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Department of Computer Engineering
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BLG 506E COMPUTER VISION
ASSIGNMENT 5
Convolutional Nets: The Last Stand

-1. This is the last stand against the unbelievable, unprecedented and unimaginable storm of assignment series! But you MUST HOLD YOUR GROUND!

I see in your eyes, the same fear that would take the heart of me.
A day may come when the courage of people fails, when we forsake our friends and break all bonds of fellowship.
But it is NOT THIS DAY!
An hour of wolves and shattered shields when the age of people comes crashing down!
But it is NOT THIS DAY! THIS DAY WE FIGHT!
By all that you hold dear, on this good Earth! I BID YOU STAND, PEOPLE OF THE WORLD!

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! Solutions from different GitHub repositories will get 0 points.
In your submission (.zip), provide all source files (.py, .ipynb etc.) that you used.
You should have comments in your code.
You are responsible to write a report that includes motivations behind your decisions (eg: hyperparameter tuning) related to experiments and your observations/thoughts about the results.
The report should be in .pdf, .txt or .doc(x) format.

The story of the assignment belongs to Azmi C. Özgen. I thank him for his creative contributions to the assignment document.

1. Download assignment 2 from Stanford's CS231n:
http://cs231n.github.io/assignments2019/assignment2/
You will be following ConvolutionalNetworks.ipnyb notebook. You will implement several layers of convolutional networks, then use these layers to train on the CIFAR-10 dataset to get state-of-the-art results. *We are surrounded.*

2. Implement conv_forward_naive function in cs231n/layers.py . Test your implementation on the notebook. *For our people.*

3. To have a better understanding of convolution operation you are presented some image processing operations in the notebook, just examine and run it. *The aid is coming.*

4. Implement conv_backward_naive function in cs231n/layers.py . Test your implementation on the notebook. *Keep fighting.*

5. Implement max_pool_forward_naive function in cs231n/layers.py . Test your implementation on the notebook. *What are you waiting for?*

6. Implement max_pool_backward_naive function in cs231n/layers.py . Test your implementation on the notebook. *Just let it go!*

7. There are fast implementations provided for you. Just run the cells and you will use those. They will provide a lot of speed-up. Make sure you have cython in your environment and run python setup.py build_ext --inplace . *Precious!*

8. Just run convolutional sandwich layers that combine multiple operations into commonly used patterns. *Take my hand.*

9. Implement ThreeLayerConvNet class in cs231n/classifiers/cnn.py . Run gradient check cells. *Don't you let go.*

10. Overfit small data, see it on the training-validation plot. *DON'T LET GO!*

11. Now train your convolutional network and acquire an accuracy over 40%. *REACH!*

12. Now spatial normalization.. Wait! Hold on a second! What is happening?! It is.. collapsing. They retreat! YOU HAVE DONE IT! YOU ARE VICTORIOUS!

13. You have come to an end. We were surrounded by evil and darkness. The hope had abandoned us. We were desperate. But it is done. IT IS DONE! The rest is just being happy and enjoying for all the challenges you have overcome. Now I see the joy in your eyes. I appreciate your dauntless tenacity. And I am glad you are here with me. Here at the end of all things.

All that is gold does not glitter,
Not all those who wander are lost;
The old that is strong does not wither,
Deep roots are not reached by the frost.

From the ashes a fire shall be woken,
A light from the shadows shall spring;
Renewed shall be blade that was broken,
The crownless again shall be king.

For any question or discussion, you can e-mail to saritas21@itü.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
```