Object Detection (Yolo Algorithm)

Presented by

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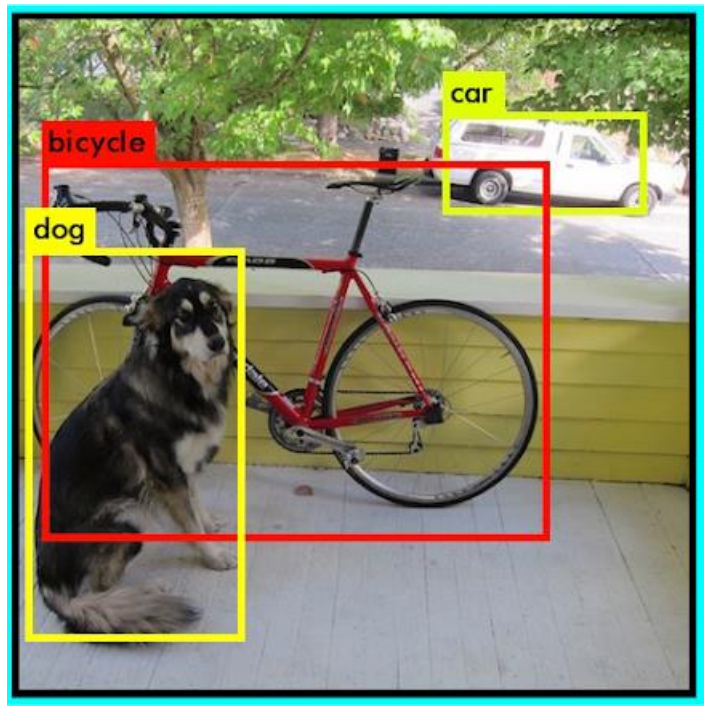
You Only Look Once

- It’s object detection algorithm.
- single convolutional network predicts the bounding boxes and the class probabilities for these boxes all at once .
- running at as high as 45 FPS.



How it works ?

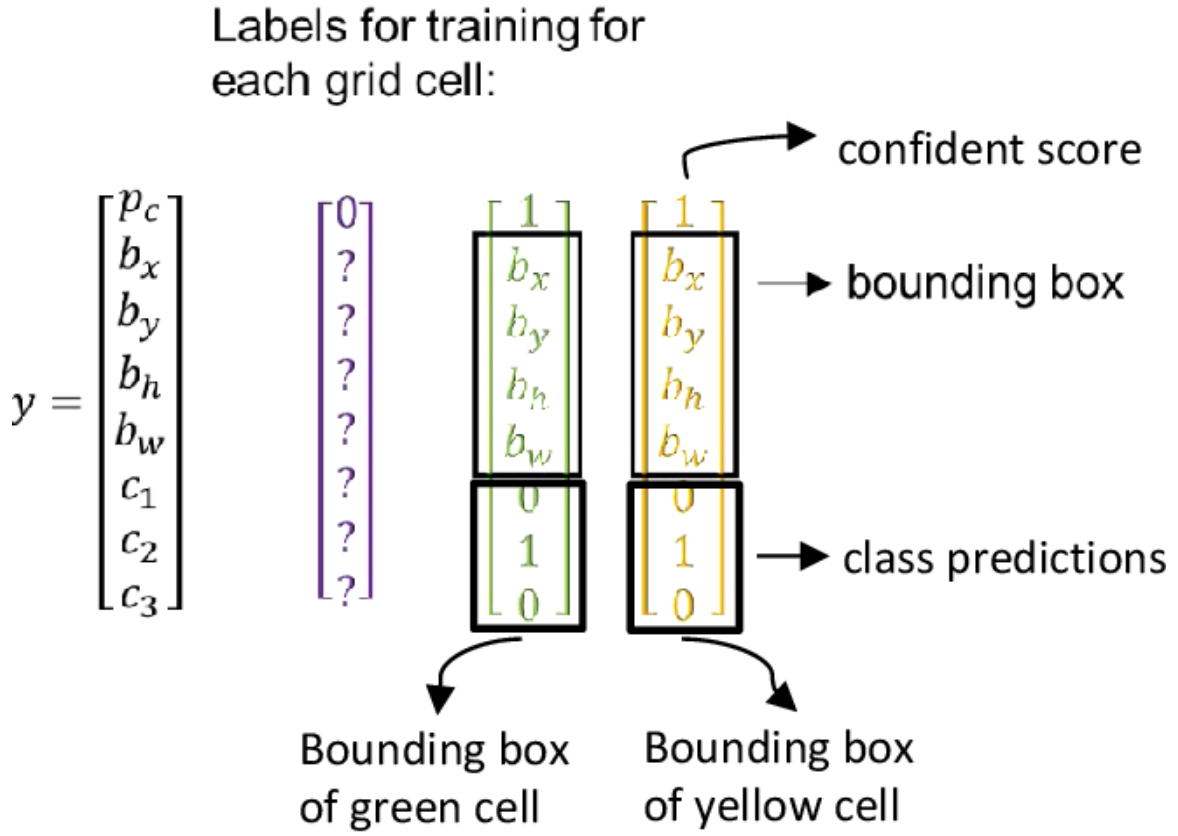
Step One :

Divide the image into a SxS grid.

