

## Assignment 4 Object Detection with SSD

February 9, 2022

### Objective

- Continue gaining experience with PyTorch and helper libraries
- Understand the VOC Object Detection Dataset
- Train and evaluate the SSD neural network architecture
- Perform an ablation study testing a different base network and learning rate schedule - Learn the Non-Maximum Suppression (NMS) algorithm

### Resources and Instructions

#### Environment Setup:

We recommend using Google Colab to complete this assignment.

1. Create a folder called “ece495\_assignment4” within your Google Colab “Colab Notebooks” folder.
2. Upload the assignment ipynb, utils.py and json files to the Google Colab “ece495\_assignment4” folder
3. Open the assignment
  - Runtime -> change runtime type
  - Set hardware accelerator to None for data download, all initial development and testing (to avoid hitting the GPU limit); see tutorial slides instructions for manual download if automatic fails
  - Set hardware accelerator to GPU when ready for final training

#### Assignment:

1. Ablation study on using a different network base
  - Model A: Train and evaluate the SSD network with the default VGG base.
  - Model B: Implement the ResNetBase class. Then train and evaluate this model.
2. Ablation study on updating the learning rate
  - Model C: Train and evaluate the SSD network with the default VGG base but also with a PyTorch learning rate scheduler.
3. Answer 2 questions on the differences from the NMS pseudo code described in the lectures / tutorial and the implemented version in the code.

#### Deliverable HTML output:

In the Jupyter notebook, go to File > Download as > HTML (.html) Submit a ZIP file containing the HTML output. Please follow the naming convention of your zip file: a4\_<user\_id>.zip

### Due Date

11:59 pm, February 16, 2023

No late submissions will be accepted. There will be no extensions.

### Marking Scheme

This assignment is out of 10 marks.

- 2 marks for training and evaluation output for the SSD network with the default VGG base
- 3 marks for implementing the ResNet base and displaying the training and evaluation output

- 3 marks for adding the learning rate scheduler and the training and evaluation output for the SSD network with the default VGG base
- 1 mark for the model with the learning rate scheduler to get at least 50% mAP
- 1 mark for the NMS questions

## **Policies**

### Collaboration

You can discuss the problem with peers, but you must design and implement your own solution independently.

### Use of online resources

You may consult online resources for inspiration, but you must develop your own code.