ECE371 Neural Networks and Deep Learning Assignment 1

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Abstract: Through the learning and practice of Task 1, I have gained an initial understanding of the process of image recognition. I have attempted to modify and write configuration files to complete the basic work of image recognition. The goal was to train a model that can recognize five types of flowers in the raw data with over 90 accuracy. During this task, ChatGPT and DeepSeek were helpful in code writing and debugging.

Keywords: Image Recognition, Neural Networks, Deep Learning

1 Introduction

This image classification task is quite basic. The goal is to use the five types of flowers in the raw data and train a machine to identify the different flower species while maintaining an accuracy of over 90. In this task, both ChatGPT and DeepSeek assisted in the code writing and debugging process.

2 Related Work

Previous research on image classification has demonstrated the effectiveness of deep learning models, particularly convolutional neural networks (CNNs), in various computer vision tasks. **?**] introduced AlexNet, which significantly outperformed traditional methods in image classification. More recently, transfer learning techniques have been employed, where pre-trained models such as ResNet and VGGNet are fine-tuned for specific tasks, providing substantial improvements in performance with fewer data requirements. These advancements form the basis of our approach to solving the flower classification task.

3 Method

In Experiment 1, the MobileNetV3 model was chosen due to its lightweight architecture and high accuracy, which was particularly advantageous since my computer uses a CPU for training. During the data preparation stage, I used a script to convert the raw data into ImageNet format. For fine-tuning the model, the data was processed with cropping, resizing, and flipping techniques. The learning rate was set to 0.01, and linear and cosine annealing learning rate strategies were applied. The training cycle was reduced to 20 epochs.

Experiment 2 employed transfer learning, using the pre-trained ResNet-18 model for flower image classification. By applying image augmentation techniques such as cropping, flipping, and rotation, the model's generalization ability was improved. The final layer of the network was modified to fit the 5-class classification task, and the training utilized cross-entropy loss and SGD with momentum. A learning rate decay strategy was also used to enhance the model's performance.

9th Conference on Robot Learning (CoRL 2025), Seoul, Korea.

4 Experiments

Below are the accuracy variation plots for both experiments:

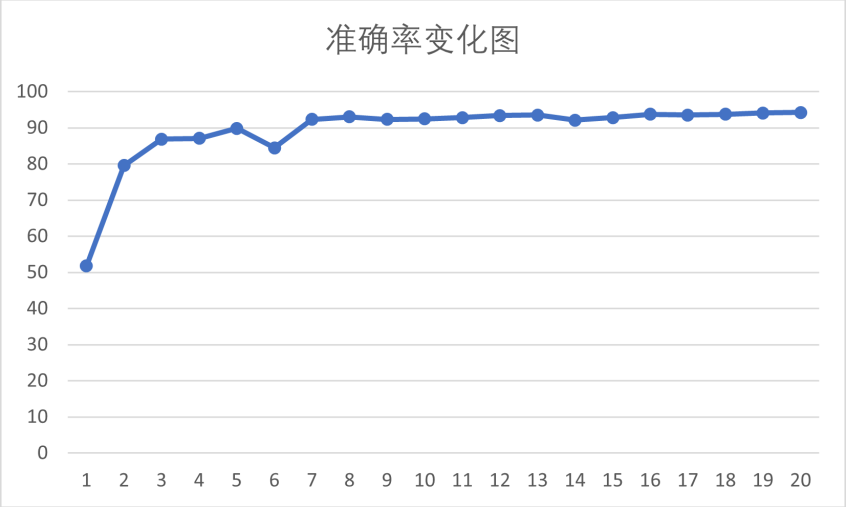

Figure 1: Accuracy variation for Experiment 2, also achieving the target accuracy of over 90%.

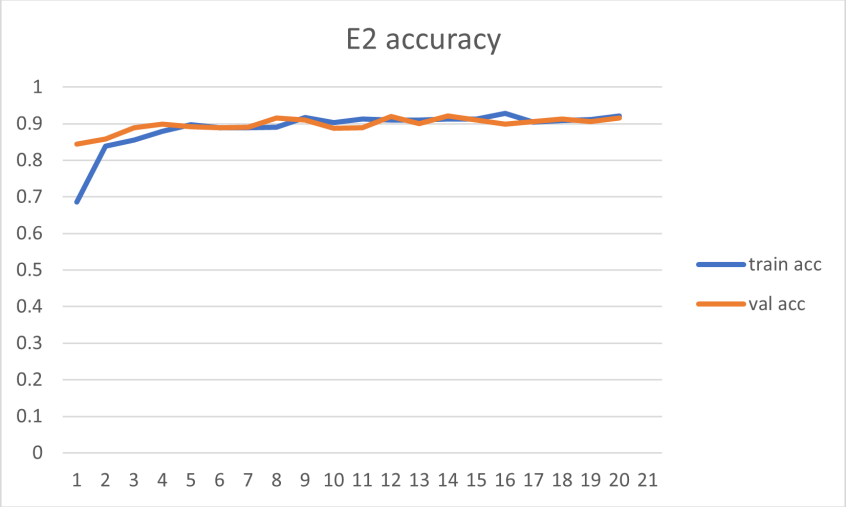

Figure 2: Accuracy variation for Experiment 2, also achieving the target accuracy of over 90%.