Assignment 3

CV701 - Human and Computer Vision

Introduction:

In this assignment you must implement the following **two tasks** and submit the code (if required) along with a brief report summarizing your findings. This is a **group assessment**, where you are expected work in groups of no more than 4. You **must** implement all of the functions mentioned below from scratch without using any available libraries that directly carry out the full task/sub-task.

Submission. For this assignment, you must submit:

- The group report in PDF format, to be submitted to the link labelled with "Group Report Submission". Only one member of the group should submit this. You must add your code as editable text to this document. This report **must not exceed 6 pages,** excluding referencing and appendices.
- The group code and other materials (i.e. images) in a compressed (zip/tar) file to be submitted to the link labelled "Group Code Submission". Similar to the above, only one member of the group should submit this.
- Individual report in PDF format (no more than half a page), highlighting your individual contribution to the group.

Task 1: Architectural Changes (8/12.5 Marks)

Starting from the CNN architecture defined in "models.py" and the dataset class defined in "dataset.py", carry out the following:

1. Train the baseline CNN model provided to classify the images in the dataset defined in "dataset.py". You should select and justify some reasonable training hyperparameters. The hyperparameters selected should be kept the same for the remainder of this task.
2. Test the trained model from step 1 on the test set and report the achieved accuracy. Show the link between the training and test loss trends.
3. Based on your analysis of the baseline model, make changes to the convolutional layers and pooling layers to improve upon the performance of the model. Report your conclusions following training and testing the updated model.
4. To further improve the classification performance, add Dropout and Batch Normalization layers to your model. Report the impact on performance and explain the changes.

Task 2: Hyperparameter Changes (4.5/12.5 Marks)

Using the models developed in Task 1, carry out the following tasks:

1. Change the optimizer used and analyze the impact on the training process and the test results.

2. Change the learning rate and the learning rate scheduler. Analyze the impact on the training process and the test results.
3. Adjust the number of epochs used and the batch size. Similarly to the above, analyse the impact on the training process and test results.
4. Apply data augmentation during training using a single data augmentation strategy. Explain the impact of the data augmentation applied on the model performance.

Constraints

All the above-mentioned tasks should be carried out with the following constraints:

1. The maximum number of model parameters must not exceed 3 million.
2. There should be no more than 50 training epochs per experiment.
3. You must not try to use more than three configurations per hyperparameter.