1. INTRODUCTION

1.1 Project Overview

GrainPalette is an AI-powered web application designed to classify various types of rice grains using deep learning techniques, particularly Transfer Learning. The project leverages a pre-trained Convolutional Neural Network (CNN) model to accurately identify rice grain varieties from images uploaded by the user.

This solution bridges the gap between agricultural practices and modern AI by offering an intuitive platform that automates rice variety classification, replacing traditional manual methods that are often time-consuming and error-prone. The system is implemented using Python, TensorFlow/Keras for the backend model, and Flask for the web interface, providing an end-to-end pipeline from image input to class prediction.

1.2 Purpose

The purpose of GrainPalette is to:

- Provide an accessible and intelligent platform for rice classification that benefits farmers, distributors, exporters, food laboratories, and quality control units.
- Minimize manual effort and errors in the grain identification process through automation.
- Enhance decision-making for rice sorting, packaging, and distribution based on rice type.
- Reduce dependency on expensive lab analysis by introducing a low-cost, AI-based tool.
- Encourage digital transformation in agriculture, particularly in quality inspection and post-harvest processing.

By addressing the practical challenges in rice grain identification, this application contributes to both efficiency and accuracy, ultimately supporting the larger goal of precision agriculture.