EEE408 – ASSESSMENT 2

Assessment Number	2
Contribution to Overall Marks	20%
Submission Deadline	24-May-2019

Assessment Objective

This assessment aims at evaluating students' ability to exploit the deep learning knowledge, which is accumulated during lectures, and after-class study, to analyze, design, implement, develop, test and document the pedestrian detection algorithm using Fast R-CNN framework [1]. The assessment will be based on the Pytorch software.

General Guidelines

1. All the Pytorch configuration files and the implementation source code are required to include in the report as appendix.
2. The final pedestrian detection performance that you obtain should be reported in the lab report. Meanwhile, the screenshot of the final performance results is also required in the report.
3. For the final performance results that you obtained, the numeric results are required. Meanwhile, it is also important to include some subjective image examples in the report with correct bounding boxes marked as red, whereas false bounding boxes marked as green.

Pedestrian detection using Fast R-CNN

Overall Description:

This lab is to use the Pytorch software and Fast R-CNN framework [1] for pedestrian detection. Pedestrian detection aims to predict bounding boxes of all the pedestrian instances in an image. It has attracted much attention within the computer vision community in recent years as an important component for many human-centric applications, such as self-driving vehicles, person re-identification, video surveillance and robotics.

Fast R-CNN is a fast framework for object detection using deep convolutional neural network. The following images are examples of pedestrian detection.

Figure 1. Examples of pedestrian detection.

Problem Specifications:

1. Please describe the 2 key components in the Fast R-CNN framework: the RoIPooling layer and the loss functions in the framework. (20%)

2. Please describe the object detection performance metric, mAP (Mean Average Precision), and explain why it can well reflect the object detection accuracy. (20%)

3. Please train and test the Fast R-CNN framework on one of the existing pedestrian detection datasets, and report the final AP performance that you have achieved. The dataset could be CUHK-SYSU [2], Citypersons [3].   Please also report some pedestrian detection examples by including the images and bounding boxes. (40%).

4. Propose your own method to further improve the pedestrian detection performance based on the Fast R-CNN framework. (20%)

Hint:

1. In literature, there are existing methods that improve the Fast R-CNN for pedestrian detection. One such work is published in [4]. You can refer to [4] for problem 4.

2. There are many open sourced codes for Faster R-CNN and it is highly recommended to use the latest benchmark from Facebook (https://github.com/facebookresearch/maskrcnn-benchmark) and train the model without Mask part.

3. Python version of the API of the datasets can be found on github. And the datasets can be download at

   https://pan.baidu.com/s/15ZknOJOMBva9JmwHM2ykbw   mm: n6se

   https://www.cityscapes-dataset.com/

Reference

[1] Girshick, Ross. "Fast R-CNN" In CVPR 2015.

[2] Tong Xiao, Shuang Li, Bochao Wang, Liang Lin, and Xiaogang Wang. Joint detection and identification feature learning for person search. 2017 IEEE Conference on Computer Vision and Pattern Recognition (CVPR), Jul 2017.

[3] Shanshan Zhang, Rodrigo Benenson, and Bernt Schiele. Citypersons: A di-verse dataset for pedestrian detection. 2017 IEEE Conference on Computer Vision and Pattern Recognition (CVPR), Jul 2017.

[4] https://arxiv.org/pdf/1510.08160.pdf