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Orgikart: A Smart Herbal Identification and Recommendation System

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ABSTRACT

The growing interest in herbal medicine and natural remedies has made the demand for a rapid and precise system for identifying medicinal plants essential. The Orgikart Herbal Plant Identification and Recommendation System employs machine learning and image processing techniques to recognize herbal plants from images and suggest them based on their medicinal characteristics. The system is created to assist researchers, herbalists, and general users in identifying plants quickly using mobile or web-based applications. Using a trained dataset of herbal plants, the system can recognize different species and recommend their uses, benefits, and potential applications. The recommendation system also suggests the most suitable herbal plants for certain diseases or health ailments, offering users personalized suggestions. This project contributes to the herbal medicine field using contemporary technology and traditional knowledge of plants, proposing an innovative application for plant identification and medicinal suggestions.

KEYWORDS: *Plant Identification, Image Processing and Deep Learning, CNN, NLP, SVM (Support Vector Machine), KNN (K-Nearest Neighbors)*

I. INTRODUCTION

All life on Earth relies on the oxygen produced by plants. Through supplying oxygen and water, plants of various sizes and shapes are vital in sustaining the diversity of life on Earth. Medicinal plants or herbs are employed to cure most disorders and diseases in human beings . Plants have various medicinal uses, ranging from roots to leaves. Plants have been utilized by human beings for numerous purposes such as medicine, cooking, and cosmetics. Herbalists need to apply taxonomy to understand the many medicinal plant species at their disposal, some of which are hard to differentiate from each other. To a large extent, professionals in some nations continue to apply outdated techniques of herb identification. Both animal and human health can gain from the use of therapeutic herbs. They used to be referred to as common plants in traditional Chinese medicine; nowadays, they are called herbal remedies. Though the plant itself is not utilized frequently, there is at least one part of it that can be utilized in order to produce herbal treatments.

II. RELATED WORK

During the internship, numerous research studies and projects were considered to understand the evolution in herbal plant recommendation and identification systems. The concerned research includes the examination of image processing techniques, machine learning algorithms, and existing plant identification applications. Some key areas of research and development are as follows:

- **Plant Identification Using Image Processing and Deep Learning**

Previous studies have explored the application of convolutional neural networks (CNNs) in plant identification. PlantNet and LeafSnap are instances of systems that employ image recognition to recognize plant species based on leaf features. The applications were utilized as a reference when implementing deep learning techniques in our project.

Various machine learning techniques such as SVM (Support Vector Machine), KNN (K-Nearest Neighbors), and CNN-based models were explored to determine the most suitable approach for accurate classification.

- **Medicinal Plant Databases and Recommendation Models**

Herbal plant databases available such as Ayurvedic Pharmacopoeia of India (API) and Traditional Chinese Medicine (TCM) databases hold rich medicinal properties of plants. These databases were used to enhance the recommendation system by implementing authenticated herbal data.

Natural language processing (NLP) techniques have been utilized in past research to provide herbal remedies based on symptoms. Based on literature review, the internship sought to increase the precision and individualization of recommendations.

- **Synthesizing AI with Mobile and Web Applications**

The application of plant identification software in mobile brought into focus the importance of real-time processing, ease of interface, and cloud-based AI models.

A study of literature involving edge AI computation was carried out to debate whether on-device computing can optimize the response time as well as off-line ability.

- **Herbal Plant Identification: Challenges**

Congruity in plant types, varying illumination states, and noises in the image were pointed out as problems previously. Strategies such as data amplification, knowledge transfer learning, and models which combine AI forms were considered for enhancing the system. Ethical concerns of abuse of medicinal plant data and sound health counsel verification were also debated.

III. DATA AND SOURCES OF DATA

For plant identification, the system is based on image datasets, and for recommendations, it relies on medicinal data.

1. Sources of the image dataset

- Public databases: PlantNet, LeafSnap, and PlantCLEF.
- Research Collections: GBIF and the Indian Biodiversity Portal.

- Custom Data: User-contributed images gathered in the field.

2. Sources of Medicinal & Recommendation Data

- Government & Academic Databases: Ayurvedic Pharmacopoeia of India (API), Traditional Chinese Medicine (TCM).
- Scientific Investigation: PubMed, ResearchGate, phytochemical research. Expert Validation: Herbalists, practitioners of Ayurveda, WHO reports on medicinal plants.
- In Orgikart, AI combines public data, expert data, and expertise to deliver precise plant identifications and reliable health recommendations.

