ResNet50 Fish Classification – Transfer Learning Report

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Model Summary:

This report summarizes the transfer learning model based on ResNet50 used for fish classification.

Introduction

In this project, a transfer learning model was built using the ResNet50 architecture to classify nine different fish species. The goal was to achieve high accuracy and stable training by leveraging pretrained ImageNet weights.

Analysis

The dataset contains nine balanced fish classes. Image data augmentation such as rotation, zoom, shifting, and flipping was used to improve generalization. The dataset structure was clean and suitable for multi-class classification.

Methods

ResNet50 was used with pretrained ImageNet weights and without the top classification layer. A new classifier head was added with GlobalAveragePooling, a dense ReLU layer, dropout for regularization, and a softmax output layer. Only the top layers were trained while the base model remained frozen. Adam optimizer, early stopping, learning rate scheduling, and checkpointing were used to improve stability and performance.

Results

The model achieved excellent performance with approximately 98.5% validation accuracy and 100% top-3 accuracy. The classification report and confusion matrix confirmed strong results across all nine fish species. Training and validation curves showed smooth convergence without signs of overfitting.

Reflection

This project demonstrates the effectiveness of transfer learning. ResNet50 significantly outperformed a custom CNN model. Future improvements may include fine-tuning deeper layers, testing alternative architectures like EfficientNet, and deploying the model in real applications.