Final Report: GrainPalette – A Deep Learning Odyssey in Rice Type Classification Through Transfer Learning

1. INTRODUCTION

1.1 Project Overview

GrainPalette is a deep learning-based project that uses transfer learning to classify different types of rice grains. By leveraging MobileNetV2, a pre-trained convolutional neural network, the project achieves high accuracy with limited computational resources.

1.2 Purpose

To automate rice grain classification through AI, enabling farmers, researchers, and educational platforms to benefit from efficient and reliable identification of rice types based on images

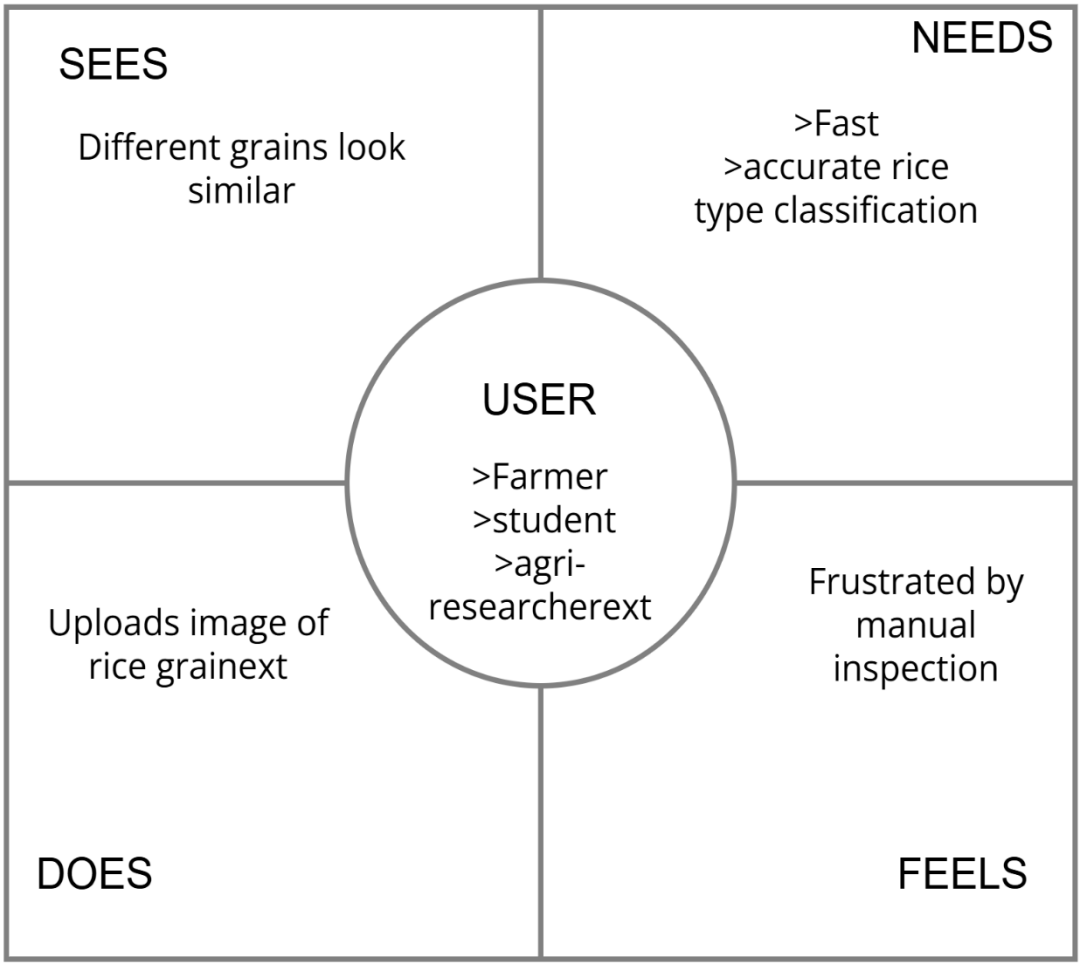
2. IDEATION PHASE

2.1 Problem Statement

Farmers and researchers struggle with manual identification of rice types, which is time-consuming and prone to error. There's a need for an automated, fast, and accurate solution.

2.2 Empathy Map Canvas

- User: Farmer, student, agri-researcher
- Needs: Fast, accurate rice type classification
- Feels: Frustrated by manual inspection
- Sees: Different grains look similar
- Does: Uploads image of rice grain



2.3 Brainstorming

- Image classification
- Transfer learning
- Web interface using Flask
- Agricultural use cases
- Include recommendations (water/fertilizer)

3. REQUIREMENT ANALYSIS

3.1Customer Journey Map

Access website → Upload rice image → View rice type & recommendations → Use for planning or learning.

