Assignment 4: Flower Image Classification Using CNNs

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Objective

The goal of this assignment is to classify images of flowers into 102 categories using two pre-trained CNNs: **YOLOv5** and **VGG19**. The models were fine-tuned on the Flowers102 dataset.

Dataset

- **Dataset Name**: Flowers102
- **Total Images**: 8,189
- **Classes**: 102
- **Splits**:
    - Training: 50%
    - Validation: 25%
    - Testing: 25%
- **Preprocessing**:
    - Resized images to 224x224.
    - Normalized using ImageNet's mean and standard deviation.

Models

1. YOLOv5

- Adapted for image classification by modifying the final classification layer.
- Fine-tuned with a learning rate of 0.005.

2. VGG19

- Fine-tuned by replacing the last fully connected layer with a 102-class classifier.
- All layers frozen except the last classification layer.

Training Process

1. **Optimizer**: Adam
2. **Loss Function**: Cross-Entropy Loss
3. **Batch Size**: 128
4. **Early Stopping**:
   o Patience of 3 epochs to prevent overfitting.

Results

YOLOv5

- **Validation Accuracy**: 92.97%
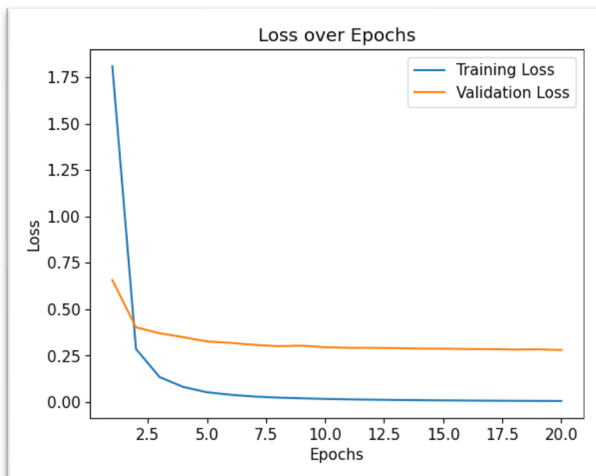- **Test Accuracy**: 93.02%
- **Training Time**: ~28 minutes

VGG19

- **Validation Accuracy**: 76.50%
- **Test Accuracy**: 77.54%
- **Training Time**: ~37 minutes

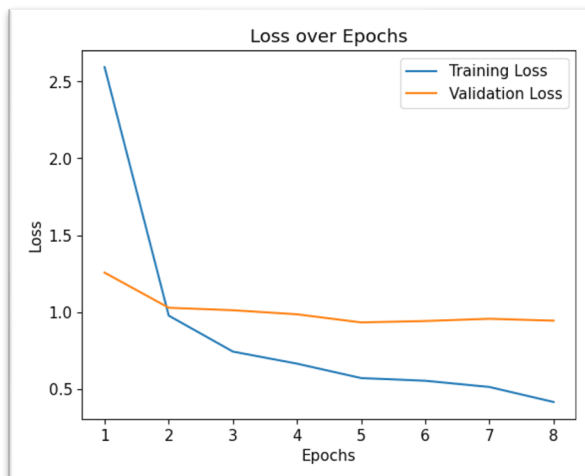## Plots

1. **Loss Over Epochs**

YOLOv5   VGG19

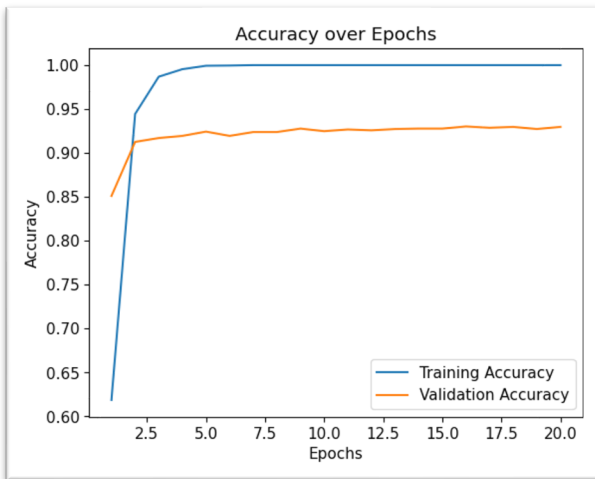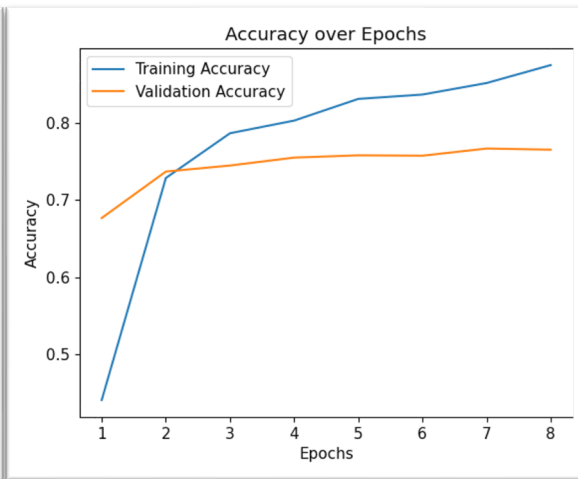## 2. Accuracy Over Epochs

YOLOv5

VGG19

Conclusion

- **YOLOv5** outperformed **VGG19**, achieving a test accuracy of **93.02%**.
- The results demonstrate the effectiveness of transfer learning for flower classification.
- Further improvements could be made by exploring additional pre-trained models or using ensemble methods.