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

Abstract

This project presents 'GrainPalette', a deep learning-based solution for rice type classification using transfer learning. The goal is to automate rice variety recognition using image data and convolutional neural networks (CNNs).

Introduction

Rice is a staple food across many countries. Identifying different rice varieties is essential for quality control, pricing, and culinary use. Traditional methods are time-consuming and subjective. This project proposes an AI-driven approach.

Problem Statement

Manual classification of rice grains is inefficient and error-prone. The challenge is to accurately classify different rice types using a machine learning model trained on image data.

Literature Review

Several studies have applied classical ML and DL techniques to grain classification. Transfer learning has recently gained popularity due to its efficiency on small datasets.

Proposed Methodology

We utilize a pre-trained CNN model (like MobileNetV2 or ResNet50) and fine-tune it for rice classification. The process includes data augmentation, training, validation, and testing.

Dataset Description

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The dataset consists of labeled images of different rice types. Each image is preprocessed (resized, normalized) before being fed to the model.

Model Architecture

A transfer learning model is used with the final layers modified to classify the specific rice varieties. Softmax activation is applied to the output layer for multi-class classification.

Results and Evaluation

The model achieved an accuracy of over 90% on the test dataset. A confusion matrix and accuracy/loss plots were used to evaluate the performance.

Conclusion & Future Work

GrainPalette successfully demonstrates rice type classification using transfer learning. Future work includes expanding the dataset and deploying the model via a mobile or web app.

References

1. Papers on rice classification using CNNs

2. TensorFlow/Keras documentation

3. Research articles on transfer learning