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MEDICINAL PLANT DETECTION USING DEEP LEARNING

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ABSTRACT

In this project, our main aim is to create a Medicinal plant identification system using Deep Learning concept. This project will classify the medicinal plant species with high accuracy. Identification and classification of medicinal plants are essential for better treatment. Identification of the correct medicinal plants that goes in to the preparation of a medicine is very important in ayurvedic, folk and herbal 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. A database of medicinal plant leaves is created from scanned images of front and back side of leaves of commonly used medicinal plants. The leaves are classified based on the shape and dimension combination. It is expected that for the automatic identification of medicinal plants this system will help the community people to develop their knowledge on medicinal plants, help taxonomists to develop more efficient species identification techniques and also participate significantly in the pharmaceutical drug manufacturing.

I. INTRODUCTION

The world bears thousands of plant species, many of which have medicinal values, others are close to extinction, and still others that are harmful to man. Not only are plants an essential resource for human beings, but they form the base of all food chains. The medicinal plants are used mostly in herbal, ayurvedic and folk medicinal manufacturing. Herbal plants are plants that can be used for alternatives to cure diseases naturally. About 80% of people in the world still depend on traditional medicine. Meanwhile, according to herbal plants are plants whose plant parts (leaves, stems, or roots) have properties that can be used as raw materials in making modern medicines or traditional medicines. These medicinal plants are often found in the forest. There are various ty pes of herbal plants that we can know through the identification of these herbs, one of which is using identification through the leaves. and protect plant species, it is crucial to study and classify plants correctly. More than 8000 plants of India n origin have been found to be of medicinal value.

II. LITERATURE REVIEW

1. 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 algorithm is 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 tested with 50 (tested with different plant species) leaves. The efficiency of the implementation of the proposed algorithms is found to be 92%.

2. Umme Habiba et.al [2]

In this paper, for automatically classifying medicinal plants, they present a Multichannel Modified Local Gradient Pattern (MCMLGP), a new texture based feature descriptor that uses different channels of colour images for extracting more significant features to improve the performance of classification. Author have trained their proposed approach using SVM classifier with arious kernels such as linear, polynomial and HI. The proposed approach gain higher accuracy (96.11%) than other techniques, and significantly valuable for exploration and evolution of medicinal plants classification.

3. R. Janani et.al[3]

have proposed a method for the extraction of shape, colour and texture features from leaf images and training an artificial neural network (ANN) classifier to identify the exact leaf class. The key issue lies in the selection of proper image input feature to attend high efficiency with less computational complexity. they tested the accuracy of network with different combination of input feature. the test result on 63 leaf images reviles that this method gives 94.4% accuracy with a minimum of 8 input features. this approach is more prominent for leaf identification system that have minimum input and demand less computational time.

4. Vijayashree. T et.al [4]

has created database with 127 herbal leaves. For creating a database 11 texture parameters are taken into account. The parameters are Sum of Variance, Inverse Difference Moment, Aspect ratio, Correlation, Sum Entropy, Mean, and Sum Average. Gray level co-occurrence matrix (GLCM) is used for determining the parameters like entropy, homogeneity, contrast and energy. A test image is taken and compared with the database; the dissimilarity is calculated with the extracted parameters. The one with least dissimilarity is identified as the leaf and the output is displayed.

5. 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 HOG and thereby classifying based on Support Vector Machine algorithm.

III. METHODOLOGY

1. Data Collection

For this project, an extensive dataset consisting of 58,280 images was meticulously collected. The dataset focuses on five distinct Indian medicinal plant species: Pungai, Jamun (Naval), Jatropha curcas, kuppaimeni, and Basil. Each species is represented by approximately 10,000 images, providing a diverse and comprehensive collection for training and evaluation. The dataset was curated by the project team, ensuring the inclusion of relevant variations in leaf texture, shape, and colour, as well as physiological and morphological features.