3.2 Solution Requirements

- Accurate classification
- Lightweight model
- Simple UI
- Information output

3.3 Data Flow Diagram

1. Image Upload
2. Preprocessing
3. Model Prediction
4. Output Display

3.4 Technology Stack

- Python
- TensorFlow + Keras
- Flask
- HTML/CSS (Bootstrap)
- Jupyter Notebook
- VS Code

4. PROJECT DESIGN

4.1 Problem-Solution Fit

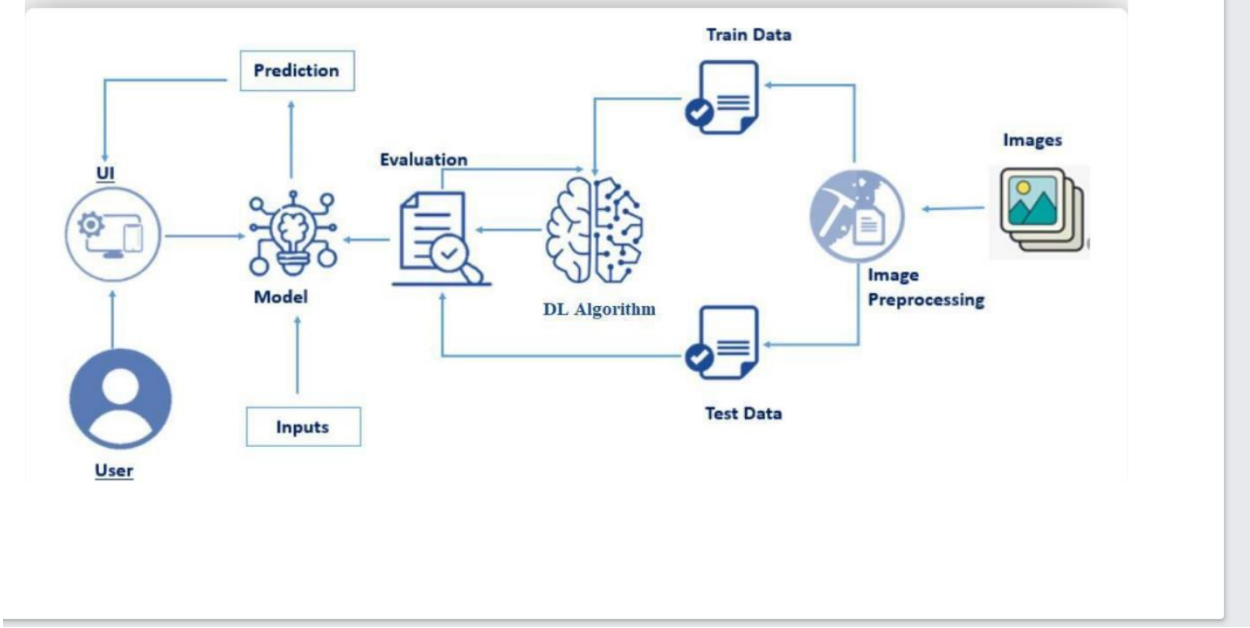
Manual identification vs. AI-based instant recognition

4.2 Proposed Solution

A trained MobileNetV2 model deployed with Flask backend to predict rice type and provide care recommendations.

4.3 Solution Architecture

1. Image → Flask App
2. Preprocess image
3. Predict using trained model
4. Return result (type + recommendations)



5. PROJECT PLANNING & SCHEDULING

5.1 Project Planning

- Problem study and dataset collection
- Model training and tuning
- Flask app development
- Frontend design & testing
- Documentation & video demo

