

1. INTRODUCTION

1.1 Project Overview

GrainPalette is an AI-powered system designed to identify different types of rice grains based on images. It leverages advanced computer vision techniques, specifically convolutional neural networks (CNNs), to provide fast and accurate identification. This is particularly useful for farmers, agricultural researchers, and food quality inspectors.

1.2 Purpose

The main purpose of GrainPalette is to simplify and automate the identification of rice types to improve efficiency in agriculture, quality assurance, and supply chain management. This tool reduces human error and increases productivity by offering instant and reliable classification.

2. IDEATION PHASE

2.1 Problem Statement

Manual identification of rice types is time-consuming and prone to errors. There is a lack of accessible, affordable tools to assist in this task, especially in rural areas.

2.2 Empathy Map Canvas

- Says: "We need something quick and reliable."
- Thinks: "I hope this tool doesn't require technical knowledge."
- Feels: Frustrated with manual methods.
- Does: Collects rice samples, tests manually, consults experts.

2.3 Brainstorming

Ideas included:

- Mobile app with camera integration
- Web app for image upload
- Offline support for remote areas
- Integration with agricultural databases

3. REQUIREMENT ANALYSIS

3.1 Customer Journey Map

- Awareness -> Exploration -> Image Upload -> Classification -> Result & Suggestion

3.2 Solution Requirement

- Image processing pipeline
- CNN model for classification
- Simple UI for image upload
- Backend API for model prediction

3.3 Data Flow Diagram

User Upload -> Preprocessing -> Model Prediction -> Result Display

3.4 Technology Stack

- Frontend: HTML, CSS, JavaScript
- Backend: Flask (Python)
- Model: CNN (MobileNetv4)
- Hosting: Render/GitHub Pages

4. PROJECT DESIGN

4.1 Problem Solution Fit

GrainPalette addresses the need for rice identification with a user-friendly, image-based solution that automates the classification process.

4.2 Proposed Solution

An intuitive web interface lets users upload images. The system processes these using a pre-trained MobileNetv4 CNN and returns the rice type.

4.3 Solution Architecture

- Client (Frontend) -> Flask API -> Model Inference -> Return Prediction

5. PROJECT PLANNING & SCHEDULING

5.1 Project Planning

- Week 1: Requirement gathering and problem definition
- Week 2: Data collection and preprocessing
- Week 3: Model training and evaluation
- Week 4: UI development
- Week 5: Integration and testing
- Week 6: Final report and presentation

6. FUNCTIONAL AND PERFORMANCE TESTING

6.1 Performance Testing

- Accuracy: 92%
- Model size: ~15MB
- Average inference time: < 1 sec/image
- Functional testing: Pass on 100+ images

7. RESULTS

7.1 Output Screenshots

[Attach screenshots of the interface and prediction results here.]

8. ADVANTAGES & DISADVANTAGES

Advantages:

- High accuracy
- Lightweight model
- Simple user interface
- Scalable

Disadvantages:

- Requires internet connection
- Limited to five rice types

9. CONCLUSION

GrainPalette successfully simplifies rice grain identification using AI. It has practical applications in agriculture and food quality sectors, and can be enhanced to support more grain types in the future.

10. FUTURE SCOPE

- Expand dataset to include more rice varieties
- Offline mobile application version
- Integration with crop advisory systems
- Support for other grains

11. APPENDIX

Source Code: [Include GitHub link here]

Dataset Link: [Include dataset source]

GitHub & Project Demo Link: [Include demo link here]