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Medicinal Plant Classification using Machine learning

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Abstract—*A deep learning-based method called AyurLeaf was created to classify medicinal plants. Conventional methods for classifying and identifying medicinal plants have depended on human observation and skill, which can be laborious and prone to mistakes. The development of deep learning methods and artificial intelligence has made it feasible to create automated systems that able to correctly categorise therapeutic herbs according to their outward appearance.For millennia, many traditional medical methods have included the therapeutic use of medicinal plants. Bioactive substances found in these plants have therapeutic qualities and can be utilised to treat a range of illnesses. However, because there are many species and minor variations in their physical characteristics, it can be difficult to identify and classify these plants.*

Keywords—Desktop application, DB sqlite, python, CNN algorithm , Machine learning

I. INTRODUCTION

Natural product combinations have been used as key components in the treatment of various illnesses. Prescriptions, herbs, and compounds, as well as their associations with phenotypes, are covered in existing databases; however, the usage of mixtures of natural product components is not. In this study, we used an association rule mining technique to incorporate data on herbal medicine, combination medications, functional foods, chemical compounds, and target genes in order to find extensive relationships between natural product combinations and phenotypes.

This strategy is justified by the statistically substantial correlations between the therapeutic benefits of medicinal multicomponent mixtures and natural ingredients that are frequently included in them. We demonstrate that the inferred associations, which have statistically significant closeness proximity in the molecular layer and a wealth of experimental evidence, are useful information for identifying medicinal combinations of natural products based on a molecular network analysis and external literature validation.

II .Literature Survey

sunyong yoo, suhyun ha1, moonshik shin1,kyungrin noh, hojung nam and doheon lee [1] Natural product combinations have been utilised as significant sources of medical care. The use of mixtures of natural product components is not covered by the databases that are now in place, but they do contain information regarding prescription drugs, herbs, and compounds and how they relate to phenotypes. By using an association rule mining technique to incorporate data on herbal medicine, combination medications, functional foods, chemical compounds, and target genes, we were able to find extensive correlations between natural product combinations and phenotypes in this paper. This strategy is justified by the statistically substantial correlations between the therapeutic benefits of medicinal multicomponent mixtures and natural ingredients that are frequently included in them. We demonstrate that the inferred associations are useful information for identifying medicinal combinations of natural products because they have a lot of experimental evidence and statistically significant closeness in the molecular layer, based on a molecular network analysis and external literature validation.

monica dutta, deepali gupta, sapna juneja, ali nauman, and ghulam muhammad [2] medicinal plants are essential for healing diseases in both humans and animals. medicinal plants are the main source of healthcare for the vast majority of people on the planet. both urban and rural environments rely on medicinal plants. both root and shoot types of medicinal plants are possible. one of the root varieties of medicinal plants with several health advantages and commercial value is the onion. the demand for medicinal plants in a smaller cultivation area is rising as a result of the rapid decline in agricultural land availability brought on by growing urbanisation.as a result, soilless smart precision farming techniques have been developed. the environmental elements influencing the development and yield of agricultural products are tracked and managed using sensors. hydroponics is the most

effective method for growing herbaceous plants among all of the vertical farming techniques. the growth responses of onions (allium cepa) grown hydroponically in a deep-water culture setup vs those grown in soil are compared in this article. an extensive review of the literature on onions cultivated hydroponically is conducted.

Ammar Chouchane, Abdelmalik Ouamane, El Ouanas Belabbaci, and Yassine Himeur, Abbes Amira [3] Plant pathology and agriculture are intersected by the detection and categorisation of tomato plant diseases using deep learning on leaf pictures. From photos of leaves, deep learning has shown great promise in correctly recognising and classifying a variety of plant illnesses. In this work, we present a hybrid system that uses contemporary and sophisticated deep networks, such as ResNet50, Darknet53, DenseNet201, and EfficientNetB0, to facilitate transfer learning while integrating a powerful machine learning method, Exponential Discriminant Analysis (EDA).
Two difficult datasets, the Taiwan and PlantVillage tomato leaf datasets, were used to assess this approach. With mean accuracies of 98.2998.09, the experimental findings highlight the strong competitiveness of the suggested approach.Index Terms: Exponential discriminant analyses, deep learning, transfer learning, plant disease classification, and leaf images.

s. roopashree and j. anitha [4] Since many plant species are in danger of going extinct, biodiversity conservation is essential. The traditional medical system, which relies heavily on the vast plant library, encourages healthy living as an alternative to synthetic medications. It is suggested to use several neural network approaches in computer vision and deep learning to create a vision-based autonomous medicinal plant identification system. The problem is that the dataset for therapeutic herbs is not readily available.
The study presents a brand-new medicinal leaf dataset called DeepHerb, which consists of 2515 leaf photos from 40 different Indian herb species. By contrasting pre-trained deep convolution neural network architectures like VGG16, VGG19, InceptionV3, and Xception, the dataset's effectiveness is demonstrated. In order to extract features and classify utilising Artificial Neural Networks (ANN) and Support Vector Machines (SVM), the work focusses on using the transfer learning technique to the pre-trained models. Bayesian optimisation is used to further adjust the SVM hyperparameters in order to produce a model with improved performance.

