

IDEA SUBMISSION FOR SIH 2023 - INTERNAL HACKATHON

Domain Bucket : MedTech / BioTech / HealthTech

Category : Software

Organization : Ministry of AYUSH

**Problem Title: Identification of Different Medicinal Plants/Raw
materials through Image Processing Using Machine
Learning Algorithms**

Problem Statement(PS) Number: SIH1343

OBJECTIVE

- **Medicinal Plant Identification:** To create a useful tool for accurately identifying medicinal plants so that genuine raw materials can be extracted.
- **Consumer SCAM (Defraud):** To educate the general public, traders, and collectors about crude drugs / raw materials in order to prevent consumer fraud.
- **Extensive Utilization:** By using this system, various unethical practices, such as adulteration and substitution, should be avoided in order to meet the demand for the supply.
- **Machine Learning Implementation:** Without a human present, machine learning algorithms can aid in the automated identification of medicinal plants.

ISSUES AND CHALLENGES

Current Issues:

- Verifying the correctness of medicinal plants from the supplier is not available in the market.
- Traditional DL algorithms require large datasets and take longer time to train for new categories of medicinal plants.
- The capacity of the current features to adapt to new species is challenging when using only ML algorithms.
- There is no multilingual support in the current system for a diverse user base.

Dependencies:

- Devices such as mobile / tablet / Laptop with stable internet connection.
- Devices with camera.

Show Stopper:

- Struggle in predicting the output for low quality(noisy) medicinal plant images accurately.

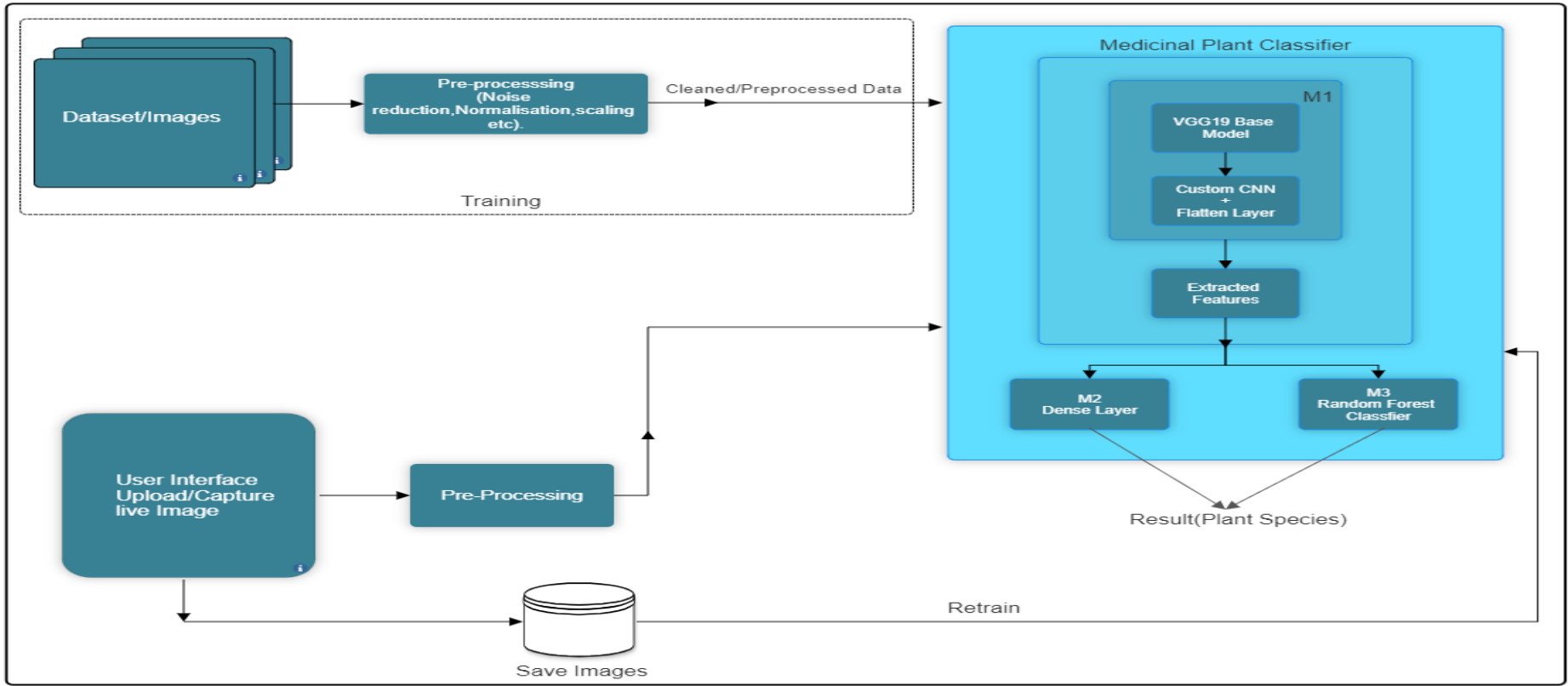
SOLUTION

Deep Learning and Neural Network based approach:

- Leveraging Deep Learning architectures, transfer learning and machine learning algorithms to create a **Hybrid (CNN + Random Forest Classifier) model** for more complex and accurate plant identification tasks.
- **Identification of medicinal plants/raw materials** along with quality and condition of the plant.
- Users can upload images of plants and get known about their **geographical distribution of the plant across India on a map**.
- The end-product comes with a **chatbot** to know more about the medicinal properties of plants.
- Integration with **supply chain** gives an added advantage of ensuring a better product quality.



