

TensorFlow Object Detection

Object detection is a Deep Learning Technology that deals with detecting instances of semantic objects of a certain class (such as humans, buildings, or cars) in digital images and videos. There are different ways for Object Detection such as Fast RCNN, Faster RCNN, SSD Mobile Net. We are using SSD Mobile Net for this purpose. The dataset is CityScape Dataset which consist of different classes for different cities. As observed from jupyter Notebook `Object_Detection_SSD.ipynb` we can see that SSD Mobile Net provides bounding boxes, Confidence Interval and Object Detection. However, as it an object detection Model it does not provide Segmentation of the Images. We can use this for Self-Driving cars and Medical Application where size of the object plays a pivotal role.

There are two types of Segmentation: Semantic and Instance Segmentation. Semantic Segmentation clusters the pixel of class and represented by same color. But it does not provide object detection. Instance Segmentation is Semantic Segmentation and Object Detection. Firstly, we are using KNN which provides Region based Segmentation. The code can be found in `Clustering_Project.ipynb`. K- Means clustering clusters the Images for its pixel. In the same manner as with other type of data, we can find pixel patterns in our images that will allow us to process them in a faster and more efficient way. k-means works well when we have a small dataset. It can segment the objects in the image and give impressive results. But the algorithm hits a roadblock when applied on a large dataset. It looks at all the samples at every iteration, so the time taken is too high. Hence, it's also too expensive to implement and since k-means is a distance-based algorithm, it is only applicable to convex datasets and is not suitable for clustering non-convex clusters.

Instance segmentation for is achieved using MaskRCNN. The implementation of the code is `Mask_RCNN_Demo.ipynb`. The Mask R-CNN is an extension of the popular Faster R-CNN object detection architecture. The Faster R-CNN method generates two things for each object in the image its class and bounding box. Mask R-CNN adds a third branch to this which output the object mask as well. Hence, we conclude that with the help MaskRCNN we can Mask the Image and provide object Detection for each of them.