

# CS 639: Deep Learning for Computer Vision, Spring 2024

## Problem Set 2

Instructor: Yong Jae Lee (yongjaelee@cs.wisc.edu)

TA: Zhuoran Yu (zhuoran.yu@wisc.edu)

TA: Zeyi Huang (zhuang479@wisc.edu)

**Due: Thursday, March 14<sup>th</sup>, 11:59 PM**

### Instructions

1. Download the zipped assignment file from Canvas.
2. Once you unzip the downloaded content, please upload the folder to your Google Drive. Then, open each \*.ipynb notebook file with Google Colab by right-clicking the \*.ipynb file. No installation or setup is required. For more information, please see this tutorial on [using Colab](#).
3. Next, we recommend editing your \*.py file on Google Colab, set the ipython notebook and the code side by side. Work through the notebook, executing cells and implementing the codes in the \*.py file as indicated. You can save your work, both \*.ipynb and \*.py, in Google Drive (click “File” -> “Save” or press “Ctrl/Cmd + s”) and resume later if you don’t want to complete it all at once.
4. While working on the assignment, keep the following in mind:
  - The notebook and the python file have clearly marked blocks where you are expected to write code. **Do not write or modify any code outside of these blocks.**
  - **Do not add or delete cells from the notebook.** You may add new cells to perform scratch computations, but you should delete them before submitting your work.
  - **Run all cells, and do not clear out the outputs, before submitting.** You will only get credit for code that has been run.
5. Once you have completed a notebook, download the completed uniqueid\_PS2.zip file, which is generated from your last cell of the convolutional\_networks.ipynb file. Submit this to Canvas. Note that only one person from the group will need to do this.
6. **You may complete the assignment individually or with a partner (i.e., maximum group of 2 people). If you worked with a partner, provide the name of your partner in the \*.ipynb file. We will be using MOSS to check instances of plagiarism/cheating.**

The goal of this assignment is for you to learn how to build a convolutional neural network so that you can

- Develop a deep understanding of convolution, pooling, batch normalization, and initialization.
- Gain experience using forward function and backward propagation for convolutional neural networks.

The notebook `convolutional_networks.ipynb` will walk you through those pipelines in PyTorch. You are required to write code on `convolutional_networks.py`.<sup>1</sup>

## [OPTIONAL] Extra credit short answer problems [up to 0.5% each added to final class score]

Save your answers into a PDF, and submit it together with your code to Canvas.

1. Discuss one advantage of using CNNs over fully connected networks for image classification tasks.
2. Discuss one limitation or drawback of batch normalization.

---

<sup>1</sup> The coding assignment is adapted from Stanford CS 231n.