IV. RESEARCH METHODOLOGY

The Research methodology adopts a scientific methodology through data preprocessing, data collection, model training, system development, and validation to enhance the accuracy for plant identification and also provide health recommendations.

1. Data Collection

- Image Data: Leaf Snap, Plant CLEF, GBIF, and community images, from Plant Net
- Pharmacopeial data: Ayurvedic Pharmacopoeia, TCM, WHO reports, and phytochemical studies.
- Symptom-to-Plant Mapping: Based on research literature, herbal medicine databases, and expert opinion.

2. Data Preparation Image Processing

- Text Data Cleansing: Removing inconsistencies, redundancy, and standardizing medicinal data.
- Resizing, noise reduction, augmentation for improved recognition.

V. RESEARCH DESIGN

3. Model Training & Development

- Plant Identification Model
- Utilizes CNN (Convolutional Neural Networks) for image classification.
- The use of labeled data sets allows for precise species identification.

4. Recommendation System:

- uses NLP (Natural Language Processing) and Decision Trees to provide symptom-based herb recommendations.
- It projects user queries onto authenticated medical content.

5. System Development

- Mobile/Web Interface: Users upload images, get plant identification, and get suggestions.
- Cloud/Local Processing: Real-time or offline AI processing for image recognition.
- Database Integration: Stores plant data, user input, and learning updates.

6. Testing and Validation

- Accuracy Testing: Performance measurement through precision, recall, and F1-score.
- Expert Validation: Verified by botanists and herbal practitioners.
- User Feedback & Refinements: Continuous improvement from actual-world testing.

7. Deployment & Optimization Model Optimization

- Fine-tuning and hyperparameter tuning using transfer learning.
- Scalability and Performance: Delivering quick processing capability in web and mobile use.

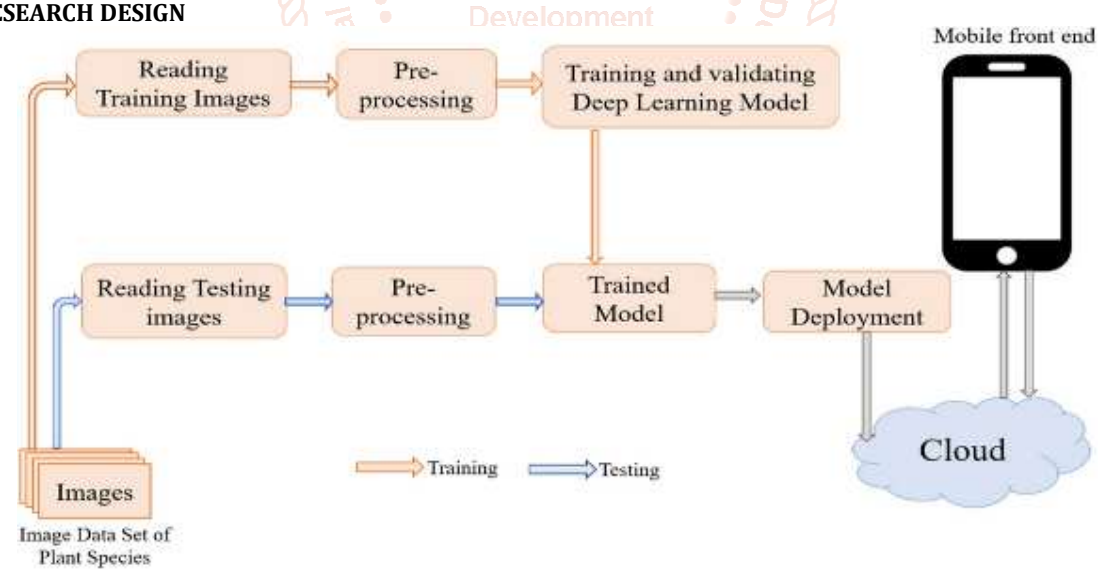

Fig 1: Herbal Plant Identification in Real-Time Using Deep Learning Model

The flowchart illustrates the **user journey on Orgikart for herbal plant identification**, covering key functionalities:

- **User Registration & Login** – Users sign up, verify their email, and log in.
- **Dashboard Access** – Users can upload plant images for identification, explore medicinal recommendations, and view their history.
- **Plant Identification Process** – AI analyzes the image and provides details about the plant.
- **Recommendation System** – The system suggests medicinal uses and benefits of the identified plant.
- **User Actions** – Users can search for more plants, revisit past identifications, or log out.

