GrainPalette - A Deep Learning Odyssey In Rice Type Classification Through Transfer Learning

# 1. Project Overview

GrainPalette is a deep learning-based solution that enables the classification of rice types using image data. Leveraging Transfer Learning with MobileNetV4, the model identifies different rice grain types with high accuracy. The goal is to support farmers, agriculture researchers, and home gardeners in recognizing rice varieties for better decision-making.

# 2. System Requirements

- OS: Windows 8 or higher

- Internet: Minimum 30 Mbps bandwidth

- Browsers: At least two installed browsers (for compatibility and testing)

- Tools: Python (3.x), Jupyter Notebook / Google Colab, Streamlit / Flask

- Libraries: TensorFlow/Keras, NumPy, Pandas, OpenCV, Matplotlib

# 3. Prior Knowledge

- Python fundamentals

- CNNs and deep learning basics

- Transfer learning

- Image preprocessing

- Model evaluation metrics (accuracy, confusion matrix)

- Web app deployment using Streamlit or Flask

# 4. Project Objectives

- Build a CNN model using transfer learning to classify rice types

- Train the model on rice grain images

- Evaluate the model’s performance

- Save and deploy the model for end-user interaction

- Enable accurate predictions via image uploads

# 5. Project Flow

1. Data Collection

2. Image Preprocessing

3. Model Building (Transfer Learning using MobileNetV4)

4. Save the Model

5. Application Building (Web Interface)

# 6. Project Structure

grainpalette/

├── data/

│ └── rice\_dataset/

├── notebooks/

│ └── rice\_classification.ipynb

├── model/

│ └── rice\_model.h5

├── app/

│ └── app.py (Streamlit/Flask code)

├── requirements.txt

└── README.md

# 7. Scenarios & Use Cases

a. Farmers' Crop Planning

Farmers upload seed images to determine rice types and plan irrigation, fertilizers, and other practices.

b. Research & Extension

Agricultural scientists use it during fieldwork to assist farmers with on-spot rice type identification.

c. Home Gardening & Education

Home growers and students explore rice diversity and gain knowledge about different rice types.

# 8. Technical Architecture

[User Uploads Image] →

[Preprocessing using OpenCV] →

[Model: MobileNetV4 Transfer Learning] →

[Prediction Output: Rice Type] →

[Web App (Streamlit/Flask Interface)]