Each cell will predict :

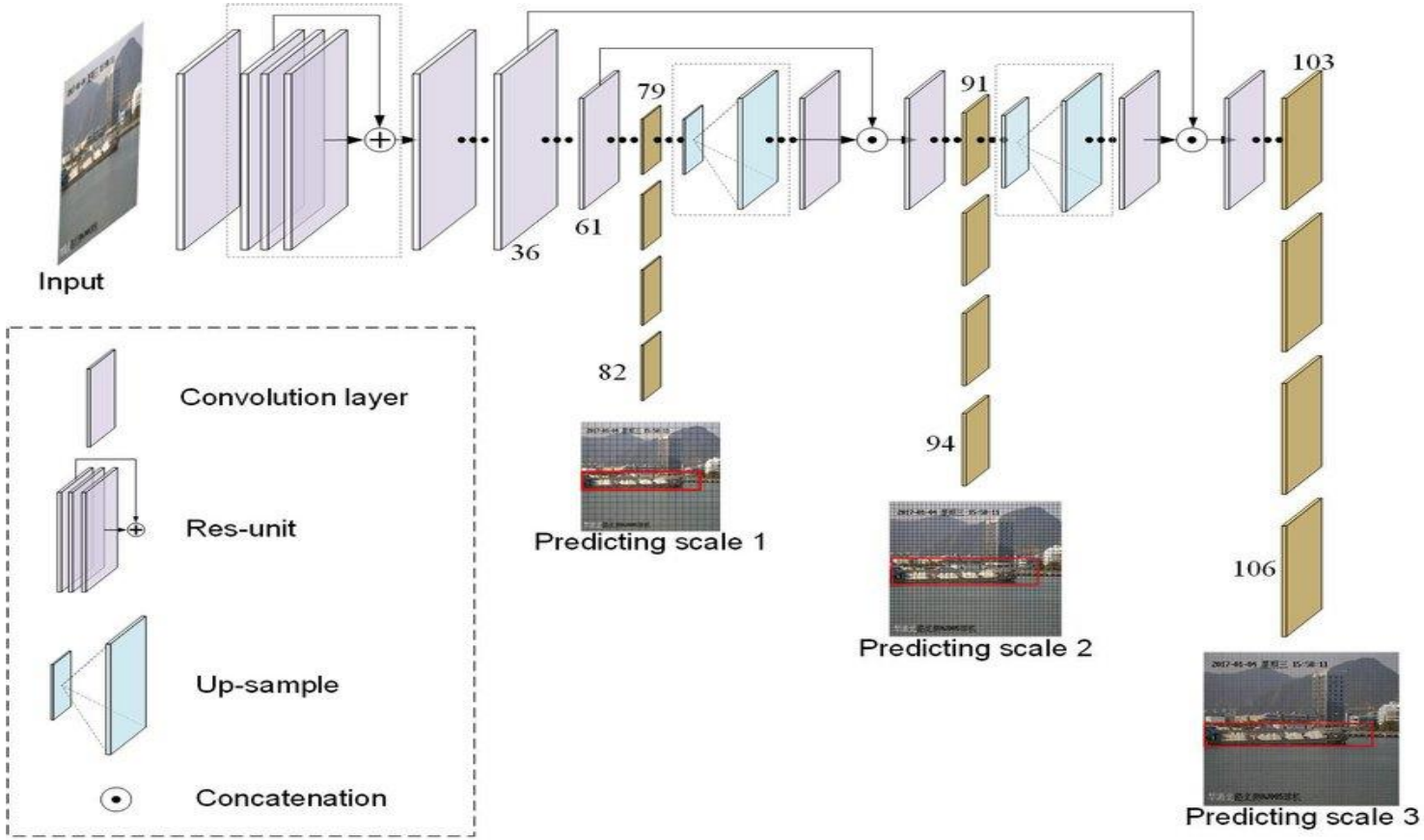
- Predict if an object exists
- Coordinates of the center of the object
- Size of bounding box
- The class of the object

- Each cell should predict the vector which have the class probability and the bonding box
- YOLO needs to be trained with labeled dataset first to can predict