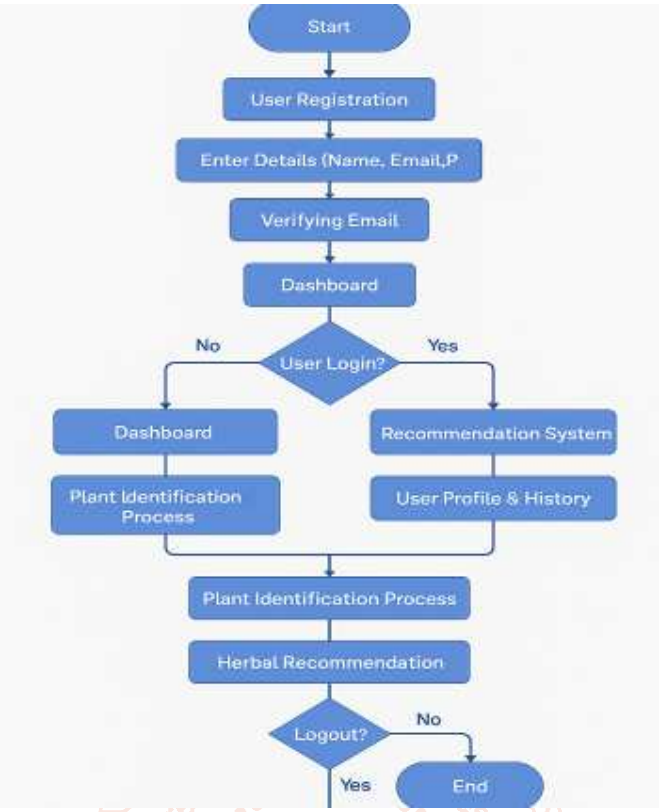

Fig 2:flowchart of user journey

The flowchart illustrates the Super Admin workflow on Orgikart for herbal plant identification, detailing system management functionalities:

- **Super Admin Login** – Secure authentication to access the admin panel.
- **User & Role Management** – Add, update, or remove users and assign roles.
- **Plant Database Management** – Update herbal plant data, images, and medicinal information.
- **AI Model Monitoring** – Oversee system accuracy, update AI models, and improve performance.
- **User Activity & Reports** – Track user interactions, generate reports, and ensure smooth operations.
- **System Security & Maintenance** – Manage security settings, resolve issues, and optimize system performance.