2. Image Acquisition

The images used in this project were acquired through various sources, employing methods to capture both individual leaves and groups of leaves. The goal was to simulate real-world scenarios where a random single leaf or a cluster of leaves might be encountered for medicinal plant identification. The images were captured under different lighting conditions and angles to enhance the diversity of the dataset and improve the model's robustness.

3. Data Pre-processing

Prior to training the deep learning model, a comprehensive data pre-processing pipeline was implemented. This involved tasks such as resizing images to a standardized format, normalizing pixel values, and addressing any potential noise or artifacts in the dataset. The pre-processing step played crucial role in ensuring that the model could effectively learn and generalize from the provided dataset.

4. Feature Extraction

The feature set for the medicinal plant identification system includes leaf texture, shape, colour, as well as physiological and morphological characteristics. These features were extracted from the pre-processed images to form a rich and informative input for the Convolutional Neural Network (CNN) during the training phase. Extracting meaningful features is essential for the model to discern patterns and make accurate predictions.

5. Apply Algorithm

The chosen algorithm for this project is the Convolutional Neural Network (CNN), a deep learning architecture wellsuited for image classification tasks. The algorithm was applied to the pre-processed dataset to train the model. The CNN leverages its ability to automatically learn hierarchical features from the input data, making it particularly effective for image-based tasks like medicinal plant identification.

6. Modelling

Several model architectures were explored and trained using the prepared dataset. The models underwent iterative refinement to optimize their performance. Hyperparameter tuning and experimentation with different CNN architectures were conducted to achieve the highest possible accuracy. The final model demonstrated a remarkable 96.67% success rate in accurately identifying the medicinal plant species.

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7. Predicting

Once the model was trained and validated, it was ready for predicting the medicinal plant species from new, unseen images. The predictive capability of the model makes it a valuable tool for practical applications, such as providing advisory information or early warnings related to the identified plant species. The high success rate of 96.67% underscores the effectiveness of the developed system in medicinal plant identification.