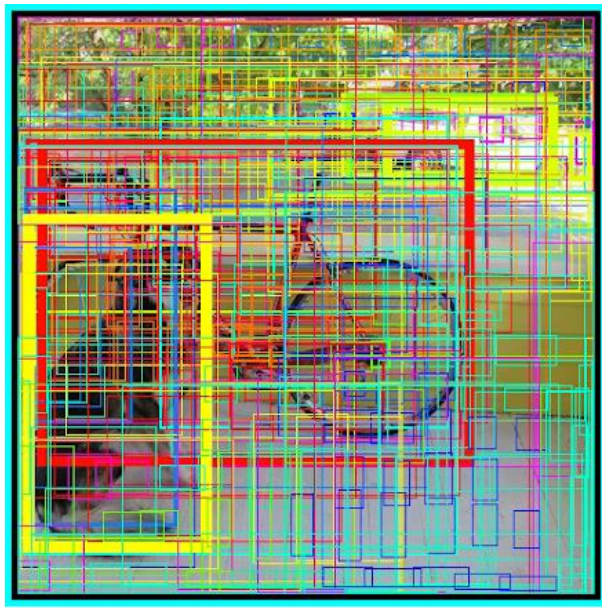
Architecture

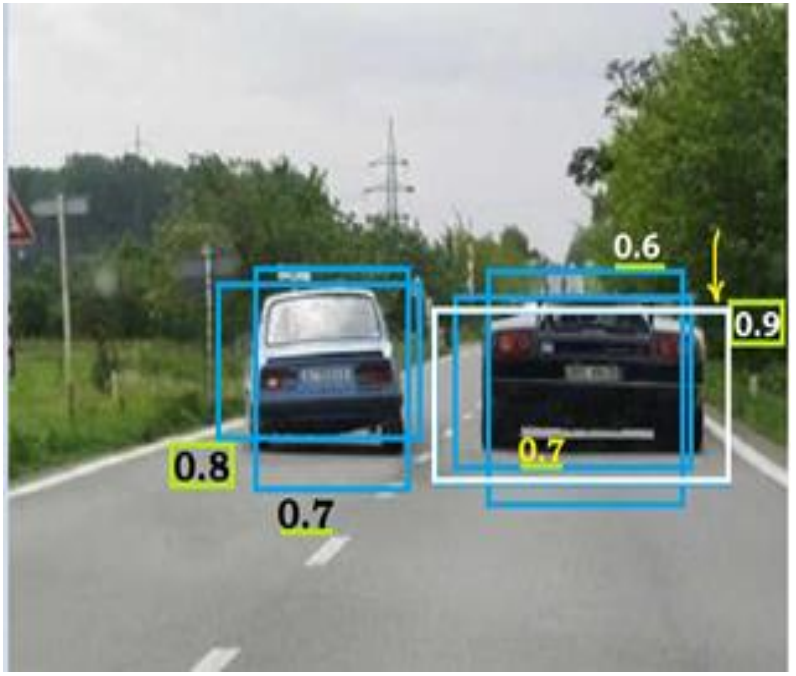
- In the Architecture of YOLO v3 it takes 3 different scales of cell to improve the accuracy of detecting the object



Step two:

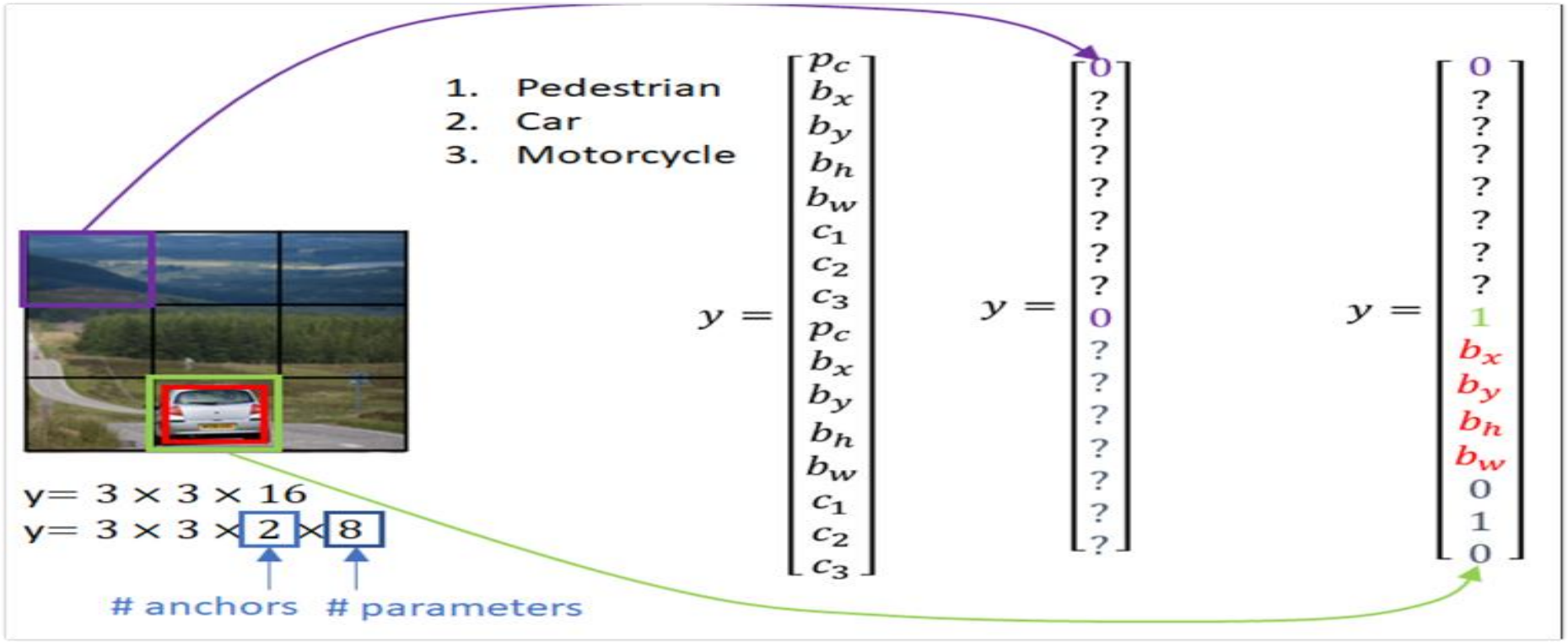
- every cell predict its vector (bounding box)
- Every box has probability of the object in it and the boxes intersects
- We can’t take the maximum to avid the case that existing two objects close to each other and consider it as one object
- Applying IOU (intersection over union) : compute the intersection area of the boxes and apply thresholding if its higher apply non maximum suppression and take the higher probability



