

DL/DLOps (2023)
DLOps Assignment 1: ResNet and Layer-wise pretraining [100 Marks]
Deadline: 28/02/2023, 23:59:59

Programming instructions:

1. Programming language: Python
2. Use of PyTorch is compulsory. Marks shall not be given for TensorFlow implementation.

Reporting instructions:

1. Please submit all your working codes as .py or .ipynb files.
2. A single report (PDF) file should be submitted containing all relevant information including data pre-processing, observations, results, and analysis across the problem. Do not put snapshots of code in the report.
3. The report should be detailed and clearly explain every step you have followed. All the intermediate outputs, their inferences should be present in the report. The PDF file should be properly named with your complete roll number XYZ (ex: "XYZ_DLOps_Assignment-1.pdf"), with your name and roll number mentioned inside the report as well.
4. Record a video of your terminal/ipynb file which shows that your written codes are working. (max. video size - 3 minutes)
5. Mention any resources/articles/GitHub links that you may have used as a reference to solve any question of the assignment in the references section of the report.
6. Make sure all the submission files along with the working codes are included in a single zip file.

General instructions:

1. DO NOT plagiarize from the internet or your peers. The institute's plagiarism policy will be strictly enforced.
 2. The assignment will be evaluated out of 50% of the total marks in case a report is not submitted.
 3. We highly suggest using Google Colab with GPU runtimes for this assignment.
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Question 1 [80 marks]

Train ResNet18 on Tiny ImageNet dataset (download from [here](#)) with X as the optimizer for classification task. Plot curves for training loss, training accuracy, validation accuracy and report the final test accuracy. Here consider accuracy as top-5 accuracy.

1. Use CrossEntropy as the final classification loss function [10 marks]
2. Use Triplet Loss with hard mining as the final classification loss function [30 marks]
3. Use Central Loss as the final classification loss function [40 marks]

Compare the performance of different models and analyze the results in the report.

Note - The code for ResNet18 architecture and the loss functions needs to be implemented from scratch. Directly importing from the library is not allowed and 0 marks will be awarded for that.

X = Adam, if last digit of your roll no. is odd

X = SGD, if last digit of your roll no. is even

Question 2 [20 marks]

Implement a multi-layered classifier where weights of each layer is calculated greedily using layer-wise pretraining with the help of auto-encoders on STL-10 dataset. Train a classifier having X structure (excluding input and output layers) for classification task on the test set.

1. Report the classification accuracy on the test set and plot loss curves on the training and evaluation set.
2. Report the class-wise accuracy of each class.
3. Plot t-sne for this model (use embeddings from layer X[3]) . Use the first 500 images of each class from the test dataset for this visualization.

X = [1024,1200,728,512,128], if last digit of your roll no. is odd

X = [1024,1000,500,256, 128,64], if last digit of your roll no. is even

Reference - [Slides](#) [page number 11 to 14]