Object Detection

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Object Detection (Intro)

- Computer vision is an interdisciplinary field that has been gaining huge amounts of traction in the recent years(since CNN) and self-driving cars have taken center stage.
- Another integral part of computer vision is object detection. Object detection aids in pose estimation, vehicle detection, surveillance etc.
- The difference between object detection algorithms and classification algorithms is that in detection algorithms, we try to draw a bounding box around the object of interest to locate it within the image. Also, you might not necessarily draw just one bounding box in an object detection case, there could be many bounding boxes representing different objects of interest within the image and you would not know how many beforehand.

Object Detection (Intro) ..

- We have to select a huge number of regions and this could computationally blow up. Therefore, algorithms like R-CNN, YOLO etc have been developed to find these occurrences and find them fast.
- regions from the image called region proposals .

OB Algorithm

- **R-CNN**
- It still takes a huge amount of time to train the network as you would have to classify 2000 region proposals per image.
- It cannot be implemented real time as it takes around 47 seconds for each test image. and 49 seconds with regional proposal
- **Fast R-CNN**
- The reason “Fast R-CNN” is faster than R-CNN is because you don’t have to feed 2000 region proposals to the convolutional neural network every time. Instead, the convolution operation is done only once per image and a feature map is generated from it.
- it takes 0.32 seconds without region proposal and 2.3 seconds with regional proposal. Region proposals become bottlenecks in Fast R-CNN algorithm affecting its performance.

OB Algorithm..

- **Faster R-CNN**
- it takes 0.2 seconds for test each image.
- it can even be used for real-time object detection.
- **Yolo (You Only Look Once)**
- YOLO is orders of magnitude faster(45 frames per second) than other object detection algorithms. The limitation of YOLO algorithm is that it struggles with small objects within the image.

1. TFOD 2.0 API

Tensorflow model zoo

Since we want to deploy our model in mobile device so we have to trade-off between accuracy and time.

Research paper : The Faster R-CNN Inception Resnet V2 Atrous Coco (Ren et al., 2017) pre-trained model with a TensorFlow object detection application programming interface (API) was used.

Faster-RCNN available.

YOLO

- Not Implemented in our problem because of
- It may detect multiple bounding box and we cant take max of that because its used intersection over union its Non max separation.
- In our Problem one grid cell may contain center of different objects and in real real its hard for it to predict smaller object.

Yolo vs Faster RCNN

- We can see that YOLO and Faster RCNN both share some similarities. They both uses a anchor box based network structure, both uses bounding both regression. Things that differs YOLO from Faster RCNN is that it makes classification and bounding box regression at the same time. Judging from the year they were published, it make sense that YOLO wanted a more elegant way to do regression and classification. YOLO however does have it's drawback in object detection. YOLO has difficulty detecting objects that are small and close to each other due to only two anchor boxes in a grid predicting only one class of object. It doesn't generalize well when objects in the image show rare aspects of ratio. Faster RCNN on the other hand, do detect small objects well since it has nine anchors in a single grid, however it fails to do real-time detection with its two step architecture.