ARCHITECTURE/WORKFLOW DIAGRAM



MODULES / DEVELOPMENT PIPELINE

1) Collect the medicinal plant image

from the user and apply preprocessing such as noise reduction, normalization, scaling, etc.



Data Gathering

Feature Extraction

Classification

Display Info

2) Features in the medicinal plant such as shape, edge, vein pattern, texture, etc., are extracted using the convolution layer, i.e. **VGG-19 (pretrained model) + custom convolution layers** and provided as a vector.



3) The output vector from the feature extractor is fed into the RandomForest (classifier) and Dense Layers, and the combined result from both models is used to **identify the uploaded image**.



4) **Details about the identified plant** such as its vernacular name, botanical name, medicinal values, distribution map of the species across India, simple medicines prepared using the species etc are displayed



OUTPUT

```
predict_plant(r'C:\Users\loges\Downloads\Dataset-medecinal_plants\Dataset-medecinal_plants\hibiscus\3a3b8e4f0988fb6d57d8bcdab66
```



1/1 [=====] - 0s 159ms/step

Deep Learning Model

Predction probab:['0.00', '0.00', '0.00', '0.00', '0.93', '0.00', '0.00', '0.00', '0.01', '0.00', '0.00', '0.00', '0.00', '0.01', '0.00', '0.00', '0.00', '0.00', '0.00', '0.00', '0.00', '0.04', '0.00', '0.00', '0.00', '0.00', '0.00', '0.00', '0.01']

Predicted class label: Hibiscus

```
predict_plant_rf(r'C:\Users\loges\Downloads\Dataset-medecinal_plants\Dataset-medecinal_plants\tulasi\82aeafa85154526df19e233de
```



1/1 [=====] - 0s 117ms/step

RandomForest Classifier

[27]

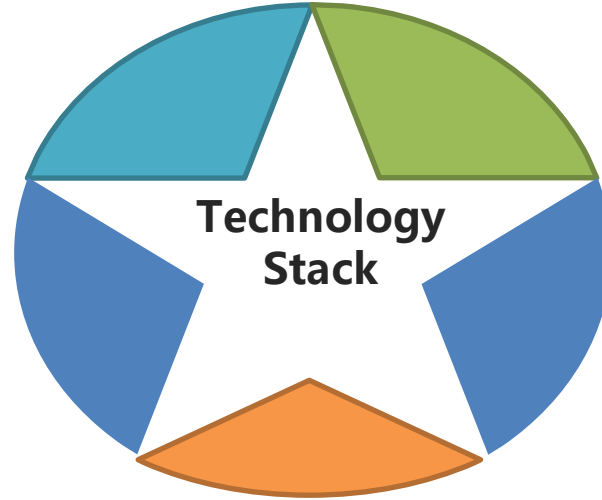
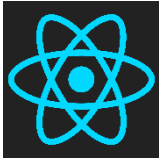
```
[[0.          0.01960784 0.02614379 0.02614379 0.02614379 0.
 0.0130719 0.00653595 0.          0.00653595 0.05882353 0.
 0.          0.          0.03921569 0.00653595 0.0130719 0.
 0.          0.          0.          0.0130719 0.          0.
 0.0130719 0.0130719 0.01960784 0.67973856 0.01960784]]
```

Predicted class label: ['tulasi']

TECHNOLOGY STACK

Web Development

- React JS



Machine Learning

- Tensorflow
- Scikit Learn



App Development

- React Native
(Cross Platform JS Framework)



Backend Tools

- Django
- Node JS



Database

- MongoDB
- Firebase



Metrics

Novelty

- Hybrid model used to achieve higher accuracy.
- Interactive chatbot
- Supply chain Integration
- Offline herbal remedy book for homemade remedies

Scale of Impact

- Supports huge number of medicinal plant suppliers.
- Helps in identifying medicinal plant for different person in the supply chain

Use cases

- Safety and Efficacy
- Pharmacological Research
- Quality Control in Herbal Products
- Ethnobotanical Studies
- Seasonal and Geographical Variability
- Species Differentiation

User Experience

- Color for UI is chosen to help Color blindness people.
- Multi Language Support is used.