

Object Recognition and Lane Segmentation

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Introduction

- ❖ Computer vision algorithm is being implemented for the purpose of segmenting and detecting the objects.
- ❖ Using the Deep Learning and convolution Neural Networks(CNN), we are trying to build a model that is aware enough to classify and segment the objects.
- ❖ An Image dataset consisting of Vehicles, lanes and traffic symbols are utilized.
- ❖ Some of the technologies utilized in the project are Python, OpenCV, CNN, TensorFlow, YOLO, Spatial Pyramid Pooling.

Computer Vision

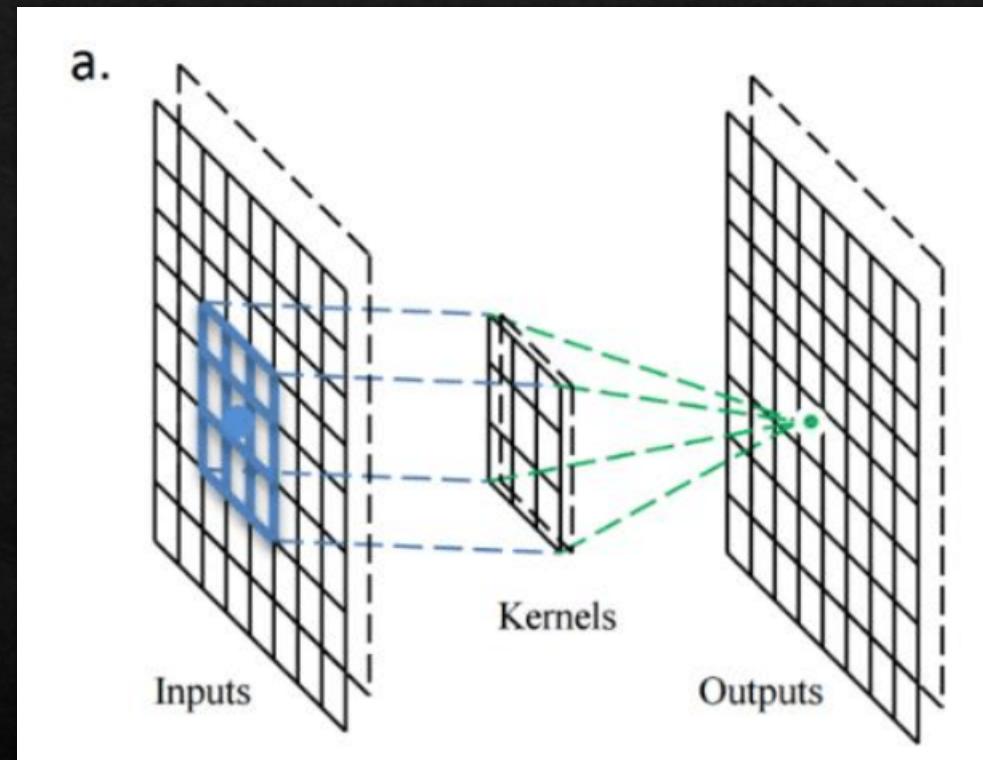
- ❖ Computer Vision is a field of Artificial Intelligence (AI), that enables computers and systems to derive meaningful information from the Images, videos and other visual inputs.
- ❖ It trains a machine to perform functions such as what that image is, how far away each objects are, whether they are moving or something wrong in the image.
- ❖ All this training is done with the help of cameras, image data and algorithms.
- ❖ Applications of CV:
 - ❖ Face Recognition
 - ❖ Smart Cars
 - ❖ Surveillance