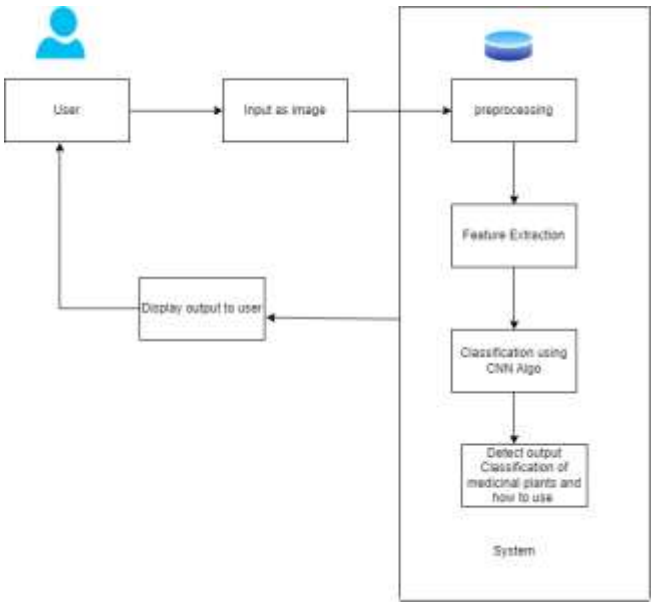
III.MOTIVATION

- Economic benefits: Those who harvest, prepare, and distribute medicinal herbs may be able to make a living from them.
- Health advantages: Those who eat medicinal plants may have health advantages. Traditional knowledge: Traditional health care systems in rural communities rely heavily on indigenous knowledge of medicinal plants and remedies.
- Sustainability: Exsitu and insitu conservation strategies are critical to the long-term usage of medicinal plants.
- Scientific investigation: Native knowledge of therapeutic plants can serve as a basis for scientific investigation.
- Employment opportunities: Those involved in the cultivation and distribution of medicinal plants may be able to find employment.
- Tax revenue: Medicinal plants have the potential to generate revenue for the government. Improved worker
- health: Medicinal plants may help improve worker health.

IV.OBJECTIVE

encouraging the in-situ and ex-situ conservation of medicinal plants and using ethnobotanical research to document traditional knowledge.
Cultivating and naturalising endangered species to secure their survival and generate a lot of planting material is known as ex-situ conservation.
Identification and standardisation: determining the quantities of active ingredients or indicators in herbal medicine products in a consistent and trustworthy manner. Effective agricultural methods: encouraging the development of medicinal plants in a sustainable and safe manner for both producers and users. Giving technical assistance for post-harvest management is known as post-harvest management. Research and development: Assisting with the study and advancement of therapeutic plants.

V.System Architecture



VI.Proposed System

- **Data Collection**:

Develop a comprehensive dataset of medicinal plant images. This dataset should capture plants from multiple angles and under varying lighting conditions to aid the CNN in learning accurate features.

Each image must be labeled with relevant information, including the plant's common

- **Image Preprocessing**:

To ensure consistency, resize all images to a standard input size for the CNN (such as 64x64 pixels).

Apply image augmentations like rotation, zoom, flipping, and brightness adjustments. These augmentations increase the variety of input data, making the model more adaptable and resilient.

Normalize pixel values to create a uniform scale across images, which helps enhance the model's learning process.

· **Feature Extraction**:

Employ CNN layers to extract essential image features automatically, such as leaf structure, vein pattern, color, and shape, which are pivotal in distinguishing different plants.

- **Model Architecture**

Convolutional Neural Network (CNN):

Input Layer: This layer accepts the preprocessed images.

Convolutional Layers: Multiple layers in the CNN extract unique features, with each convolutional layer applying filters to highlight different aspects of the image. ReLU activation is used to incorporate non-linearity.

Pooling Layers: Pooling reduces the dimensions of the feature maps, retaining only the most relevant information, which optimizes computation.

Fully Connected Layers: These layers gather the extracted features and produce a final classification.

Output Layer: A softmax layer provides a probability distribution across plant categories for accurate identification

- **System Workflow**

Image Input: Users upload plant images through a user interface.

Image Preprocessing: The system applies preprocessing steps to standardize the uploaded image.

Prediction: The CNN processes the image, generating predictions that include the plant's identity and confidence scores.

Result Display: Present the user with the plant's name, confidence level, and other details, such as medicinal properties.

VII. Problem Statement

Medicinal plant identification and categorisation can be difficult and time-consuming, frequently requiring manual inspection and skill. When working with huge datasets, traditional approaches for classifying medicinal plants may not be effective and are prone to errors. The process is further complicated by the minute variations in the morphological characteristics of different plant species. An automated method that can swiftly and precisely categorise medicinal plants according on their visual

VIII.Conclusion

To sum up, the AyurLeaf deep learning method for classifying medicinal plants offers a revolutionary approach to herbal medicine. AyurLeaf has the potential to improve plant identification accuracy by utilising deep learning's sophisticated pattern recognition skills, which would benefit both scientific research and real-world traditional medical uses. In addition to expediting the classification process, this method offers insightful information about the medicinal qualities of different plants, which may help in the development of novel natural cures. AyurLeaf may prove to be an essential resource for herbalists,

botanists, and the larger medical community in advancing the efficient use of medicinal plants as the system develops.

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