MEDICATIVE PLANT CLASSIFICATION A REVIEW

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ABSTRACT— Since ancient Vedic times, plants have served as a fundamental source of medicinal components in Ayurveda. The critical initial step in Ayurvedic medicine preparation involves the manual identification of the correct plant. However, with the growing demand for mass production, there is an imperative need for automating the identification process. This article presents a new approach that uses convolutional neural networks (CNN) to automatically identify medicinal plants.The system is built upon a comprehensive dataset containing Medicinal plant varieties, and its core classification model is trained using the powerful ResNet 50 architecture, which excels in deep learning image recognition tasks. Integrated with a Flask-based user interface, the system allows users to upload plant images, automatically present detailed information about the identified medicinal plant using Gemini API. The technique leverages various features such as shape, size, color, and texture to enhance the accuracy and efficiency of the identification process. The integration of modern technology with traditional medicinal practices addresses the challenges posed by mass production demands in the realm of Ayurvedic medicine.

KEYWORDS- Medicinal Plants, Machine Learning, Automated Classification, Image Processing.

I. INTRODUCTION

Ayurveda, an ancient system of medicine originating in India around 5000 years ago, holds its roots in the Vedic times. Central to Ayurvedic treatments are medicinal plants, encompassing various components such as leaves, roots, and bark. Among the vast array of Indian flora, more than 8000 plants have been recognized for their medicinal value, with approximately 1500 forming a subset commonly employed in herbal medicines across different Indian systems. Notably, 500 of these plants are specifically included in commercial Ayurvedic medications. Traditionally, Ayurvedic physicians personally picked medicinal plants from woods and wastelands, creating medications for their patients. However, with evolving environmental conditions, humanity faces new challenges in the form of life-threatening viruses and illnesses. The recent global pandemic, exemplified by COVID-19, underscores the urgency of developing immediate solutions to combat emerging health threats.

Addressing emerging viruses and disorders presents considerable challenges for the pharmaceutical and medical industries.The need for swift and effective solutions has never been more critical. Medicinal plants emerge as a valuable resource, offering new properties that pharmacists and medical practitioners can harness in the quest for defenses against life-threatening viruses and illnesses. This project aims to bridge traditional Ayurvedic knowledge with contemporary challenges in medicine. Through the implementation of advanced techniques, particularly focusing on the utilization of Convolutional Neural Networks (CNN) and various features like shape, size, color, and texture, we seek to automate the identification process of medicinal plants.

II. LITERATURE REVIEW

1. A. Gopal et. Use pictures of plant leaves as the foundation for classification in an image processing system. The software finds the nearest match for the query. We put the suggested method into practice and used ten plant types to assess system efficiency. 100 leaves (10 of each plant species) are used to train the software, and 50 leaves (of various plant species) are used for testing. 92% efficiency was attained when the suggested methods were put into practice.

2. Umme Habiba et. al The Multichannel Modified Local Gradient Pattern (MCMLGP), a novel texture-based feature descriptor that employs various color image channels to extract more important features to enhance classification performance, is presented in this paper for the automatic classification of medicinal plants. The authors used SVM classifiers with different kernels, including linear, polynomial, and HI, to train their suggested method. Through thorough tests, we also employed a variety of feature descriptors for comparative experimental analysis with MCMLGP on our dataset of medicinal plants. The suggested method outperforms previous methods in terms of accuracy (96.11%) and is highly beneficial for the investigation and advancement of the classification of medicinal plants.

3. R. Janani et. al In order to determine the precise leaf class, a technique for extracting form, color, and texture data from leaf photos and training an artificial neural network (ANN) classifier has been developed. The choice of appropriate image input features is crucial for achieving high efficiency with minimal computing complexity. They experimented with various input feature combinations to assess the network's accuracy. Test findings on 63 leaf pictures show that this method achieves 94.4% accuracy with at least 8 input features. For leaf identification systems that require less processing time and minimal input, this method is more common.

4. Vijayashree. T et. al has compiled 127 herbal leaves into a database. Eleven texture parameters are considered when building a database. The parameters are inverse difference moment, mean, sum average, sum of variance, correlation, aspect ratio, and sum entropy. The gray level co-occurrence matrix, or GLCM, is used to calculate metrics such as energy, contrast, homogeneity, and entropy. A test image is taken and compared with the database; the dissimilarity is calculated with the extracted parameters. The output is shown after identifying the leaf with the least amount of dissimilarity.

5. Venkataraman et. al A method for recognizing the plant and determining its therapeutic properties is devised, which will aid in the natural treatment of numerous illnesses. The gathering of datasets, feature extraction using texture and HOG, and classification using the Support Vector Machine technique are all covered in this work.