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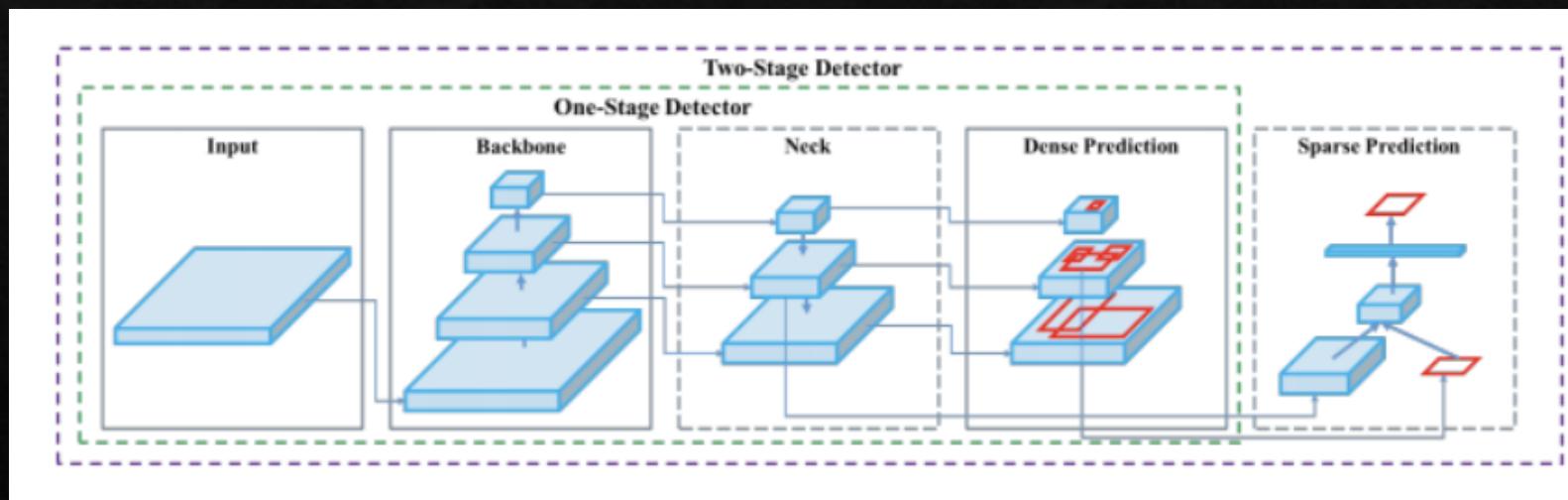
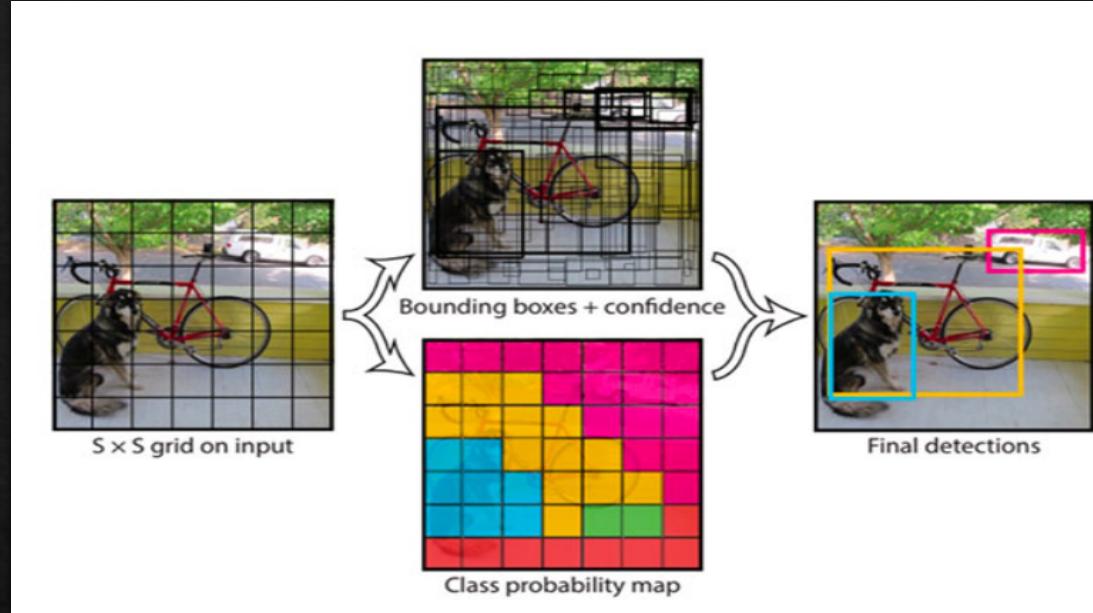
Convolution Neural Network

