Identification of Different Medicinal Plants through Image Processing using Machine Learning Algorithm

Dr.R.Umamaheswari[1], Dhanushkumar.N[2], Sundharesan.V[3], Thalapathi.P[4], Rahul.S[5], Mr.Sabari.M.S[6]
[1,6],*Professor/Head of the Department, Department of CSE, Gnanamani College of Technology, Namakkal,Tamilnadu, India.*
[2,3,4,5],*UG Students, Department of CSE, Namakkal, Tamilnadu, India.*

ABSTRACT-Simplifying the identification and utilization of medicinal plants is the focus of this endeavor, achieved through the integration of image processing and machine learning algorithms. Users can upload plant images and promptly receive detailed information on their medicinal properties, preparation techniques, and health benefits. This user-friendly platform facilitates informed decision-making regarding herbal medicine, enhancing accessibility and understanding of plant-based remedies. By bridging traditional herbal knowledge with modern healthcare practices, the tool aims to promote the safe and effective use of medicinal plants, contributing to holistic wellness and healthcare sustainability.

I.INTRODUCTION

For generations, people have turned to medicinal plants to stay healthy. Yet, there's still much we don't understand about their healing powers. Our project aims to change that by using new technology to explore the benefits of these plants. We're gathering a big collection of information and pictures of medicinal plants to learn more about them. By using advanced techniques like machine learning, we can make this process faster and easier. Our main goal is to discover all the ways these plants can help us when we're sick. And we want to make sure everyone, especially young people, knows how valuable these plants are for our health. In addition to studying their healing properties, we're also interested in understanding how medicinal plants are used in different cultures. By documenting traditional knowledge and practices, we hope to preserve and promote the use of these plants in modern healthcare. Through our project, we aim to bridge the gap between traditional herbal knowledge and modern scientific research. By harnessing the power of technology, we can unlock the full potential of medicinal plants and improve global health outcomes.

II. LITERATURE SURVEY

[1] The best use of advanced techniques such as transfer learning in computer vision and deep learning, motivate the building of an automatic recognition system for medicinal plants [13]. [2] The herbs using an artificial neural network classifier shows an average accuracy of 97.5% using the Deep Herb dataset.
[15] Techniques such as class weighting and the use of focal loss function were applied to improve the learning process of the model. [4] Simple and traditional techniques are used to prepare medicines that are essentially used to cure diseases like headache, fever, common cold, asthma, abdominal pain, depression, typhoid, worm infections, heart problems, and injuries like bone fractures, muscular dislocation, cut wounds, etc. [4] Ethnobotanical knowledge of medicinal plants and practices are held mostly by older-aged groups of the community.

III. PROBLEM STATEMENT

The problem we're tackling is the difficulty in identifying medicinal plants accurately. People often struggle to distinguish between different plants, which can lead to confusion and potential misuse. This lack of accurate identification hampers efforts in utilizing medicinal plants effectively for health benefits. Our goal is to develop a solution that simplifies the process of identifying medicinal plants, making it easier for everyone, especially children, to access their health benefits safely and efficiently.

IV. ALGORITHM

Convolutional Neural Networks (CNNs) are commonly used for image classification tasks like plant identification. Training a CNN involves forward and backward passes through multiple layers of the network, which can be computationally expensive. The time complexity depends on factors like the number of layers, the size of the input images, and the complexity of the network architecture. Similarly, CNNs require memory to store the model parameters, intermediate activations, and gradients during training. The space complexity depends on the number of parameters in the network and the batch size used for training. Support Vector Machines (SVMs) are another popular choice for image classification tasks. The time complexity of training an SVM depends on the kernel function used and the size of the training dataset. Training an SVM with a linear kernel has a time complexity of O(n^2), where n is the number of training samples. Training with non-linear kernels like polynomial or Gaussian radial basis function (RBF) can have higher time complexity. SVMs also require memory to store the support vectors and other parameters learned during training. The space complexity depends on the number of support vectors and the size of the training dataset.

