

Homework 2

1 Introduction

In this assignment you will practice putting together a simple image classification pipeline, based on the SVM/Softmax classifier. The goals of this assignment are as follows:

- Understand the basic Image Classification pipeline and the data-driven approach;
- Get a basic understanding of performance improvements from using higher-level representations than raw pixels (e.g. color histograms, Histogram of Gradient (HOG) features)
- Master basic neural network adjustment skills and try to improve deep neural networks

You will be given a set of *.py files which include tools to check your code.

You just need to upload all your code and do not upload datasets.

2 Submission

- You need to submit the following files:
 - 1) features.py
 - 2) Optimization (selected from Deep Learning Specialization by Andrew Ng on Coursera, you can easily find the solution online)
 - Gradient Checking.py
 - Initialization.py
 - Optimization methods.py
 - Regularization.py
 - 3) Further improve the three-layer neural network in Homework 2 based on optimization techniques and summarize the improvement (with explanation of what you have done) in the report.
 - 4) Report
- Please convert your experiment report to PDF format

3 Higher Level Representations: Image Features

In this problem you will be given snippets of code. The snippets will be functions that you will be introduced to throughout the course and famous functions you might use in basic deep learning algorithms.

Your task is to complete and hand in this completed worksheet (including its outputs and any supporting code outside of the worksheet) with your assignment submission. **You will:**

- Implement features.py in "homework_2"
 - use the validation set to set the learning rate and regularization strength

- train a three-layer neural network on image features
- See the code file for details.

4 Improving Deep Neural Networks

In this problem you will be given four subtasks in folder “Improving Deep Neural Networks Hyperparameter tuning, Regularization and Optimization”.

Please complete the code in the .py file according to the experimental instructions in .ipynb. You will complete the experiment in the following four folders:

- Gradient Checking
- Initialization
- Optimization_methods
- Regularization

Notice:

0) You can use your previous code in “homework_1” to override some default code;

- 1) Modify the package path as your need;
- 2) Modify the datasets path in data_utils.py;
- 3) You can download the dataset using download.py, or you can download the dataset "ciarf-10" yourself. Make sure you have torchvision installed when you use download.py.