6. Shitala Prasad et. A novel and effective method for leaf acquisition is presented in this research.The image is converted into a device-independent lαβ color space, which is then utilized to extract features using the VGG-16 model. The derived feature map is projected onto a PCA subspace to improve species recognition performance. The robustness of this approach is validated using two distinct plant leaf datasets.

7. Dileep M.R et. al This study suggests Ayur Leaf, a Convolutional Neural Network (CNN) model based on Deep Learning, for the classification of medicinal plants based on leaf characteristics such size, shape, color, and texture. This study also introduces a standardized dataset of medicinal plants that are commonly found across different regions of Kerala, a state located on the southwestern coast of India. The introduced dataset comprises leaf samples from 40 different medicinal plant species. A deep neural network inspired from Alex net is utilized for the efficient feature extraction from the dataset. Ultimately, classification is carried out using both SoftMax and SVM classifiers. Our model, upon 5-cross validation, achieved a classification accuracy of 96.76% on Ayur Leaf dataset. Ayur Leaf helps us to preserve the traditional medicinal knowledge carried out by our ancestors and provides an easy way to identify and classify medicinal plants.

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

9. Manojkumar P. et. al 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 the front and back side of leaves of commonly used ayurvedic medicinal plants. Leaf classification is performed using distinctive feature combinations, achieving identification accuracies of up to 99% across a diverse range of classifiers. This work has been further extended to enable the identification of dry leaves, utilizing a combination of feature vectors that yielded identification accuracies exceeding 94%.

10. Amala Sabu et. al The proposed system uses a combination of SURF and HOG features extracted from leaf images and a classification using k-NN classifier. The experimental results demonstrate promising accuracy levels, indicating the feasibility of developing real-world applications based on this approach

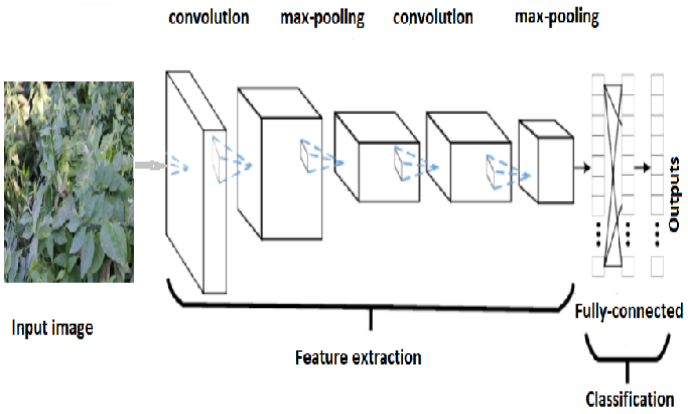
III. METHODOLOGY

The proposed system, Medicinal Leaf, introduces a sophisticated Convolutional Neural Network (CNN) model built on deep learning principles for the purpose of classifying medicinal plants. By analyzing distinctive leaf features like shape, size, color, and texture, the system aims to enhance the precision and efficiency of medicinal plant classification. Users upload a plant image through the Flask-based web interface, where it undergoes preprocessing, including resizing and normalization for model compatibility. The processed image is then analyzed using a ResNet 50 model, which predicts which medicinal plant it is. Additionally, this research initiative puts forth a standardized dataset comprising leaf samples from 40 different medicinal plant species, commonly observed across various regions of India. The proposed system, with its innovative CNN model and comprehensive dataset, seeks to contribute significantly to the advancement of medicinal plant studies, providing a valuable tool for accurate and automated plant classification in the field.

Convolutional Neural Network

A Convolutional Neural Network (CNN) is a type of deep learning algorithm specifically designed for image processing and recognition tasks. In contrast to other classification models, Convolutional Neural Networks (CNNs) demand minimal preprocessing, as they are capable of autonomously learning hierarchical feature representations directly from raw input images.

CNN ARCHITECTURE



IV. SYSTEM REQUIREMENT

SOFTWARE REQUIREMENT

- Python Software IDE
- Gemini API

V. CONCLUSION

Our study utilized Convolutional Neural Networks (CNN) and machine learning techniques for the extraction of features and

classification of various medicinal plant species. The dataset encompassed images of medicinal plants, including Neem, Lemon, Karanda, Basale Peepal tree, among others. The Medicinal Plant dataset served as a comprehensive repository, featuring images captured under diverse conditions with varying backgrounds and without specific environmental constraints. Our approach aimed to enhance the efficiency of medicinal plant species identification by leveraging advanced technologies, contributing to the broader field of plant classification and offering potential applications in areas such as herbal medicine, pharmacology, and biodiversity conservation.

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