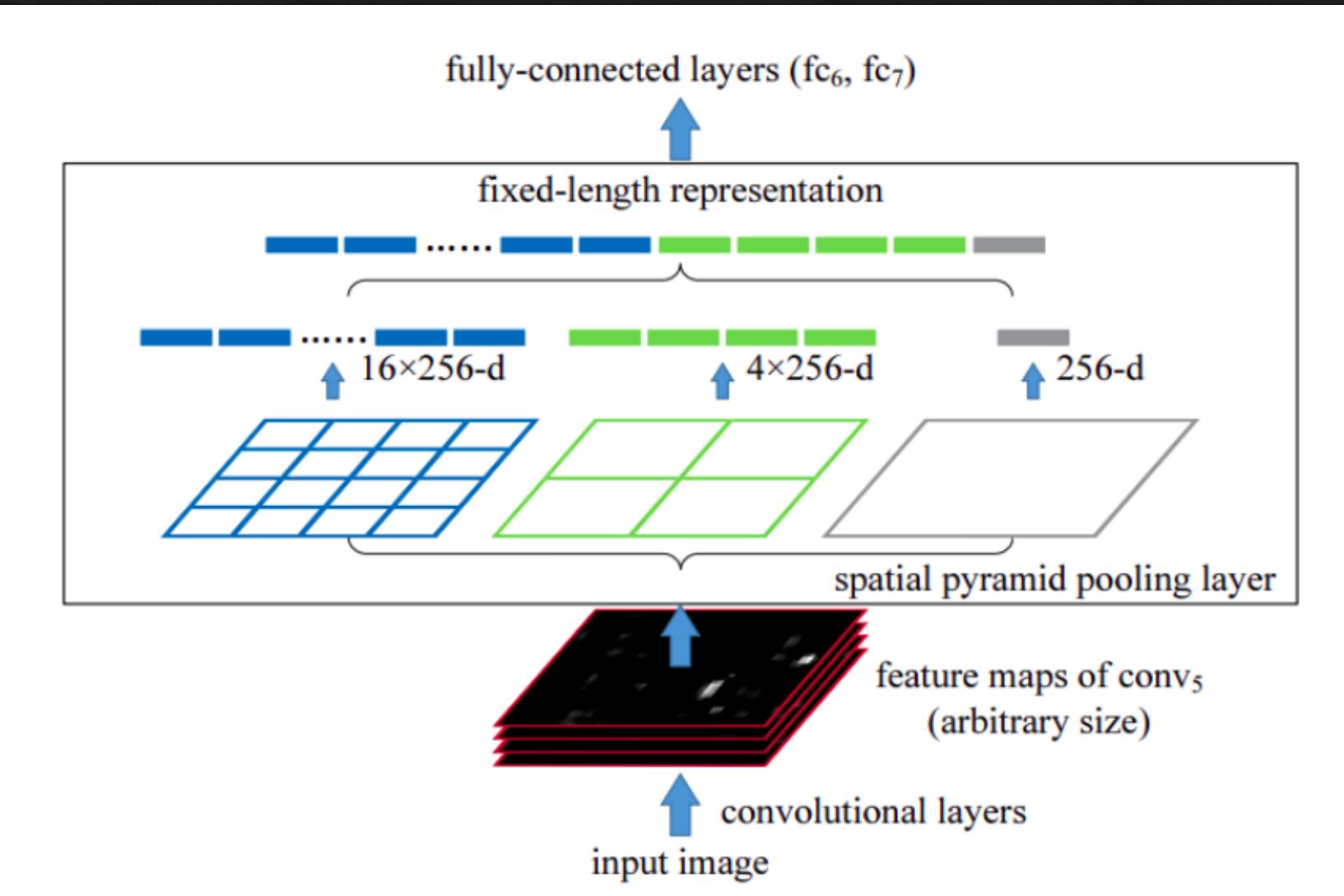
- ❖ A Convolutional neural network (CNN) is a neural network that has one or more convolutional layers and are used mainly for image processing, classification, segmentation.
- ❖ Each convolutional layer contains a series of filters known as convolutional kernels.
- ❖ The filter is a matrix of integers that are used on a subset of the input pixel values, the same size as the kernel.