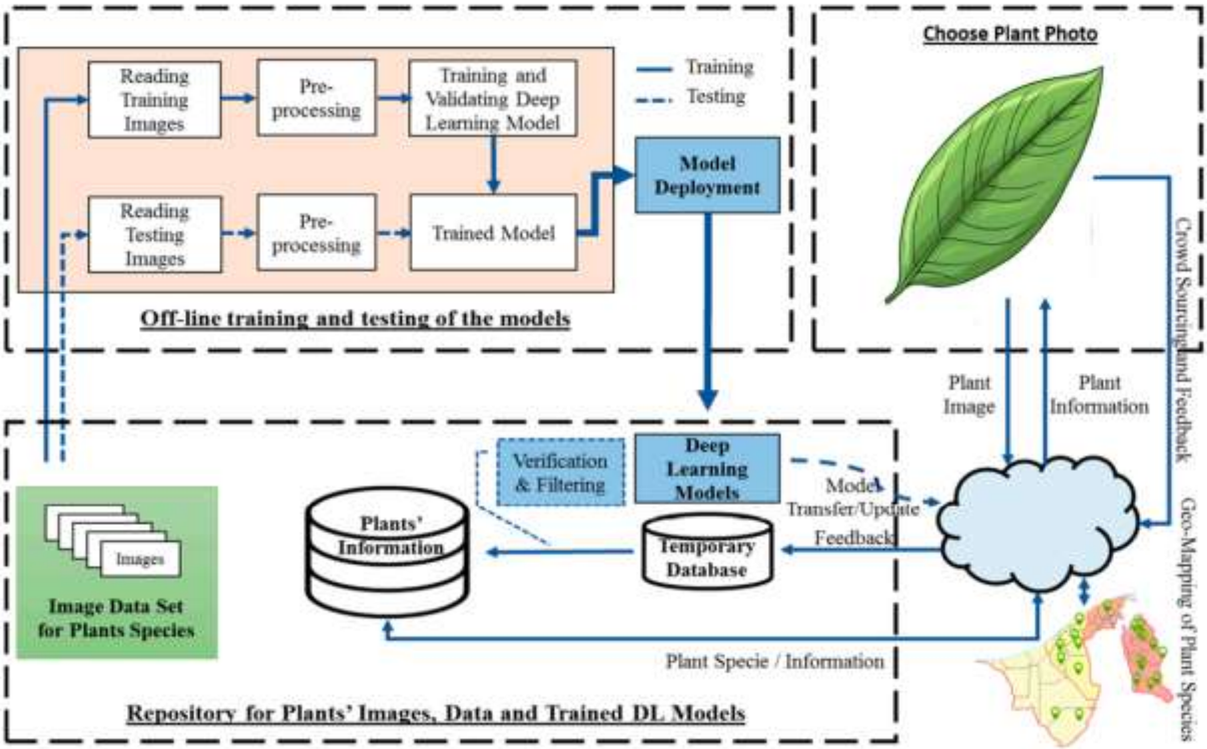

Fig 1: Architecture diagram

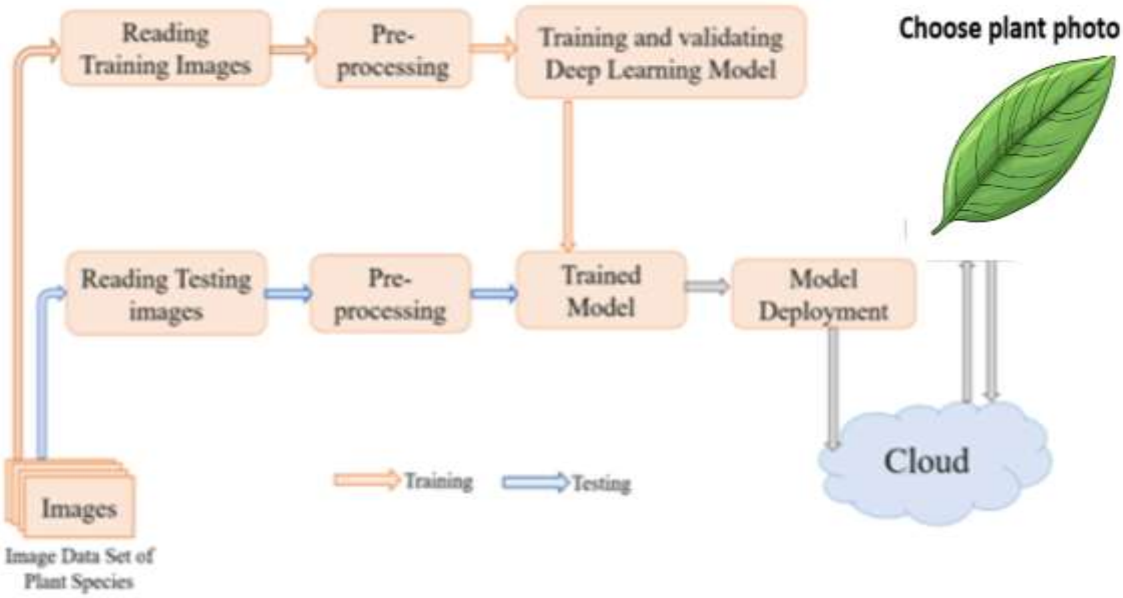

Fig 2: Flow chart of Execution

IV. RESULTS AND ANALYSIS

Fig 3: Home page our model

Test Case-1:

