Deep Learning and its applications to Signal and Image Processing and Analysis

361.2.1120

ASSIGNMENT 1 - BASIC DEEP LEARNING

Submission Date: 05.04.2021

Introduction

In this assignment we will learn the basics of deep learning platform. You will perform a classification task of the fashion MNIST dataset. **Before you start,** please read the submission instructions at the end of the ASSIGNMENT and follow them during your work. For any question regarding this assignment please refer to the course forum on the moodle web site, for personal questions **only** please email benhait@post.bgu.ac.il, soferron@post.bgu.ac.il

1 Fashion MNIST Classification

1.1 Dataset Manipulation

1. Change the labels of the images to match the following labels:
   (a) Top: T-Shirt/Top (0), Pullover (2), Dress (3), Coat (4), Shirt (6)
   (b) Bottom: Trouser (1), Sandal (5), Sneaker (7), Ankle Boot (9)
   (c) Accessories: Bag (8)
2. Use augmentation methods on the dataset. Explain which augmentations were used and why. Attach visualizations of the augmentations used.

1.2 Choosing a Model

Modify the original model. In each modification, explain the main ideas behind it.

1. Add Conv2d layers to use the spatial features in the images.
2. Try using regularization layers such as BatchNormalization, Dropout, etc.
3. Try using loss regularization such as L1/L2.

1.3 Evaluation

Evaluate your model.

1. Use different types of measures to evaluate the model:

   (a) Overall accuracy.

   (b) Per class accuracy.

   (c) Confusion matrix.

   Compare the results over different configurations, and show the contribution of the components you chose in Section 1.2

2. Use Tensorboard to display the train loss, and the accuracy vs. epochs graphs. Explain the plots (overfit, underfit, etc.).

Submission Instructions

The following instructions are mandatory and will be checked and graded by the course staff. Failing to follow these instructions **will** reduce points from you grade.

The assignment is to be done in Tensorflow or Pytorch and submitted to the course moodle page in the form of a *.zip (**not RAR**) containing your implementation in python (**.py* or **.ipynb*) and pdf with your report. **Both the PDF and ZIP file names should be the initials and ID of both of the team members ex. 'TB-1234567_RS-7654321.pdf' and 'TB-1234567_RS-7654321.zip', respectively.**

Academic integrity: the originality of the submitted ASSIGNMENTs **will be checked.**

Document Instructions

- Only one of the team members should submit the file
- The report should be written in Hebrew or English.
- Each section should have the relevant title as is in this document.
- Every image should be accompanied with the relevant explanation.
- The displayed images should be large enough for us to see them.
- The document should be organized and readable.

Code Instructions

- Use python 3 version and above.
- A **main** function should call all the section functions in the correct order and should be named ***main.ipynb*** or ***main.py***.
- Write modular functions for the subsections and reuse those functions throughout your code whenever possible.
- Every **.py* file should start with a comment containing the full names and IDs of all team members.
- Use meaningful names for all functions and variables.
- Write comments for every line of code that is not completely self explanatory.
- All paths to files should be relative paths. Do not hard code '/' or '\' in the paths.
- The code should run completely without errors. An assignment with errors **will not be checked!**