Project Proposal

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Object detection is a computer vision technique in aim to detect objects of different classes, which locates the presence of an object in an image and draw a bounding box around that object. It has been applied widely in video surveillance, self-driving cars, object or people tracking and many other applications. In this project, we would like to apply several machine learning algorithms used for object detection on both images and videos, with the purpose of making a comparison of different methods and exploring the applicability and performance of each algorithm.

The image dataset is from Kaggle.com, which is a collaborative release of 9 million images annotated with image-level labels, object bounding boxes, object segmentation masks, and visual relationships. The links is: https://www.kaggle.com/c/open-images-2019-object-detection/data. And the videos are filmed by us, which will be shown in the presentation.

The basic deep network we will use is CNN, and we would make some modifications to suit the characteristics of object detection. Several developed methods will be explored including R-CNN, Fast R-CNN, Faster R-CNN and Yolo. And the main frameworks we use are Keras and Pytorch, because they are most commonly used packages in terms of deep neural network and we have already had a comprehensive understanding of them. To judge the performance of the network, we will use multiple indicators including IoU (intersection over union), AP and mAP score (average precision, mean average precision), and also Precision and Recall score.

In addition, we will refer to some materials regarding the implementation of different techniques. Some links are shown below. We would add more during the process of doing the project.
R-CNN: https://towardsdatascience.com/step-by-step-r-cnn-implementation-from-scratch-in-python-e97101ccde55
Fast R-CNN:
https://docs.microsoft.com/en-us/cognitive-toolkit/object-detection-using-fast-r-cnn
Faster R-CNN: https://towardsdatascience.com/faster-r-cnn-object-detection-implemented-by-keras-for-custom-data-from-googles-open-images-125f62b9141a
YOLO: https://blog.paperspace.com/how-to-implement-a-yolo-v3-object-detector-from-scratch-in-pytorch-part-2/

The project is spanning four weeks and the schedule is as follows:
First week: determine the research direction and dataset
Second week: Review the previous research
Third week: Build models and apply to dataset.
Last week: Adapt models, prepare for presentation and write the report.