Homework 2: SVM and Softmax Classifier

Description

In this homework you will practice how to create SVM and Softmax classifiers in Python with NumPy package. You need to understand how SVM and Sofmax classifier works, including back propagation and gradient decent is performed in order to complete this homework successfully. The goals of this homework are:

- To understand the steps to train/test the classifier for image classification.
- To use the validation dataset for tune up hyper parameters.
- To implement and understand SVM classifier.
- To implement and understand Softmax classifier.

Instruction

*** Before you start, install matplotlib package to plot images and weights, and install Keras to load CIFAR10 dataset by using this command.

- Windows10:
  - Download "scipy-0.19.1-cp35-cp35m-win_amd64.whl" from http://www.lfd.uci.edu/~gohlke/pythonlibs/#numpy
  - Go to download location of file using cmd then type
  - "pip3 install scipy-0.19.1-cp35-cp35m-win_amd64.whl"
  - "pip3 install matplotlib==2.0.0"
  - "pip3 install --upgrade keras"
- Linux/Mac:
  - Open terminal and run
  - "sudo pip3 install matplotlib==2.0.0"
  - "sudo pip3 install --upgrade keras"

In this homework, you need to fill the block of code in 3 python files, runSvmSoftmax.py, svm.py, and softmax.py.

- runSvmSoftmax.py: This is the main file that you will execute. It will read and processing CIFAR10 dataset, initialize classifiers, training, and also tune up hyper parameters.
- svm.py: SVM class that contains 5 functions: initialize, train, predict, calculate loss, and calculate accuracy.
- softmax.py: Softmax class that has the same structure as in svm.py.

Note:

- In each file has comments that will walk you through the implementation, and also, it has the explanation in each block of code that you have to fill in.
- Points for each block of code is also in the comment.
- Don't put any print function in your answer.
- Comment your codes.
- Edit/Add any source code outside **TODO** block is not allowed.

Submission

- Your submission will contain 3 python files **runSvmSoftmax.py**, **svm.py**, and **softmax.py**
- **Zip** file named via the following convention:
  <SU-EMAIL>_<FIRST-Name>_HW2.zip
  Ex. kpugdeet_Krittaphat_HW2.zip
- Upload zip file to blackboard before 11:59PM (EST Time) 9/29/2017