SAHYADRI
COLLEGE OF ENGINEERING & MANAGEMENT
An Autonomous Institution
MANGALURU

## Department of Computer Science and Engineering
## (Artificial Intelligence and Machine Learning)

# Proposed Project Synopsis - 2025-26

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|---|---|
| **Project Title:** | **Vision-Based Identification of Ayurvedic Medicinal Tree Bark** |
| **Project Domain:** | **Healthcare & Ayurveda ,Artificial Intelligence / Machine Learning ,Computer Vision , Agro-Forestry Technology** |
| **Is this Project Inter-disciplinary? (Yes/No)** | **NO** |

| Student Name | USN | Student Signature |
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|---|---|
| Dr. Sadhana Rai | |

**Product or Application Oriented/ Research Oriented:** **Research Oriented**

**Project Description:**

This project proposes an AI-based system to automatically identify different varieties of Ayurvedic medicinal tree bark from digital images of bark samples. The system will use deep-learning models trained on bark-texture datasets and fine-tuned using a custom field collected multi-species bark image dataset. Images captured using smartphones, macro lenses, or microscopes will be pre-processed and classified using convolutional neural networks or Vision Transformer architectures. The objective is to assist in herbal raw-material authentication, reduce adulteration in supply chains, and provide forest officials and pharmacists with a low-cost digital screening tool.

**Application of the Project :**

- SDG-3 – Good Health and Well-Being
  Ensures correct identification of medicinal raw materials.
- SDG-12 – Responsible Consumption and Production Reduces adulteration and wastage in herbal supply chains.
- SDG-15 – Life on Land
  Supports sustainable harvesting and biodiversity conservation.

**Problem Statement :**

Manual identification of Ayurvedic medicinal bark samples is difficult and subjective, especially when dried or fragmented, leading to misidentification and adulteration in herbal supply chains, and therefore a low-cost computer-vision-based system is required for large-scale authentication, quality control, and biodiversity protection.

**Objectives of the Project Work:**

- Create a labelled bark-image dataset collected under real-world conditions and, where existing datasets are available, modify and integrate them for this study.
- Development and training of machine-learning models for automatic bark identification using computer-vision techniques.
- Evaluation of the system using standard performance metrics on unseen bark samples.

**Expected Outcome of the Project:**

- Well-organized and labelled dataset of multiple Ayurvedic medicinal tree bark images collected under real-world conditions.
- Trained machine-learning model capable of identifying different medicinal bark species from images with high accuracy.
- Performance evaluation results including accuracy, precision, recall, and confusion matrices.
- A functional prototype application for bark identification.

**Technical Details:**

**Software Requirements:**

- Python
- PyTorch or TensorFlow (for ML model training)
- OpenCV (image preprocessing)
- scikit-learn (evaluation metrics)
- Albumentations (data augmentation)
- LabelImg / CVAT (image annotation)
- Streamlit or Flask (prototype application interface)

**Hardware Requirements:**

- Smartphone with macro lens
- USB digital microscope
- Raspberry-Pi with camera module

- Ring-light illumination setup
- External storage device

**Targeted Events:**

1. **Conference/ Journal (Publication) :** Computer vision / AI in agriculture / healthcare

**References:**


[1] *Huang, Y., et al.,* BarkXAI, arXiv:2502.18844, 2025.
Introduces an explainable-AI framework for tree-bark classification, showing how deep models identify texture patterns and visual cues used for species recognition

[2] *Singh, A. K., & Kumar, A.* (2024). Extraction, characterization, and biological activities of phytochemicals from Terminalia arjuna bark. DOI: 10.36676/jrps.v15.i2.1410.

[3] *Cui, Z., et al.*, CNN Improvements for Bark Recognition, Forests, 2023.
Presents enhanced convolutional-neural-network methods that improve bark-image classification accuracy in forestry applications

[4] *Kim, T.K., et al.*, Identifying Bark Features of 42 Tree Species, Scientiic Reports, 2022.
Analyzes visual and structural bark characteristics across many species, forming a benchmark dataset for automated recognition systems

[5] *Juola, J., et al.*, Spectral Analysis of Tree Bark, 2022.
Explores how spectral imaging and reflectance data can differentiate bark types, supporting non-destructive plant identification