YOLO

- ❖ **YOLO** (You Only Look Once) is a real-time object detection algorithm.
- ❖ We frame object detection as a regression problem to spatially separated bounding boxes and associated class probabilities.
- ❖ The model works by first splitting the input image into a grid of cells, where each cell is responsible for predicting a bounding box if the center of a bounding box falls within the cell.
- ❖ Each grid cell predicts a bounding box involving the x, y coordinate and the width and height and the confidence.





Line Segmentation

- ❖ The lines placed on highways show human drivers where the lanes are and serve as a guide for steering the vehicle in the appropriate direction.
- ❖ They also serve as a convention for how vehicle agents interact peacefully on the road.
- ❖ Traditional computer vision-based lane detection technology relies on image processing algorithms to extract lane line features, reduce image channels, perform gray processing on the original image, edge the grayed image, extract some features of the acquired image, and then perform lane line fitting after extracting the lane.
- ❖ we have used Computer Vision algorithm (CV) and developed the model.
- ❖ The image is read and then converted into grayscale, processed into Canny Image
- ❖ From the Canny image obtained, we are extracting a part of image using polygons from OpenCV. And then Hough lines are generated from this Canny Image. From this Hough lines we classified the lines with negative slope as Left Lane lines and others are Right Lane lines. We used cv2.line() function to plot the lines on the actual image.