Fig 4: Sample Output screen

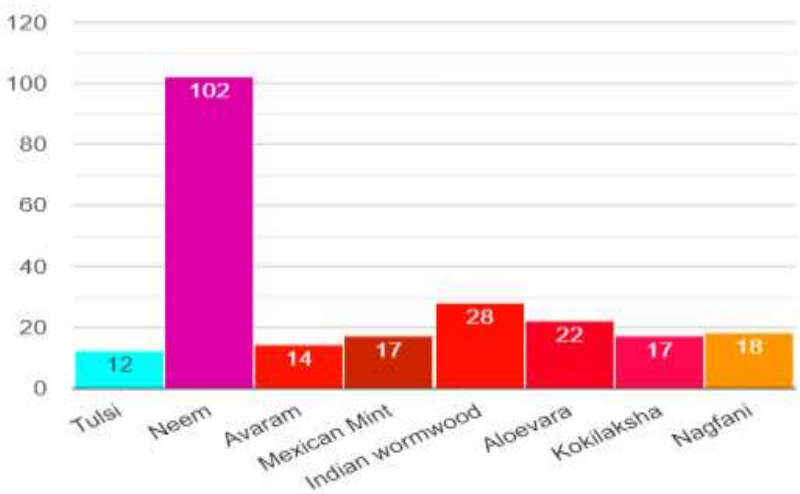

Fig 5: Bar graph of number of diseases cured by plants

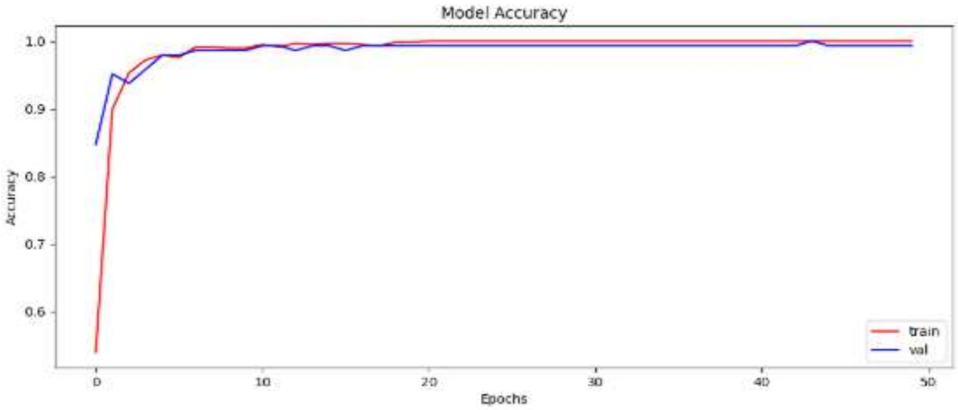

Fig 6: Accuracy plot graph of our model developed

V. CONCLUSION

In conclusion, the development of the Medicinal Plant Identification System using Deep Learning has proven to be a significant stride towards enhancing the efficiency and accuracy of medicinal plant classification. The comprehensive dataset, meticulously collected and curated by the project team, provided a robust foundation for training a Convolutional Neural Network (CNN). The inclusion of diverse features, encompassing leaf texture, shape, colour, and physiological/morphological characteristics, ensured that the model could generalize well to real-world scenarios.

The image acquisition process, capturing random single leaves or groups of leaves under varying conditions, added a layer of realism to the dataset. Data pre-processing played a pivotal role in preparing the dataset for effective learning, addressing issues such as image resizing, normalization, and noise reduction. The application of the CNN algorithm, after extracting meaningful features, demonstrated the model's capability to learn intricate patterns and achieve a remarkable 96.67% success rate in identifying the specified medicinal plant species. The iterative process of modelling involved experimenting with different architectures and fine-tuning hyperparameters, ultimately leading to the selection of a highly accurate model. The success of this project extends beyond academia, as the developed system can serve as a practical advisory tool or early warning system in the context of medicinal plant identification.

The implications of this project are profound, offering potential benefits for both healthcare and environmental conservation. Accurate identification of medicinal plants is essential for better treatment outcomes, and the success rate achieved by the model positions it as a valuable asset in the realm of herbal medicine. Furthermore, the system can contribute to the preservation of biodiversity by facilitating the identification and protection of specific plant species with medicinal value.

In essence, the Medicinal Plant Identification System stands as a testament to the power of deep learning in solving real-world challenges. Its high accuracy, coupled with the practical applicability of the results, underscores the project's success in contributing to advancements in medicinal plant research and healthcare practices.

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