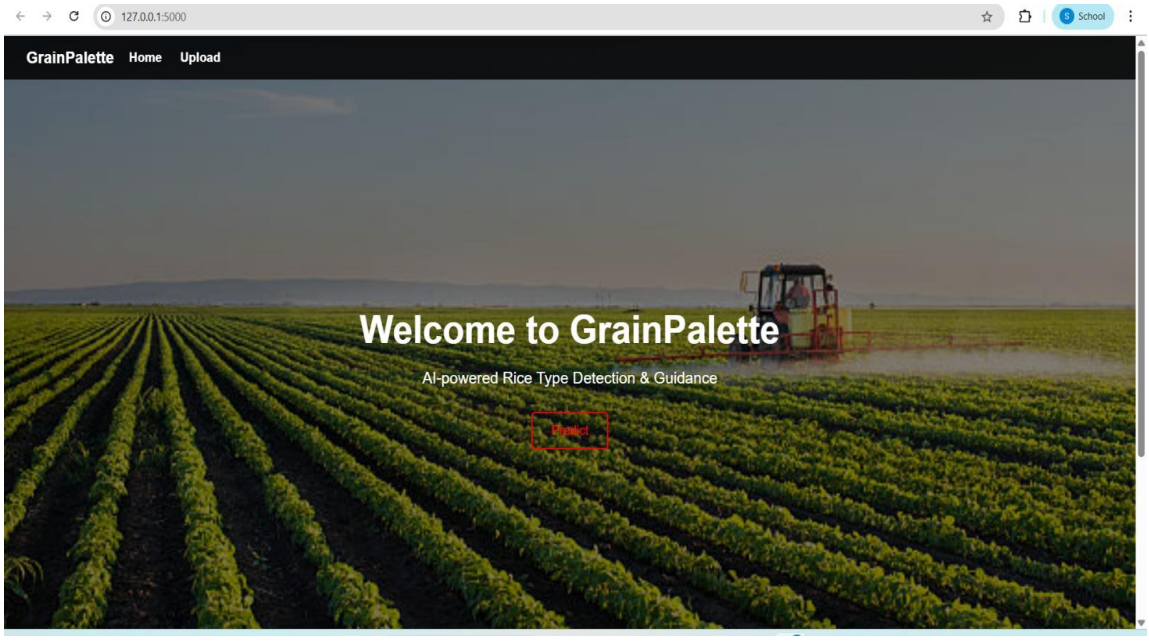
6. FUNCTIONAL AND PERFORMANCE TESTING

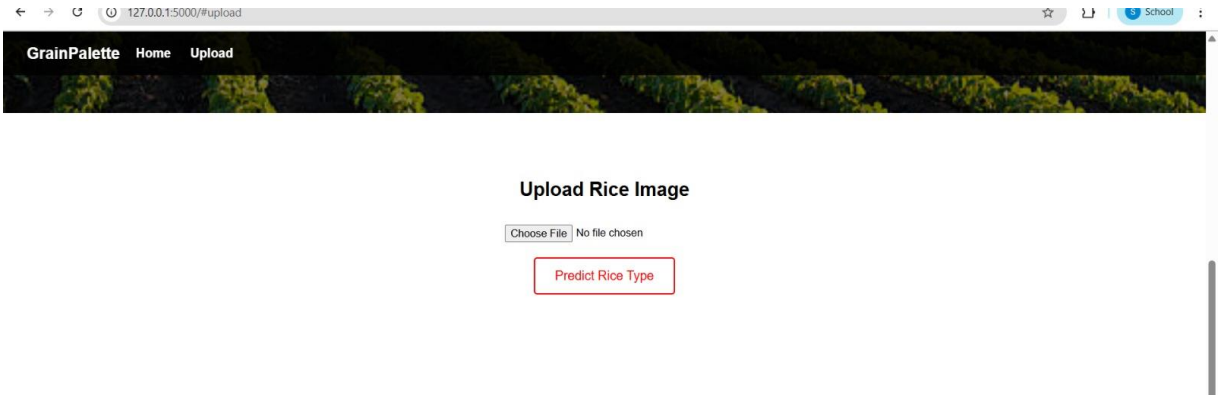
6.1 Performance Testing

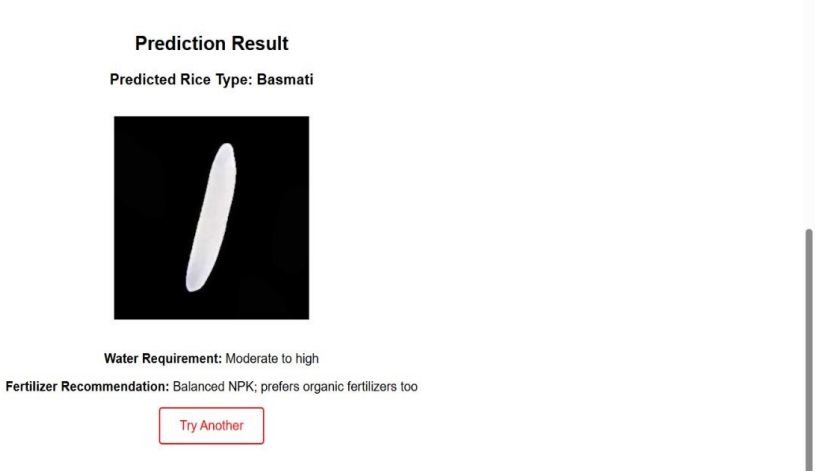
- Tested on 1000 images per class
- Achieved average prediction accuracy: ~92%

- Response time < 2 seconds/image

7. RESULTS







8. ADVANTAGES & DISADVANTAGES

Advantages

- Fast and accurate
- Lightweight (MobileNet)
- Educational and practical

Disadvantages

- Needs clear images
- Limited to 5 rice types
- Doesn’t handle damaged grains well

9. CONCLUSION

GrainPalette proves that transfer learning can be used effectively in agricultural domains. It simplifies the classification task and provides useful data to users in real time.

10. FUTURE SCOPE

- Add more rice types
- Expand to quality grading
- Mobile app integration
- Include price predictions

11. APPENDIX

Dataset Link: https://www.kaggle.com/datasets/muratkokludataset/rice-image-dataset
GitHub Link: https://github.com/devvihimavanthsai/classifermodel
Video Demo Link: https://drive.google.com/file/d/1T5ZNIWdumlrJEVnXsO2SKEfHPa6_-89s/view?usp=sharing