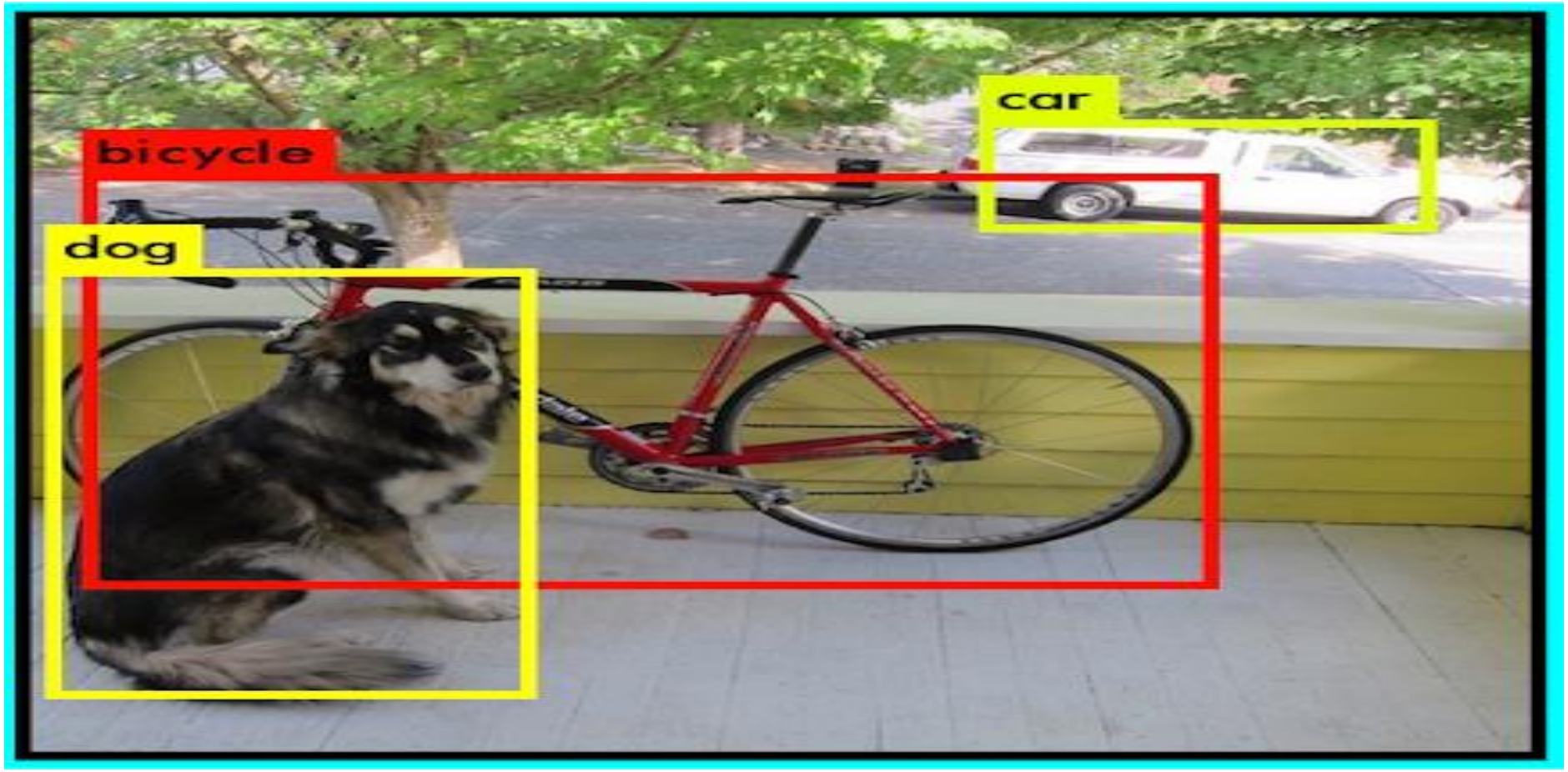


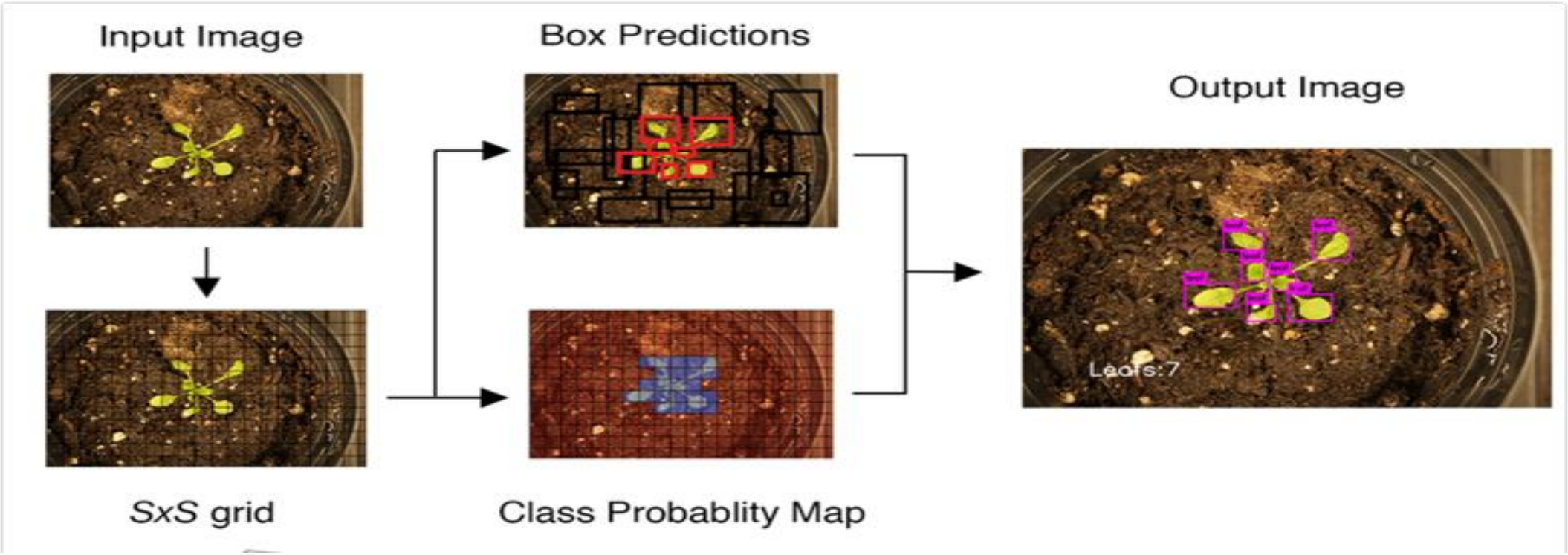
In case of have multiple objects in the same cell :

