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Empowering sustainable
farming through pest detection

Raja Vanka
Pardha Saradhi
Manikanta
Priya Bandhavi
Karthikeya

HEXART.IN INNOVATION COHORT PROGRAM

AgriTech

ABSTRACT

“Farmers often lack reliable and timely methods for identifying plant pests, leading to preventable crop damage and yield loss.”

- Limited Access to Rapid Detection
- Difficulty with Early, Accurate Identification
- Lack of Scalable and User-Friendly Solutions



INTRODUCTION

The challenge of plant pests represents a critical threat to our global food systems. The 'Global Crop Health Assessment' 2024 reveals that despite decades of agricultural advancements, an alarming 20-40% of global crop production is lost each year to these destructive organisms. This staggering loss is not just about damaged crops; it represents a severe economic blow to farmers and a serious threat to the food security of millions worldwide.



Current detection and management methods are inadequate, with over 70% of farmers in developing countries reporting significant losses due to plant pests. Compounding this, invasive pests cost the global food system approximately 70 billion dollars annually. Farmers struggle with timely pest identification due to a lack of user-friendly tools and the difficulty of identifying pest sources. Many also lack awareness or resources for effective pest management.

LITERATURE SURVEY



Current Research

<https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=10623756>

Reference Paper Name

Algorithm for Crop Disease Detection Based on Channel Attention Mechanism and Lightweight Up-Sampling Operator

Datasets

<https://data.mendeley.com/datasets/tywbtsjrjv/1>

Journals

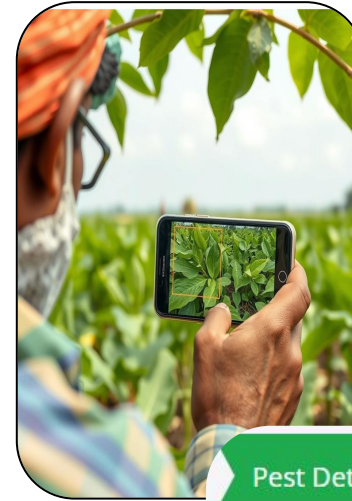
<https://www.frontiersin.org/journals/plantscience/articles/10.3389/fpls.2016.01419/full>

PROPOSED SYSTEM

A User-Centric, Accessible Pest Detection System

Key Components:

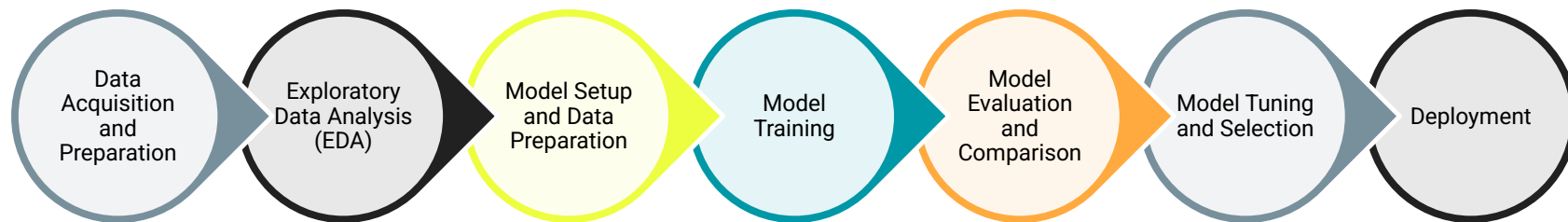
1. **User-Friendly Interface:** Interface for easy image capture and upload.
2. **Image Upload & Preprocessing:** Noise reduction, color correction, and image enhancement for accurate analysis.
3. **Advanced Feature Extraction and Object Detection:** Identifies paled areas, rots, tears, lesions, unusual spots and other features using computer vision.
4. **Enhanced Machine Learning Classification:** Classifies the leaf as either healthy or identifies specific pests/diseases, covering 14 crops and 39 variants, trained with thousands of images.
5. **Real-Time Results & Visual Feedback:** Provides clear results with pest/disease identification, with highlighted parts of concern.
6. **Offline & Reduced Bandwidth Mode:** Enables operation even without or with limited internet access.



Pest Detection Request

-  Collect Leaf images
-  Upload Supporting Images/Documents
-  Evaluate Captured Information
-  Result of status of leaf

WORKFLOW



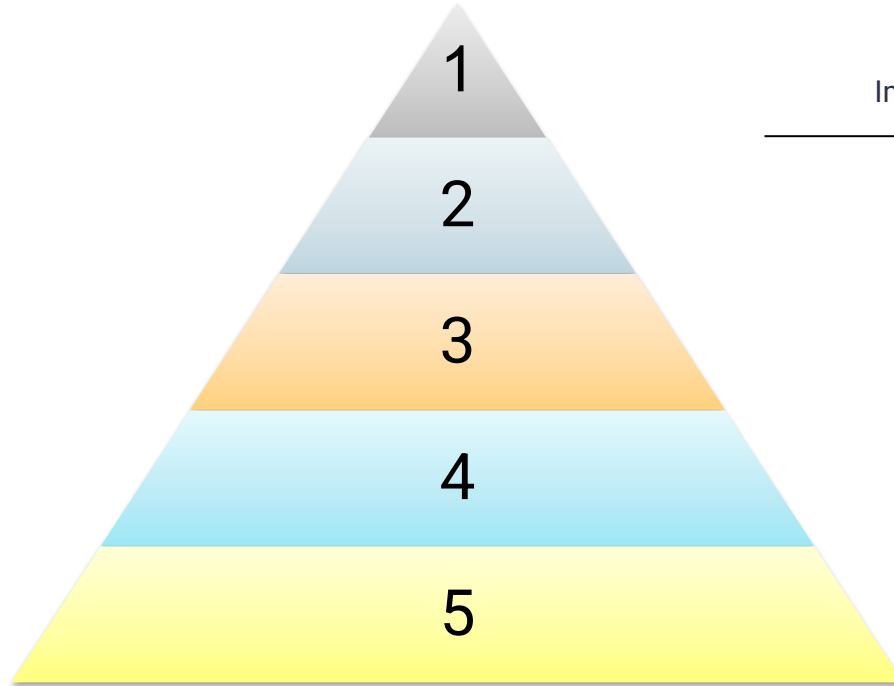
TECHNICAL STACK USED



RESULT

1. **Accuracy Assessment:** Model accuracy is evaluated to determine its proficiency in correctly classifying images. A high accuracy signifies the model's capability to make accurate predictions.
2. **Precision, Recall, and F1 Score Analysis:** Precision, recall, and F1 score are critical metrics used to understand the trade-off between correctly identifying positive cases (sensitivity) and avoiding false positives (precision). Achieving a balanced F1 score is essential for ensuring a reliable and well-rounded model.
3. **Confusion Matrix Examination:** The confusion matrix is analyzed to gain insights into the model's performance. By identifying false positives and false negatives, areas where the model excels and areas requiring fine-tuning for improved accuracy can be pinpointed.
4. **Early Detection Rate Evaluation:** Assessing the model's capability in early detection involves measuring its performance in identifying subtle symptoms or early signs of pest and disease manifestation on leaves.

OUTCOME



Improved Yield

Reduced Crop Loss

Sustainable Farming Practices

Increased Income

Reduced Pesticide Use

OUTCOME



Thank You

Hexart.In...an opportunity like never before!



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