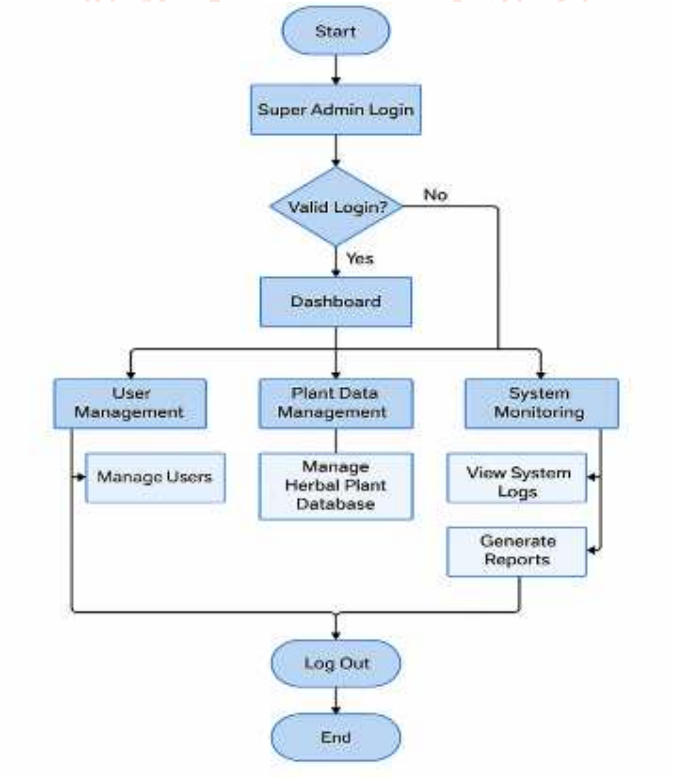

Fig:3 super admin workflow

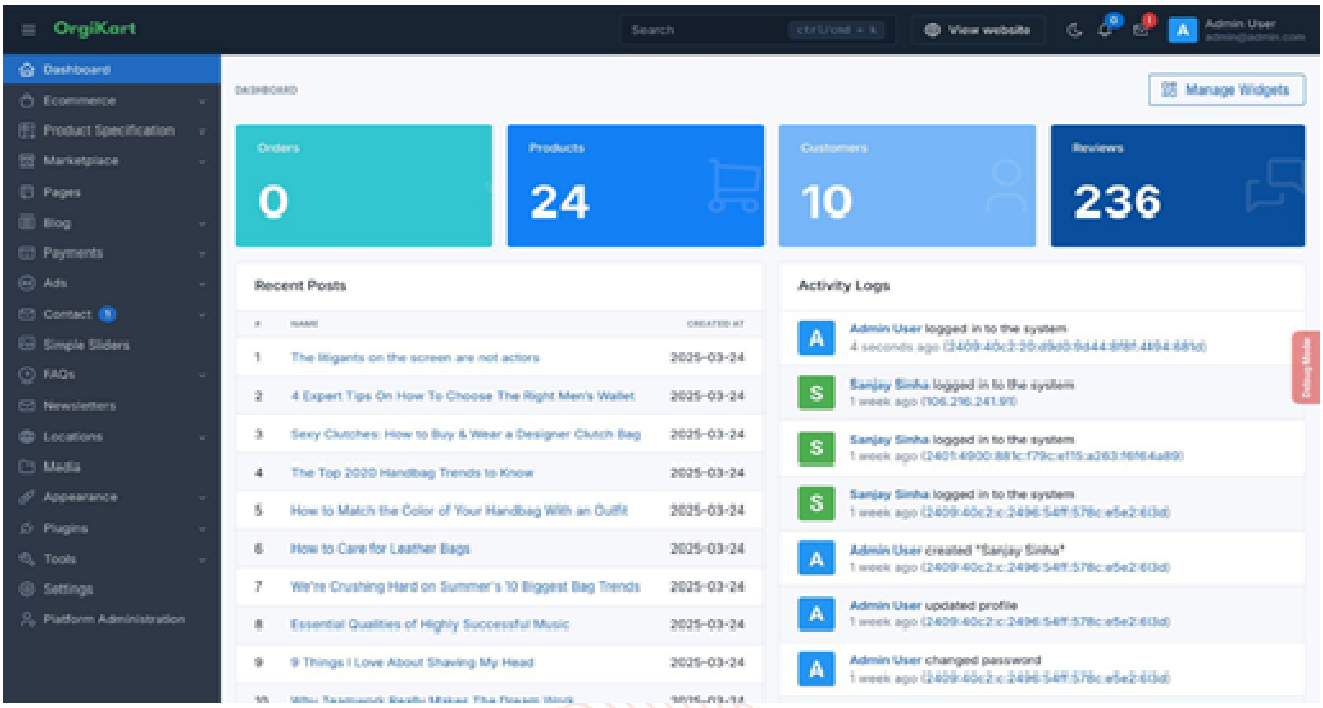

Fig:4 dashboard

VI. RESULTS AND DISCUSSION

The purpose of this study is to identify medicinal plants in real-time. The necessary medicinal leaf images were obtained from Kaggle to complete this challenge. Because the collected images are of various sizes, they have been scaled to a specific dimension. Geometrical augmentation was performed on the leaf images because the collected data is insufficient to train the DL model. The augmented data is fed into the DL model, which is trained with an epoch of 15.

Training and Validation Result

Metrics like loss, recall, accuracy, and precision are used to assess the performance of a DL model during the training and validation stages. displays the obtained metrics values. At the train and validate stages, the DL model's loss value is 1.07 and 1.64 at the 0th epoch. The loss value gradually lowers and reaches values of 0.08 and 0.18 as the epoch count increases. The second metric considered is recall performance. During training, the score begins at 0.53 on the 0th epoch and steadily rises to 0.97; during validation, the recall values at the initial and final epochs are 0.67 and 0.94. The accuracy of the DL model is assessed in the third step. The training and validation accuracy scores of the DL model are 0.64 and 0.68 at the 0th epoch. The accuracy scores for both phases are 0.97 and 0.95 at the final, 14th epoch. The precision of the DL model throughout the training and validation phases is then evaluated. Precision at the initial epoch yields a value of 0.80 and 0.70, which reaches 0.97 and 0.95 at the final epoch.