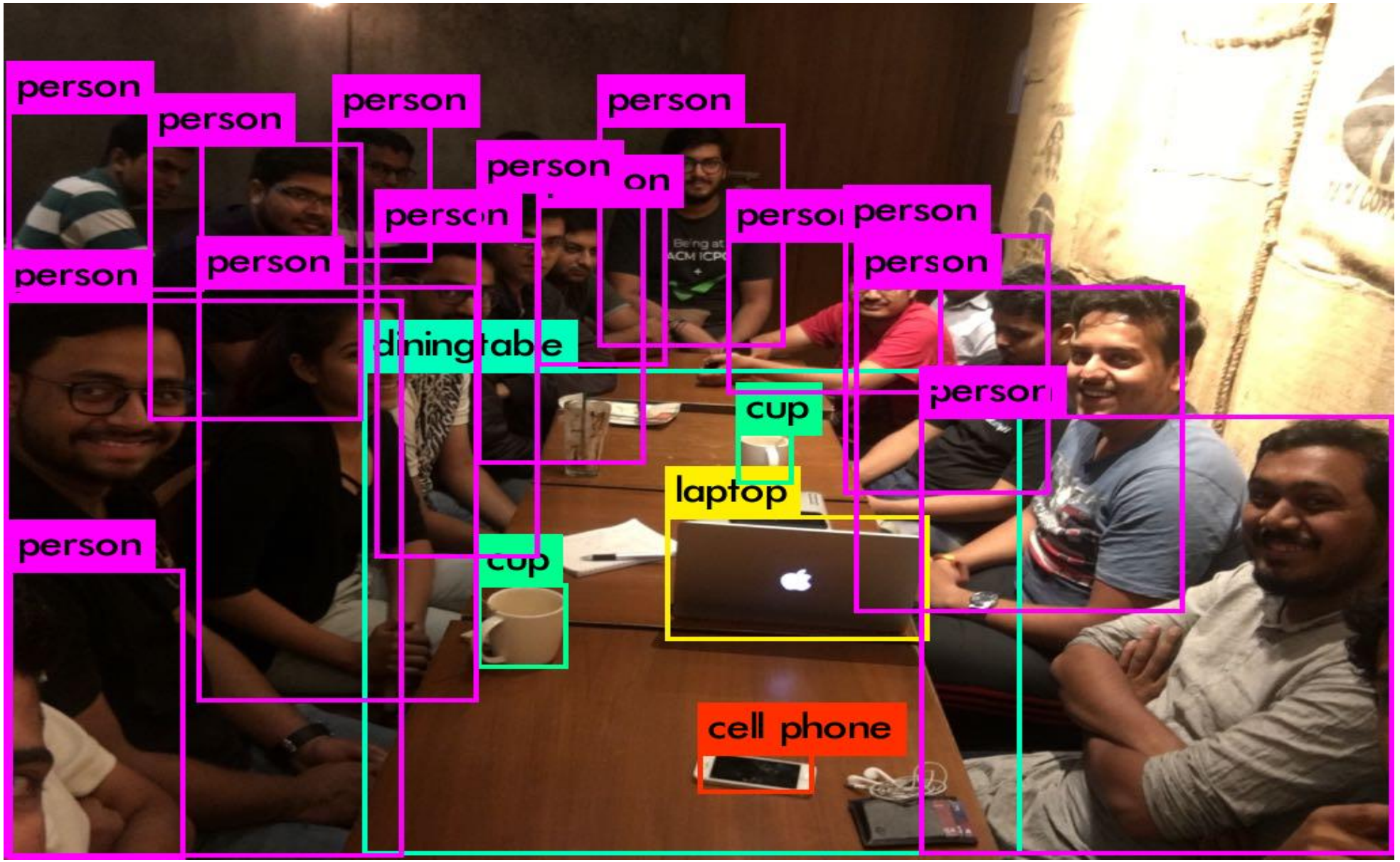
The vector can be improved to contain the predictions of the two objects



