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Department of Computer Engineering
Prof. Dr. Hazım Kemal EKENEL

BLG 506E COMPUTER VISION ASSIGNMENT 2 Linear Classifier

0. For this assignment and the others you will be given Stanford University CS231n course (<http://cs231n.stanford.edu/>) assignments. As stated in CS231n, you should be good at *Python*. Please have a look at *Python/NumPy/IPython* tutorials at <http://cs231n.github.io/>. Also we recommend you to have a *Linux* OS either locally (on your machine) or virtually (on your machine or Cloud services). Similarly, it is recommended to build a *Python* environment preferably by one of the methods below.

* *Anaconda* (<https://www.anaconda.com/>)

* *Miniconda* (<https://docs.conda.io/en/latest/miniconda.html>),

* *virtualenv* (<https://virtualenv.pypa.io/en/latest/>)

Check setup instructions page of CS231n (<http://cs231n.github.io/setup-instructions/>)

All works must be your own!

In your submission (.zip), provide all source files (.py, .ipynb etc.) that you used.

You should have comments in your code.

You are not responsible to write a report but you should give details about your implementation in ipynb notebooks by adding new text cells above the corresponding questions. You can insert images or psuedo codes to text cells.

1. Download assignment 1 from Stanford's CS231n:

<http://cs231n.github.io/assignments2019/assignment1/>

You will be following `svm.ipynb` and `softmax.ipynb` notebooks.

2. Download and extract CIFAR-10 dataset using `get_datasets.sh` script under `cs231n/datasets`. (If you downloaded the dataset for the first assignment, you can use symbolic links or arrange paths to save disk space.)

3. Start notebook with `jupyter-notebook` command. In `svm.ipynb`, run `library/parameter` setups, load CIFAR10 dataset, visualize it, split data as training-validation-test set and do preprocessing.

(If you encounter `Cannot import scipy.misc.imread` error, check if your environment have `scipy 1.3.0`. If so, downgrade it to `scipy<=1.2.0` or you can change the line "`from scipy.misc import imread`" to "`from imageio import imread`" to read images from different library in the file "`cs231n.data_utils`" -the second option is recommended for Colab user since it is hard to change some libraries in Colab environment)

4. Implement `svm_loss_naive` function in `cs231n/classifiers/linear_svm.py`. Run gradient check cell and answer inline question 1.

5. Implement `svm_loss_vectorized` function. Run gradient check cell and compare the results (loss difference and times) to naive approach.

6. Implement LinearClassifier.train function in cs231n/classifiers/linear_classifier.py . Train your svm and plot your loss. Implement LinearClassifier.predict function to measure the accuracy.
7. Tune hyperparameters using validation set. Determine the best ones.
8. Visualize the learned weights. (Answer inline question 2)
9. Open softmax.ipynb . Load data.
10. Implement softmax_loss_naive function in cs231n/classifiers/softmax.py . Run gradient check cells and answer inline question 1.
11. Implement softmax_loss_vectorized function. Run gradient check cell and compare the results (loss difference and times) to naive approach.
12. Train your softmax classifier and tune hyperparameters to find the best ones. Answer inline question 2.
13. Visualize the learned weights.

For any question or discussion, you can e-mail to saritas21@itu.edu.tr or you can (before informing is preferable) and come to the SiMiT Lab (office no: 4105).

For Colab users, you can insert the code below (do not forget changing the “FOLDERNAME”) to the beginning of the knn.ipynp file to mount Google Drive;

```
# This mounts your Google Drive to the Colab VM.
from google.colab import drive
drive.mount('/content/drive', force_remount=True)

# Enter the foldername in your Drive where you have saved the unzipped
# assignment folder, e.g. 'cs231n/assignments/assignment1/'
FOLDERNAME = None
assert FOLDERNAME is not None, "[!] Enter the foldername."

# Now that we've mounted your Drive, this ensures that
# the Python interpreter of the Colab VM can load
# python files from within it.
import sys
sys.path.append('/content/drive/My Drive/{}'.format(FOLDERNAME))

# This downloads the CIFAR-10 dataset to your Drive
# if it doesn't already exist.
%cd drive/My\ Drive/$FOLDERNAME/cs231n/datasets/
!bash get_datasets.sh
%cd /content/drive/My\ Drive/$FOLDERNAME
```