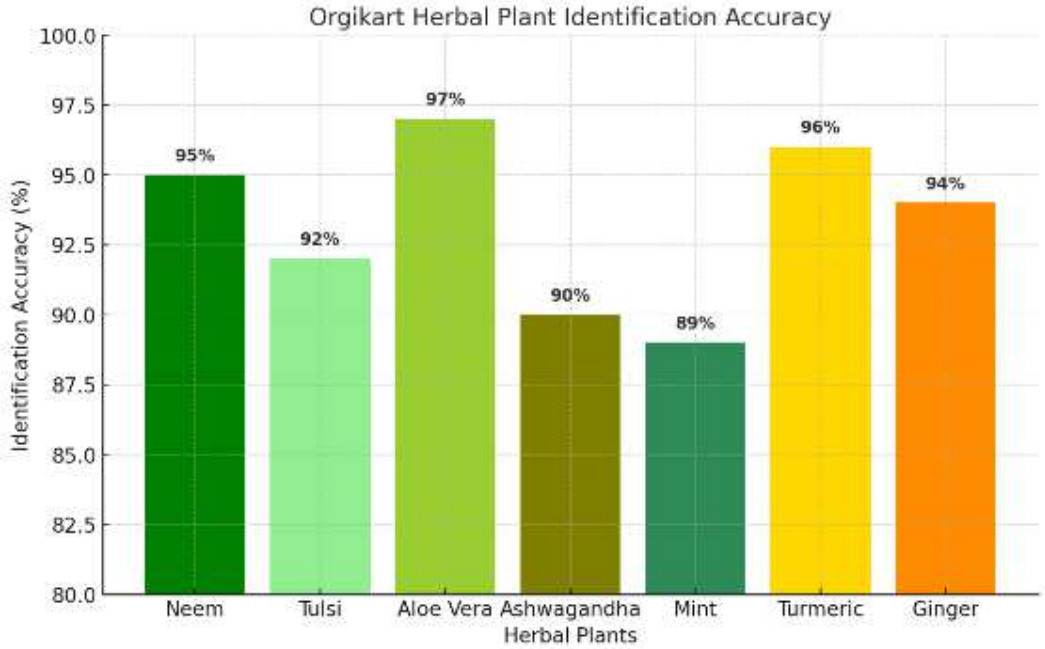

Fig 6: Bar Graph

➢ **Identification accuracy of the system**

The bar graph displays the **identification accuracy (%)** of the Orgikart system for different herbal plants. **Aloe Vera** has the highest identification accuracy at **97%**, followed by **Tulsi (92%)** and **Turmeric (96%)**. Other plants like **Neem (95%)**, **Ginger (94%)**, and **Ashwagandha (90%)** also show strong accuracy levels. The results indicate that Orgikart performs well in identifying medicinal plants, ensuring **reliable recognition and recommendations**.

Fig 7: pie Graph

VII. CONCLUSION:

Plants have a crucial role in maintaining human life. Traditional herbal remedies have been used by indigenous communities for thousands of years. Clinicians often identify herbs by years of accumulated familiarity with their smell or taste. Automatic herb identification has been greatly aided by recent developments in analytical technologies. Many people appreciate this, especially newcomers to the world of herb identification. Furthermore, laboratory-based analysis requires proficiency in sample collection and data interpretation, both of which add extra time and effort to already-lengthy procedures. So, it is necessary to have a quick and accurate procedure for detecting herbs. In this study, we use DL to develop an automated system for identifying medicinal plants. Only six herbs are used in this study. Over 97% in accuracy, precision, and recall are achieved by the created DL model. This model will be deployed in the cloud and create a smart mobile app that can instantly identify medicinal plants. For those who lack access to costly measuring instruments, this DL and mobile-based technique will be the method of choice for the rapid detection of medicinal plants. Future studies will focus on enhancing or maintaining the model's classification performance by taking more medicinal plant species.

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