GrainPalette: Rice Type Classification Using Deep Learning

Introduction:

GrainPalette is an AI-powered application designed to accurately classify various rice types using deep learning.

The project leverages computer vision and transfer learning to differentiate rice grains based on their visual features.

This system helps in quality control, supply chain sorting, and agricultural research by providing a fast, reliable, and automated way to classify rice types.

Problem Statement:

Manual classification of rice grains is time-consuming, prone to errors, and lacks scalability. In regions where rice is a staple crop,

a large volume of rice passes through mills and packaging centers daily. An automated solution for classifying rice types based on images can

significantly enhance the speed and accuracy of quality assessment.

Objectives:

- Design and develop a deep learning model capable of classifying different types of rice.

- Build a user-friendly web interface for image upload and classification results.

- Utilize transfer learning to improve accuracy with limited training data.

- Contribute an open-source tool for agriculture and food-tech communities.

Dataset:

High-quality labeled images of different rice types like Basmati, Jasmine, Arborio, Long Grain, Short Grain, and Brown Rice.

Preprocessing includes normalization, resizing, and augmentation.

Methodology:

1. Data Collection and Preprocessing

2. Model Selection using MobileNetV2 or ResNet50

3. Training and Evaluation using accuracy, precision, recall, and F1-score

4. Deployment with Flask web application

Website Features:

- Landing Page with introduction and call-to-action

- Upload Section to upload images

- Results Page showing predictions

- About Page with methodology and contributors

Technology Stack:

Frontend: HTML, CSS, JavaScript

Backend: Python (Flask)

Model: TensorFlow/Keras with transfer learning

Deployment: Heroku or local server

USP:

GrainPalette provides intelligent, accurate rice classification using deep learning and transfer learning, suitable for small datasets.

Future Scope:

- Extend to more grain types (e.g., wheat, barley)

- Add grain quality metrics (length, width, color)

- Develop a mobile version

- Expand dataset size and diversity

Conclusion:

GrainPalette shows how deep learning automates rice type classification, improving accuracy and efficiency in agriculture.

Files and Structure:

- app.py

- rice_type_classifier.h5

- rice_classification.ipynb

- forms/forms.py

- static/placeholder.txt

- templates/placeholder.txt