MSML603 – Project 3 Report

Convolutional Neural Networks for Image Classification

Dataset

The Flower Image Dataset contains 733 RGB images belonging to 10 flower categories. Since all images are stored in a single directory, i extracted class labels from the filenames. Then resized to 200×200 pixels and split into 80% training and 20% testing sets.

Task 1: CNN from Scratch

Constructed a convolutional neural network from scratch with four convolutional layers using 32, 64, 64, and 128 filters. Applied max pooling layers after each conv layer except ofc the last. So used a fully connected layer with 512 neurons followed by a softmax o/p layer for classification. Trained the model on 20 epochs with a batch size of 64.

Test Accuracy: 0.5782

Task 2: Transfer Learning with VGG16

For this I used the VGG16 model pretrained on ImageNet as a fixed feature extractor by freezing all convolutional layers. On top of this, I added a classifier with a 512-neuron dense layer, a dropout layer, and a softmax output layer, and trained this new head for 10 epochs.

Test Accuracy: 0.8095

Comparison

The VGG16-based model achieved higher test accuracy than the CNN trained from scratch, demonstrating the effectiveness of transfer learning when training data is limited.

Conclusion

This project demonstrated image classification using convolutional neural networks and showed that transfer learning with pretrained models such as VGG16 significantly improves performance.