Finally it detects the object in the image




Input Image
Box Predictions
Output Image
Leafs:7
SxS grid
Class Probablity Map

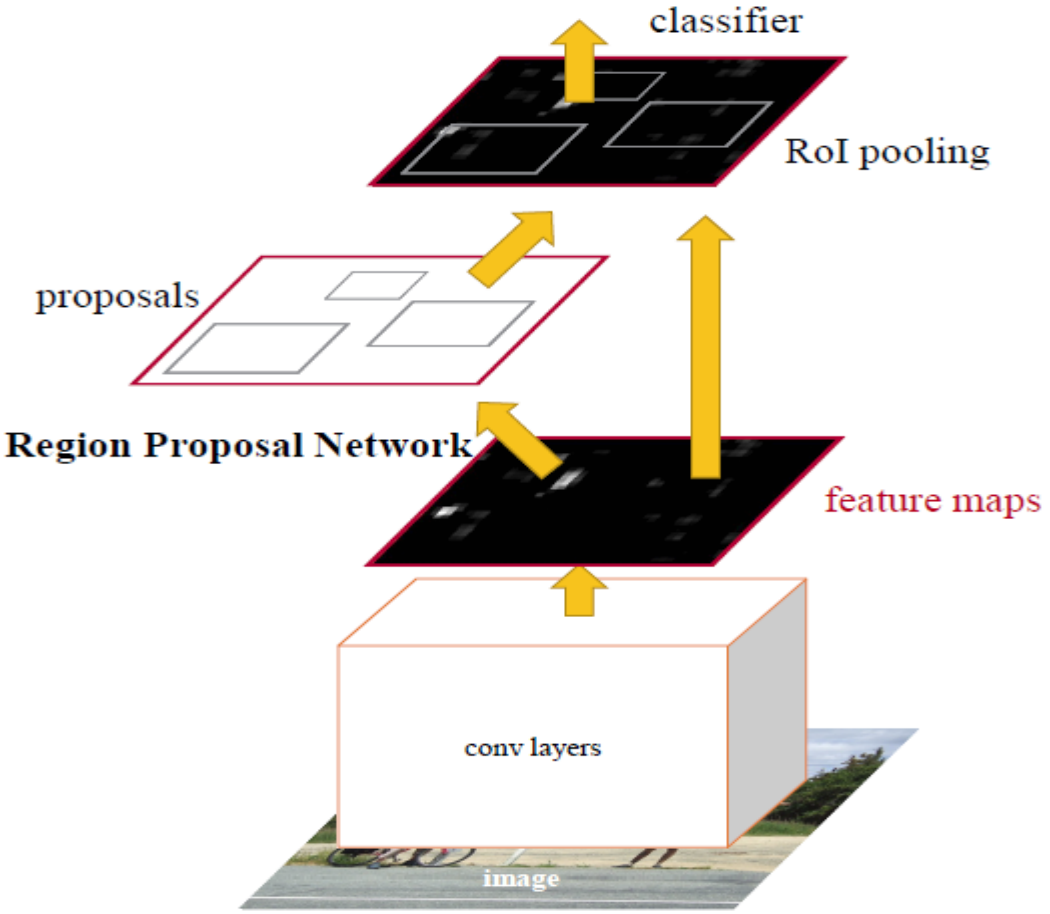

person
person
person
person
person
person
person
person
person
person
person
person
person
dining table
cup
laptop
cup
cell phone

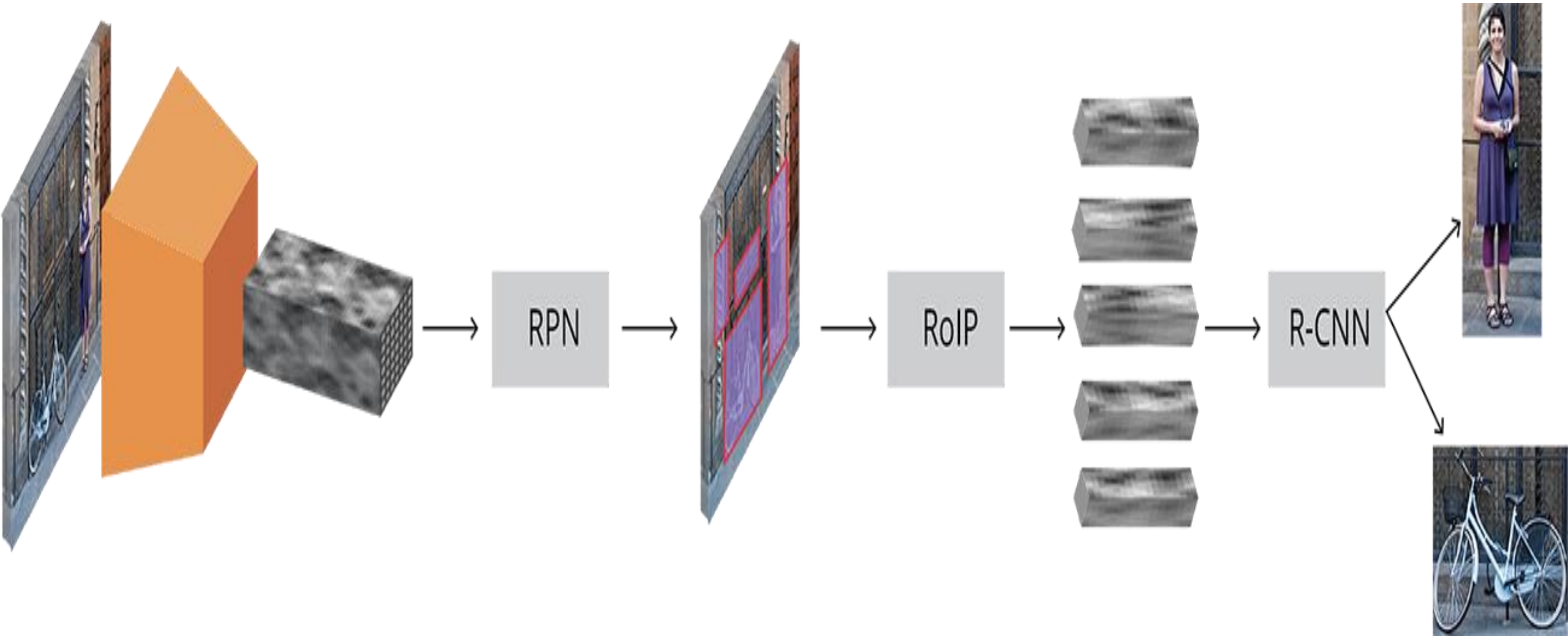
YOLO or Faster R-CNN?

Faster R-CNN:

