helawedakama", related to Sinhala culture, Sinhala language, and Buddhism. The combination of Ayurveda and Indigenous medicine introduces the "Sri Lankan Ayurveda" system [4]. Sri Lanka has a rich biodiversity with many plant resources, especially medicinal plants [5]. Today, around 60-70% of the Sri Lankan population uses medicinal plants for their primary healthcare needs [6].

Identification of valuable medicinal plants is beneficial for day to day lives of some people. But it is a complex process if we are not aware of it before. Another thing is that medicinal crops also can be infected with plant diseases. It is essential to know if the plant is infected because that disease

can cause to destroy the other valuable plants by spreading the illness. But there needs to be a proper way to assist people and farmers in protecting the quality of medicinal plants from diseases. Damaged or infected medicinal plants cause to reduce the quality of the product or treatment, and the infected infection can spread over the human body through therapeutic methods [7]. The classification of healthy and defective leaves is more significant in medicinal plants than in other agricultural plants because practitioners take the leaf as the primary input ingredient for most production purposes and treatments.

Medicinal plants are the foundation of traditional medicine and herbal products. There is a high probability of human error in the identification and disease classification of such plants. Hence an easy and effective way is required instead of time-consuming methods such as human eye and laboratory tests. This study proposed a better solution for identifying medicinal plants by classifying diseased leaves to overcome the issues mentioned earlier in the manual techniques. Hence, it can help botanists, laboratory technicians, doctors, patients, farmers, medicinal plant collectors, students, and others who use and are engaging in medicinal plants and related analysis in Sri Lanka.

This work is primarily expected to design an efficient herbal plant identification system to classify diseased leaves to assist people, using computer vision with the help of Artificial Intelligence, including the improvements of the existing systems. The subsidiary objectives of this study are pointed out below:

- Collect an excellent medicinal plant dataset.
- Implement several models and get the performance comparison.
- Design an interactive web application to recognize medicinal plants and their diseases to assist human beings.

## II. LITERATURE REVIEW

A. Gokhale et al. [8] proposed an automated system for identifying medicinal plants from leaves using image processing and machine learning techniques. The leaf image dataset used here is a Flavia leaves dataset, consisting of 1907 images of medicinal plant leaves, and for image segmentation, researchers used the threshold Segmentation method. 82.69%, 83.04%, 72.90%, and 82.99% accuracies were observed for Support Vector Machine (SVM), Logistic Regression (LR), Naive Bayes (NB), and K Nearest Neighbor (KNN) algorithms, respectively. After cross-validation of the extracted features, the accuracies were 78.74%, 78.85%, 71.23%, and 79.49%, respectively. M. Jayanka and T. Fernando presented a computer system to recognize Ayurvedic plant leaves in Sri Lanka using deep learning