CS190I
Spring 2025
Programming Assignment #1

Due: 11:59pm, Sunday, April 27th

In this assignment, you are to implement the YOLO algorithms. By "implementing" we mean

- You algorithms follow that of YOLO, not that of, say, RCNN and its enhancements; however,
- You can choose to base your implementation on any YOLO version (for simplicity, YOLO 1 might be the preferred choice).
- You may use Pascal VOC datasets or Microsoft COCO data sets for training and testing. Your program parameters will thus be influenced (e.g., either 20 or 80 classes)

You must turn in your codes and any personal libraries (not found in Csil) that are needed to run your programs for grading. Do not turn in large public-domain data sets like COCO. You must also turn in a 1-page PDF report (page limit will be strictly enforced and 2-column format is fine), which

1. Clearly states the algorithms and data sets used (but do not describe how YOLO works, cite references instead),
2. Succinctly describes what is interesting and unique about your implementation, e.g., if and how you improve upon the standard YOLO,
3. Your training and testing statistics in either a table or graph format. You must provide accuracy, loss and training time as a function of the training epoch. There are actually multiple ways accuracy and loss stats can be calculated, (e.g., mAP). Hence, you need to be specific about the evaluation criteria you use in generating your tables and graphs.
4. How to run your programs. Explain how your programs can be tested on COE GPU cluster. What are the constraints in terms of batchsize and other hyperparameters? Is there a way to validate your system using an image of, say, bikes parked on one of the campus lots taken from a cellphone camera? and
5. lessons learned.

General assignment policies

In this class, you have some flexibility with the assignments and class projects. Often times, you may have choices in the algorithms you implement, the data sets you use for training and validation, the packages you employ (Tensorflow and Pytorch), and topics of your projects. However, you should be aware of the following rules:

There are many sources (e.g., Github, Youtube, and Huggingface) where you can find valuable information, working source codes, data sets, training and validation run records, etc. Copilots and other AI programming tools may help you write and debug codes. You may even upload assignments verbatim onto Deepseek, Claude, GPT and the like, and have a generative AI system producing solutions for you.

In this era, it is unreasonable and unenforceable to ask you not to consult web tools and resources. We can likewise upload your assignment solutions onto GPT and ask if your programs are facsimiles of or closely resemble some public web codes. Then we will argue over the precision and recall of such a validation process endlessly.

The litmus test of a useful assignment, from my point of view, is this: After you finish an assignment and turn in your solution using whatever help from the web, ask yourself "Do I learn enough in this exercise that I am now confident to reproduce the outcome *without* help from AI? Am I going to pass a job interview and a coding test with Google or

Microsoft if the topic is on this particular assignment?" If your answer is no, you are wasting your time and I strongly advise you to drop the course.

As a concrete example for assignment #1, if you have never written such an nn program, you can learn a lot by watching some Youtube videos on how to code and organize your nn programs (e.g., you will need codes for preparing and loading data, for defining network architectures, for training and testing your models, and for tabulating/graphing the results). Now instead of just copying those web programs, you write the codes yourself - occasionally referring back to the videos, documentation, and public codes are perfectly fine - run and debug them. At the end, not only you learn how to solve this particular problem, you actually develop a good understanding of how most nn programs are structured. The exercise will then help you learn further in this field.