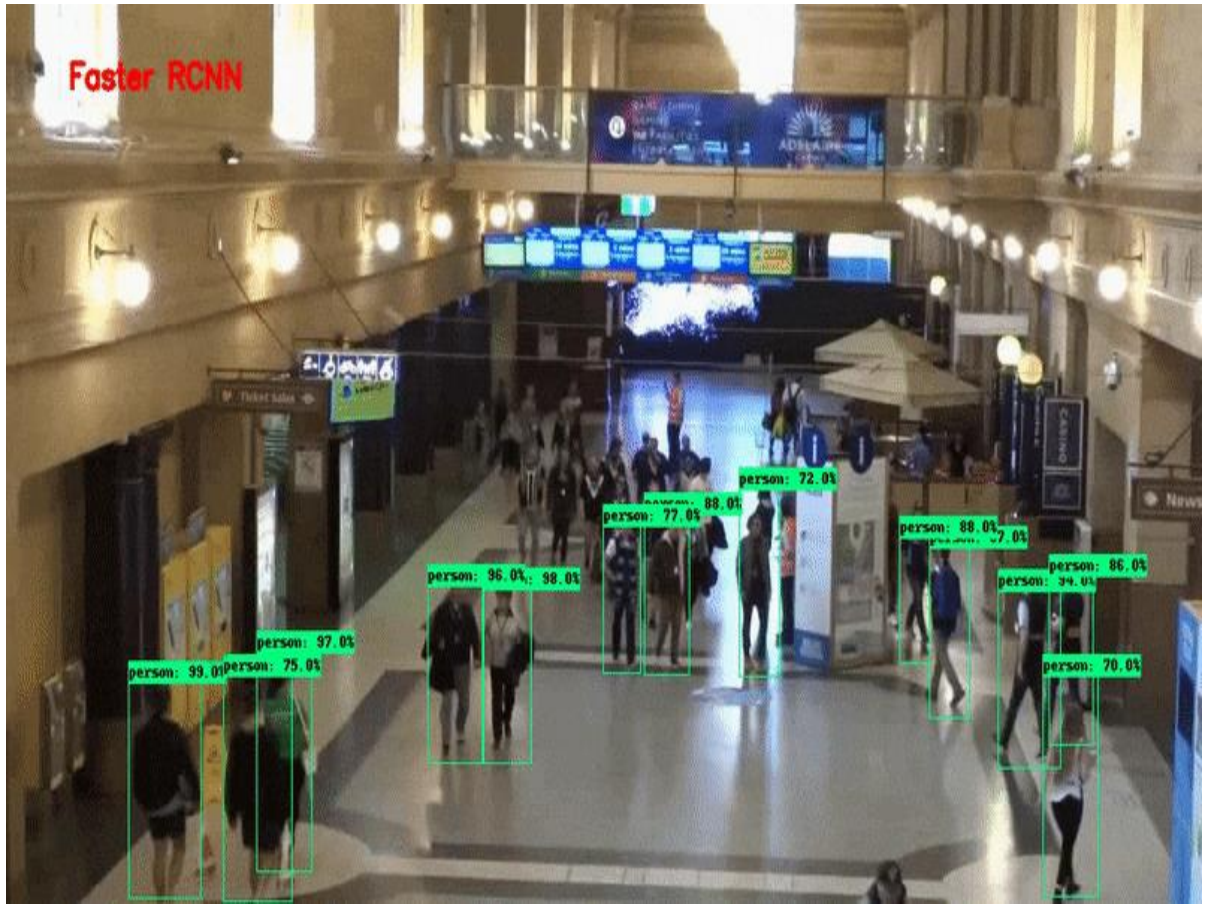
It is the closer algorithm to YOLO as it offers end-to-end training but more complex architecture

RPN is trained to produce region proposals directly without the need for any external mechanism like Selective Search. After this we use ROI pooling and an upstream classifier and bounding box regressor similar to Fast R-CNN.

