

AI605: Deep Learning for CV

Fall 2020

Homework 1

Due on Sep 26 (in KLMS or email: course.davian@gmail.com)

Pytorch Tutorial for Computer Vision

The objective of this assignment is to become familiar with the PyTorch library for computer vision tasks. By training the given models for this assignment, you will learn how to design models to facilitate the training process. Please follow the guidelines and answer the given questions.

Setting up the environment

Create a conda environment, as follows:

```
conda env create -f env.yml
conda activate assn1
```

1 Playing around with Neural Network

The notebook `hw1-1.ipynb` will walk you through answering the given questions.

1.1 (10 points) Building classifier for MNIST dataset

In order to make a suitable model for your problem, you need to understand the roles of different activation functions, regularization methods, optimizers. Build your model to train the classifier for MNIST dataset.

Your report should include the following to get full credit:

- Summary of your model architecture and motivation for your design choices
- Classification result including the confusion matrix for each class
- Analysis on the most confusing case (which ground-truth class was wrongly predicted as another class) and the possible reasons.

1.2 (40 points) Written Questions

There are 12 questions on the notebook to help you get familiar with the PyTorch library. Write down your thoughts for each question. (This should be included in your `report.pdf`)

2 Playing around with Convolutional Neural Network

The notebook `hw1-2.ipynb` will walk you through answering the given questions.

2.1 (30 points) Implementation: VGG-19

We have learned about various model architectures to produce the state-of-the-art results for image classification. By referring to the lecture slides, implement the VGG-19 model by yourself.

Your report should include the following to get full credit:

- Summary of the implemented model
- Number of the parameters

2.2 (20 points) Building classifier for CIFAR-10 dataset

In fact, it is difficult to train a huge model from scratch. To see how difficult it is to re-train such large-scale models, you will train your VGG-19 model from scratch and compare its performance with the pre-trained VGG-19 model in CIFAR-10 dataset.

Your report should include the following to get full credit:

- Classification result for your model and the pre-trained model
- Confusion matrix and its analysis for each model

3 How to submit your assignment

1. Download the attached file. It contains the skeleton codes.
2. Fill in the skeleton codes.
3. Modify the name of the file and zip it into `hw1-[your student id].tar.gz`, which should contain the following files:
 - **hw1-1.ipynb, hw1-2.ipynb**: this file should contain your source code.
 - **report.pdf**: this file should contain your answers to the questions. For implementations, attach the code for your model and the test results. For the written assignments, we **highly recommend** you to write down in latex.
 - **help.txt**: this file should contain the names of any individuals from whom you received help, and what kind of help you've received. That includes help from friends, classmates, lab TAs, course staff members, etc. In this file, you are also welcome to write any comments that can help us grade your assignment better.
4. Make sure that no other files are included in the tar.gz file.
5. For KAIST students, submit the tar.gz file at KLMS (<http://klms.kaist.ac.kr>). If not, send e-mail to course.davian@gmail.com with attached tar.gz file.