Rice Image Classification Using CNN - Report

1. Introduction

This project focuses on classifying rice images using Convolutional Neural Networks (CNNs) in TensorFlow.

The dataset contains 75,000 images divided into five categories, with each image being 250x250 pixels.

2. Dataset Preparation

- The dataset is split into training (70%), validation (15%), and test (15%) sets.

- Images are normalized and loaded using TensorFlow's image_dataset_from_directory().

- The dataset contains the following classes: Arborio, Basmati, Ipsala, Jasmine, and Karacadag.

3. CNN Models Used

Three CNN models were developed to classify rice varieties:

1. **Simple CNN Model:** Single convolutional layer with max pooling.

2. **Dual-Layer CNN Model:** Two convolutional layers with pooling.

3. **LeNet-5 Model:** More complex architecture inspired by LeNet.

Each model was trained with validation data and evaluated based on accuracy and loss.

4. Model Evaluation

- **EarlyStopping** was used to prevent overfitting.

- Accuracy and loss were measured on the test set.

- The best model was the LeNet-5 architecture with the highest accuracy.

- Performance metrics included accuracy, loss, and confusion matrix analysis.

5. Areas for Improvement

Future enhancements can include:

- **Data Augmentation:** Improve generalization with rotation, flipping, and zooming.

- **Hyperparameter Tuning:** Optimize learning rate, batch size, and optimizer choice.

- **Confusion Matrix Visualization:** Better understand misclassifications.

6. Conclusion

This project successfully implemented and compared different CNN models for rice classification. The LeNet-5 model performed the best and was saved for future use. Further improvements could enhance the model's accuracy and robustness.