Rice Classification – Final Project Report

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1 . Project Overview

This project focuses on rice grain classification using a Convolutional Neural Network model powered by TensorFlow and trained on a dataset of five rice varieties: Arborio, Basmati, Ipsala, Jasmine, and Karacadag. The aim is to automate rice type identification from images to aid quality assurance in agriculture and food industries.

1 . Problem Statement

Manual classification of rice varieties is time-consuming and prone to human error. A deep learning-based classification model can help automate the process and provide consistent and accurate identification, helping producers and regulators maintain quality control.

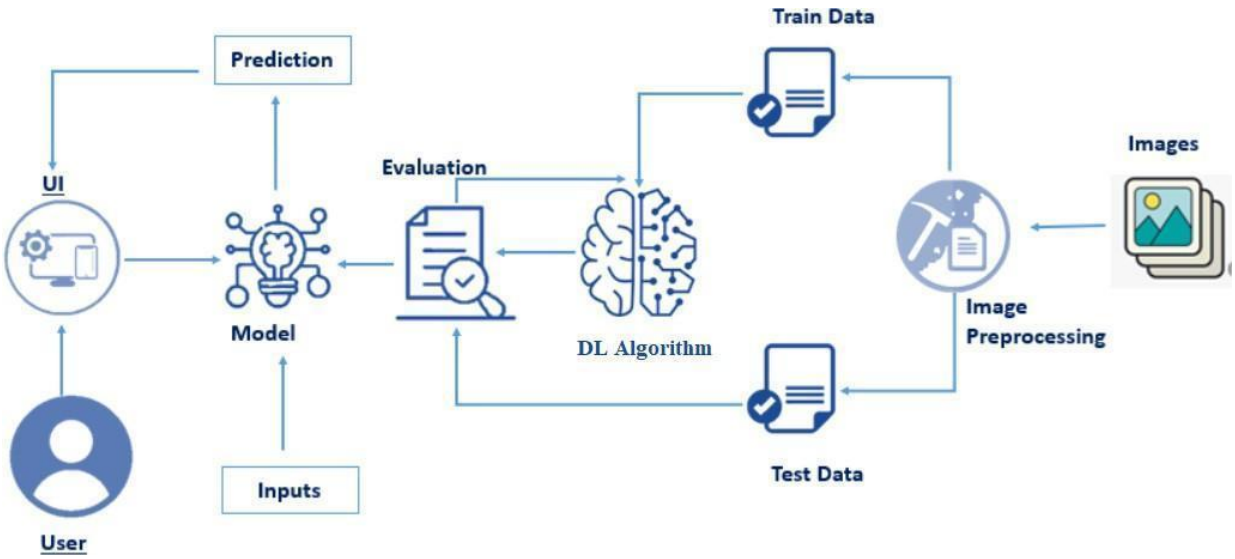
1 . Dataset and Preprocessing

The dataset consists of images categorized into five classes. For each class, 600 images were selected. Images were resized to 224x224 pixels and normalized to [0,1]. Train-test-validation split was 70%-15%-15%. Data augmentation was avoided due to sufficient class balance.

1 . Model Architecture

The model uses a MobileNetV2 feature extractor from TensorFlow Hub with a dense output layer of five units and softmax activation. It was compiled with Adam optimizer

and sparse categorical crossentropy loss. The model was trained for 10 epochs with validation monitoring.



1. Evaluation and Accuracy

Evaluation was performed on a separate test set. Metrics included accuracy and classification report. The model achieved high classification performance with validation accuracy improving across epochs, as visualized via accuracy and loss plots.

1. Web Application

A Flask web app was developed to serve the trained model. Users can upload rice grain images, and the app predicts the rice variety along with a confidence score. The app uses OpenCV for image preprocessing and TensorFlow for inference.

1. Results

The application successfully identifies uploaded rice grains with clear predictions like 'Basmati' or 'Jasmine' and returns a confidence percentage. The system performs realtime image inference with high reliability and visual feedback through web UI.

1. Advantages & Limitations

Advantages: Automated classification, user-friendly interface, scalable model deployment.

Limitations: Model trained on fixed image sizes and may not generalize to unseen lighting or image quality conditions.

1. Conclusion

The rice classification project demonstrates the application of transfer learning in agriculture. The system can help automate grain classification and can be scaled with more data and advanced features.

1. Future Scope

Future improvements include integrating image augmentation, mobile deployment, adding more rice varieties, and improving generalization through diverse datasets.