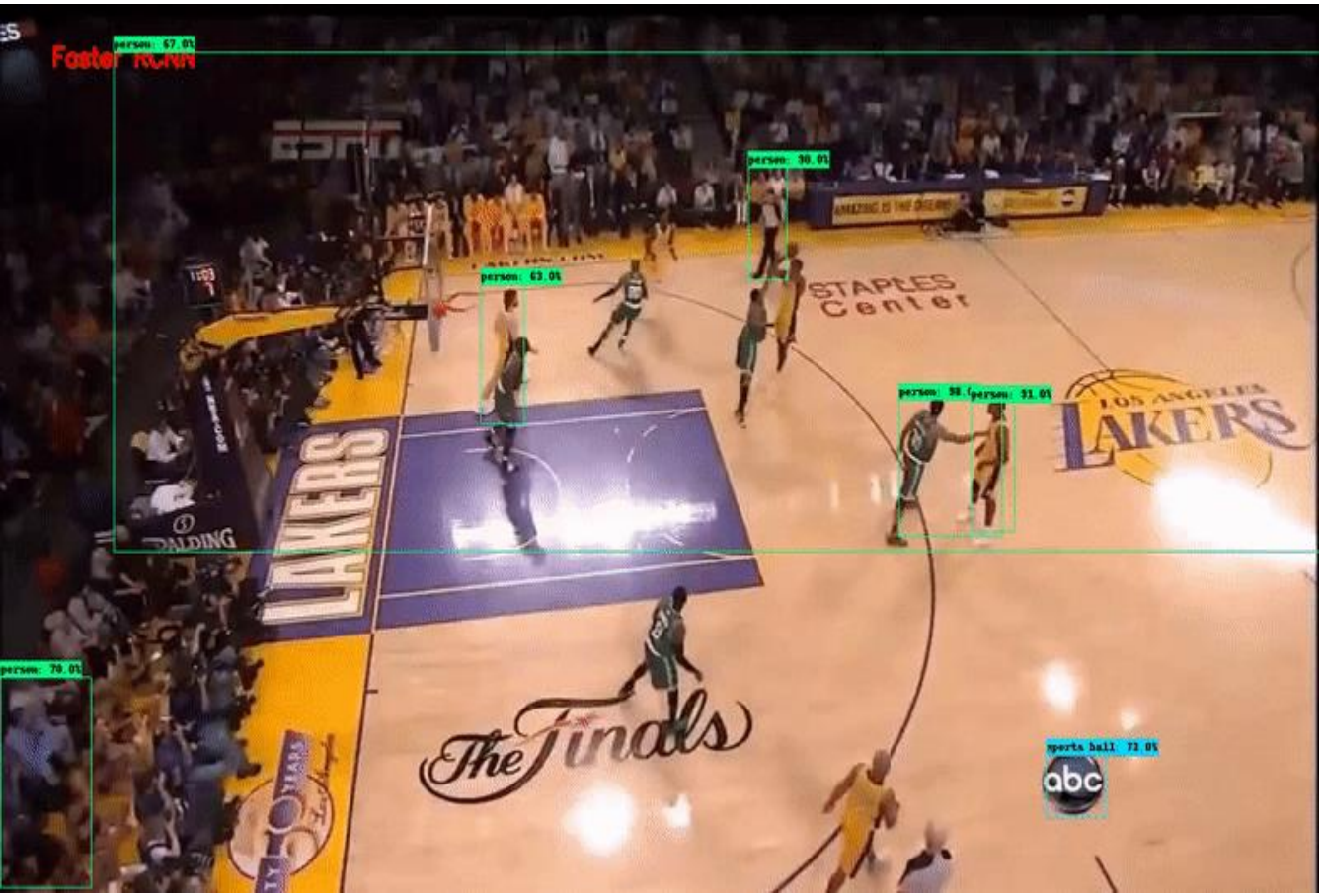


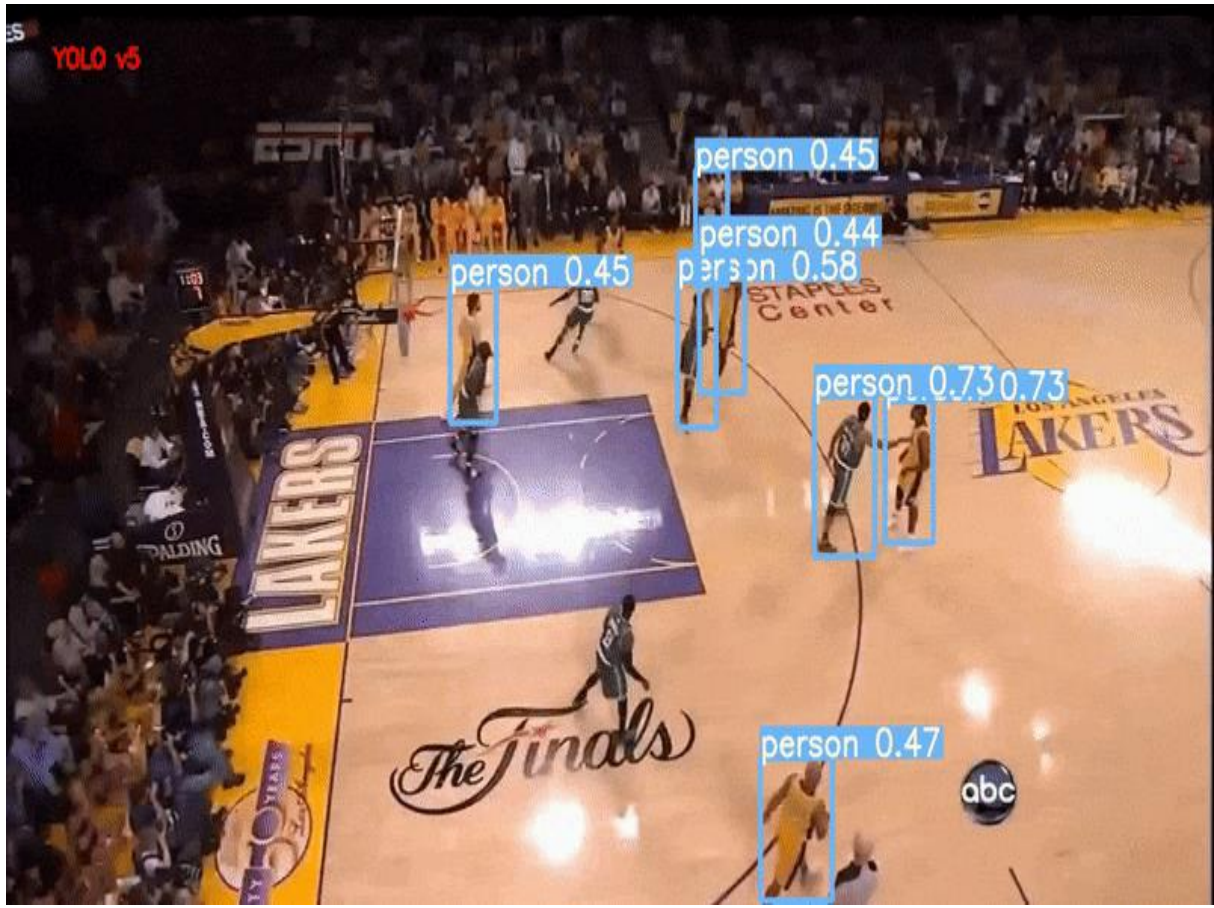

RPN
RoIP
R-CNN

	YOLO v5	Faster RCNN
Inference Speed	✓	
Detection of small or far away objects	✓	
Little to no overlapping boxes	✓	
Missed Objects	✗	✗
Detection of Crowded objects	✓	✓


Faster RCNN
person: 99.0%
person: 75.0%
person: 97.0%
person: 96.0%
person: 98.0%
person: 77.0%
person: 72.0%
person: 88.0%
person: 86.0%
person: 70.0%

YOLO v5
person 0.46
person 0.55
person 0.43
person 0.58


Faster RCNN
person: 67.0%
person: 30.0%
person: 63.0%
person: 98.
person: 91.0%
person: 70.0%
sports ball: 72.0%
STAPLES Center
LAKERS
The Finals
abc


YOLO v5
person 0.45
person 0.44
person 0.45
person 0.58
person 0.73
0.73
person 0.47
STAPLES Center
LAKERS
The Finals
abc