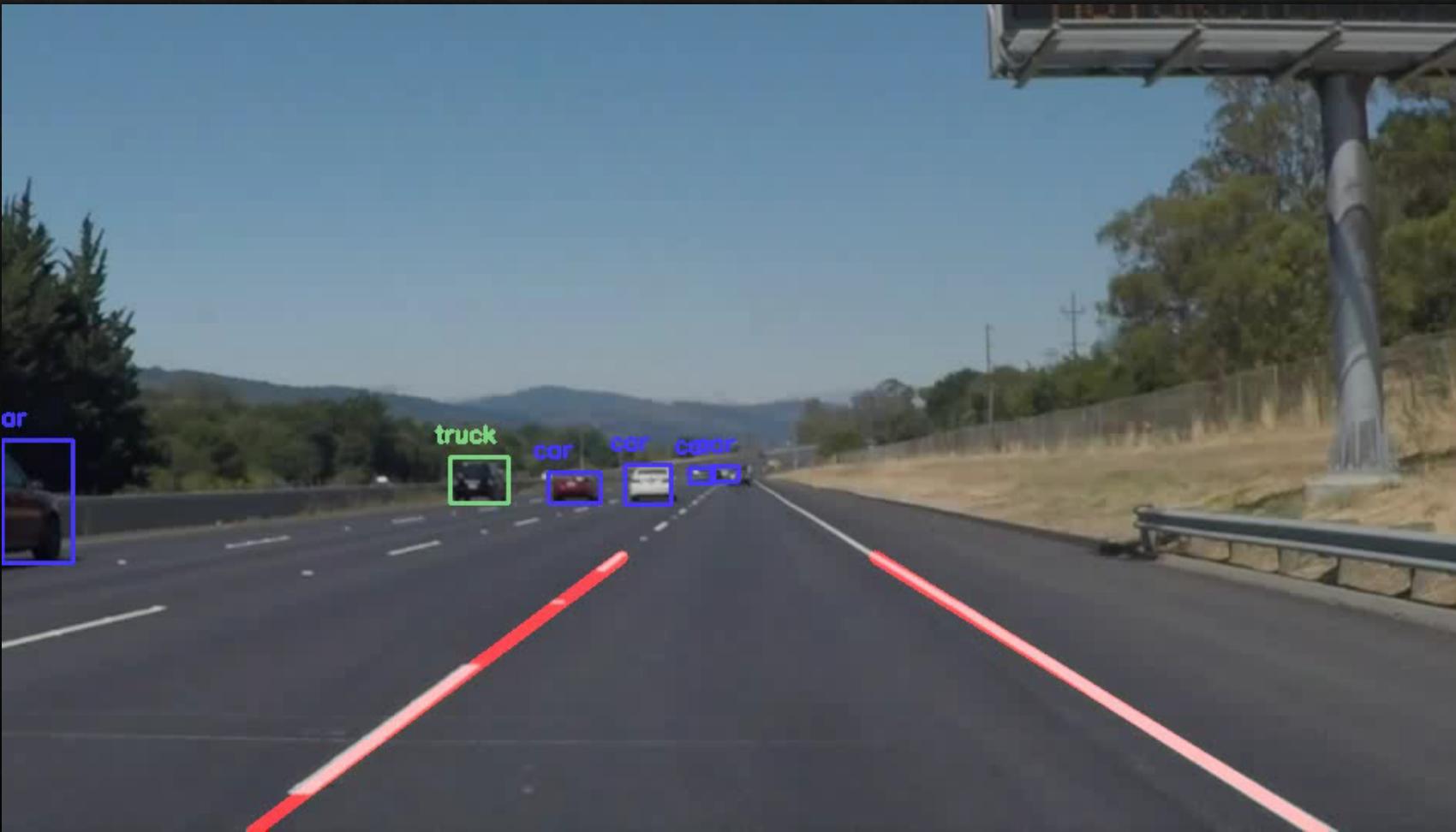
Object Detection

- ❖ Object detection's main goal is to identify and find one or more effective targets in still or video data.
- ❖ It covers a wide range of methods, including image processing, pattern recognition, artificial intelligence, and machine learning.
- ❖ It has a wide range of applications, including the prevention of traffic accidents, military restricted area monitoring.
- ❖ The object detection process is traditionally established by manually extracting feature models, where the common features are represented by HOG (histogram of oriented gradient), SIFT (single oriented gradient histogram), and SIFT (scale-invariant feature transform).
- ❖ Object identification techniques based on deep learning CNN (convolutional neural network) features, such as the R-CNN (region-based convolutional neural networks) series and the YOLO (you only look once) or SSD (single shot multiBox detection) models, are increasingly well-known.
- ❖ Deep learning CNN models may collect higher-level information from the post-level convolution layer in addition to extracting detail texture data from pre-level convolution networks.[2]

Output



Output



Conclusion

- ❖ In this project, we were able to develop a Computer Vision model that has the ability to Segment the lane and detect the objects on the lane.
- ❖ Due to lot of crevices on the lane, the model has challenge finding the lanes, however it segmented with good accuracy when the lane is smooth.
- ❖ And other challenges that we have faced during the development is, small and unclear images are not detected by the model, since we considered unclear pictures as weak detectors and eliminated after certain threshold ($\text{confidence_threshold} > 0.5$).
- ❖ Coming to the model performances the model is really accurate in detecting multiple objects at the same time with high accuracy even in unclear part of image along the lane detection.

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