Random Forests are an ensemble learning method commonly used for classification tasks. Training a Random Forest involves building multiple decision trees based on random subsets of the training data and features. The time complexity depends on the number of trees, the depth of each tree, and the size of the training dataset. In general, training a Random Forest is faster compared to some other algorithms like SVMs. Random Forests also require memory to store the decision trees and other parameters learned during training. The space complexity depends on the number of trees and the depth of each tree.

K-Nearest Neighbors (KNN) is a simple and intuitive algorithm for classification tasks. The time complexity of KNN for classification depends on the number of training samples (n) and the number of features (m). To classify a new data point, KNN computes the distance between the new point and all training points, which can be computationally expensive for large datasets. The time complexity for each prediction is O(n * m). KNN does not require much memory during training, as it simply stores the training data. However, during prediction, it requires memory to store the entire training dataset.

Working

The project operates by first collecting a dataset comprising plant images and corresponding textual information such as common names, scientific names, and medicinal properties. This dataset serves as the foundation for training machine learning models. Initially, the input data undergoes preprocessing steps to standardize and extract relevant features. Subsequently, the machine learning models are trained using this processed data to learn patterns and associations between the images and their corresponding textual information. During the training phase, the models adjust their parameters iteratively to minimize prediction errors and improve accuracy. Once trained, the models can classify new, unseen plant images based on their learned knowledge, effectively identifying the medicinal plants depicted. The system then generates output results, including the predicted names of the plants and additional relevant information extracted from the dataset. Through thisiterative process of training and classification, the project enables accurate and efficient identification of medicinal plants, facilitating research, education, and conservation efforts in herbal medicine.

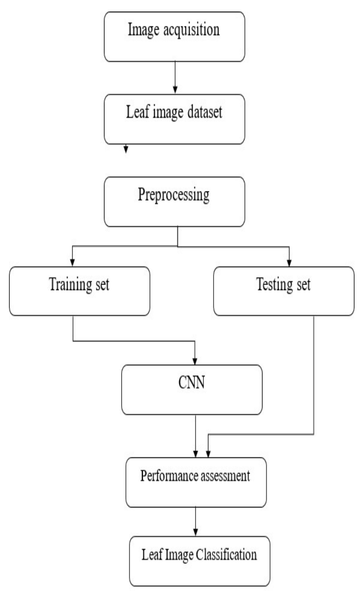

Fig 3.1 Flowchart of proposed system

A. Software requirements:

Operating System: Windows XP/7.
Code language: Python
IDE: Jupyter Notebook
Database: SQLite

B. Hardware requirements:

Processor: Intel Core i3
Hard Disk: 100 GB.
RAM: 4GB or higher

V. CONCLUSION

Our project represents a significant advancement in understanding medicinal plants through the integration of cutting- edge technology like machine learning and image processing. Through the systematic collection and analysis of vast amounts of data, we've gained valuable insights into the therapeutic properties of these plants and their potential impact on human health. This newfound knowledge has the potential to revolutionize healthcare practices and may even pave the way for the development of innovative medicines. Additionally, by raising awareness about the importance of medicinal plants, particularly among younger generations, we're fostering a deeper appreciation for nature's resources and promoting healthier lifestyles. Overall, our project has made a substantial contribution to healthcare research and holds promise for improving the well-being of many individuals. Moving forward, our project could benefit from several enhancements to further its impact and effectiveness. Firstly, incorporating real-time plant identification capabilities using mobile applications would enhance accessibility and convenience for users. Secondly, expanding the dataset to include a wider variety of medicinal plants and their respective properties would improve the system's accuracy and comprehensiveness. Additionally, integrating natural language processing techniques could enable the extraction of information from textual sources, enriching the dataset and enhancing the depth of analysis. Furthermore, implementing a user feedback mechanism would allow for continuous improvement and refinement of the system based on user experiences and suggestions. Finally, collaborating with botanical experts and healthcare professionals could provide valuable insights and ensure the project remains aligned with the latest advancements in herbal medicine research.

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