

Lecture 11 - Image Segmentation

Prof. André Gustavo Hochuli

gustavo.hochuli@pucpr.br

aghochuli@ppgia.pucpr.br

Topics

- Review of Lecture 10 – CNN Applications and Tricks
- Classification vs Segmentation
 - Classification
 - Object Detection
 - Segmentation
- Practice

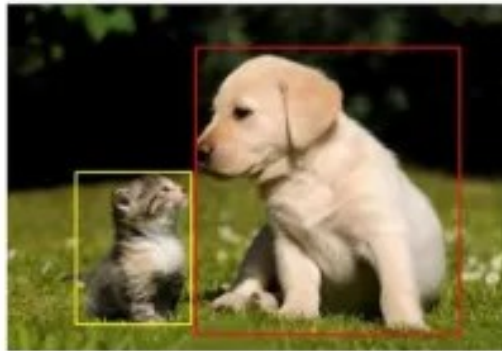
Classification vs Segmentation

Is this a dog?



Image Classification

What is there in image
and where?



Object Detection

Which pixels belong to
which object?

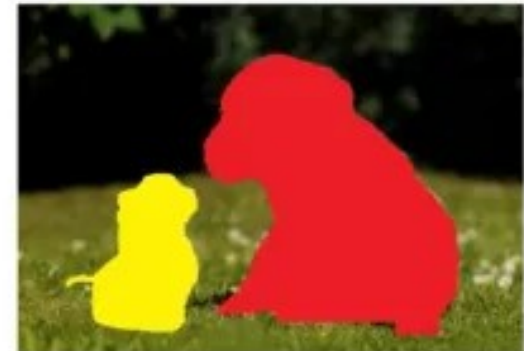
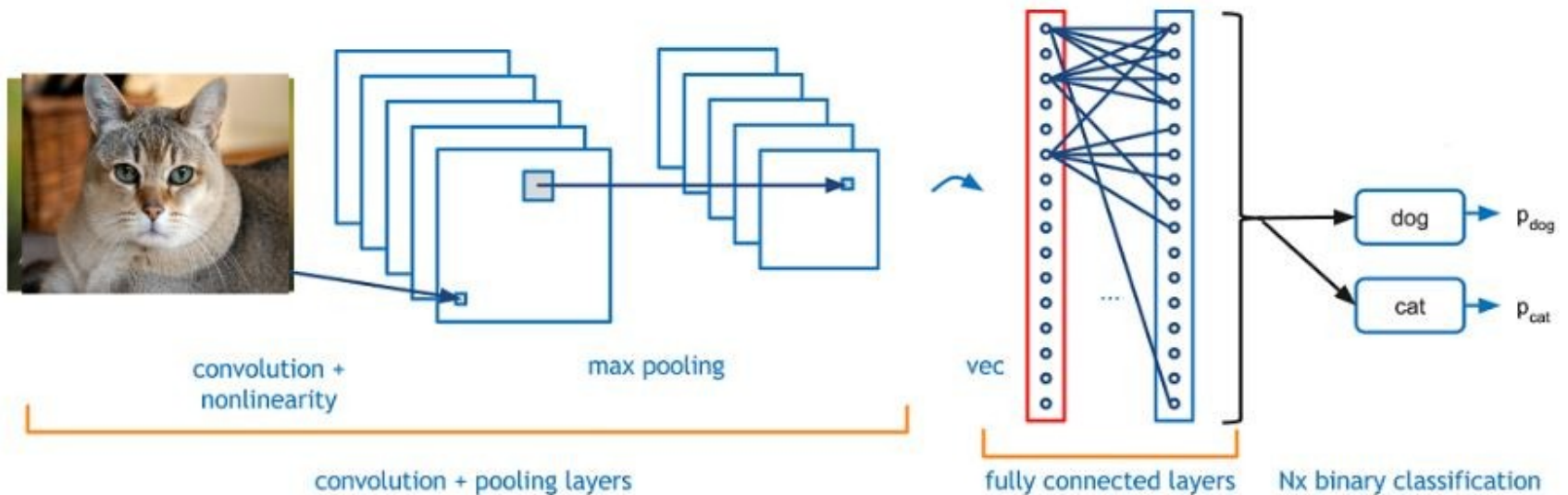
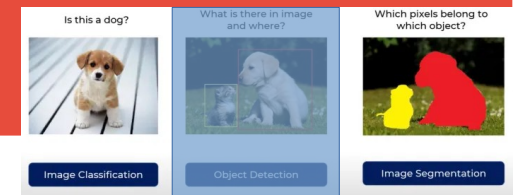
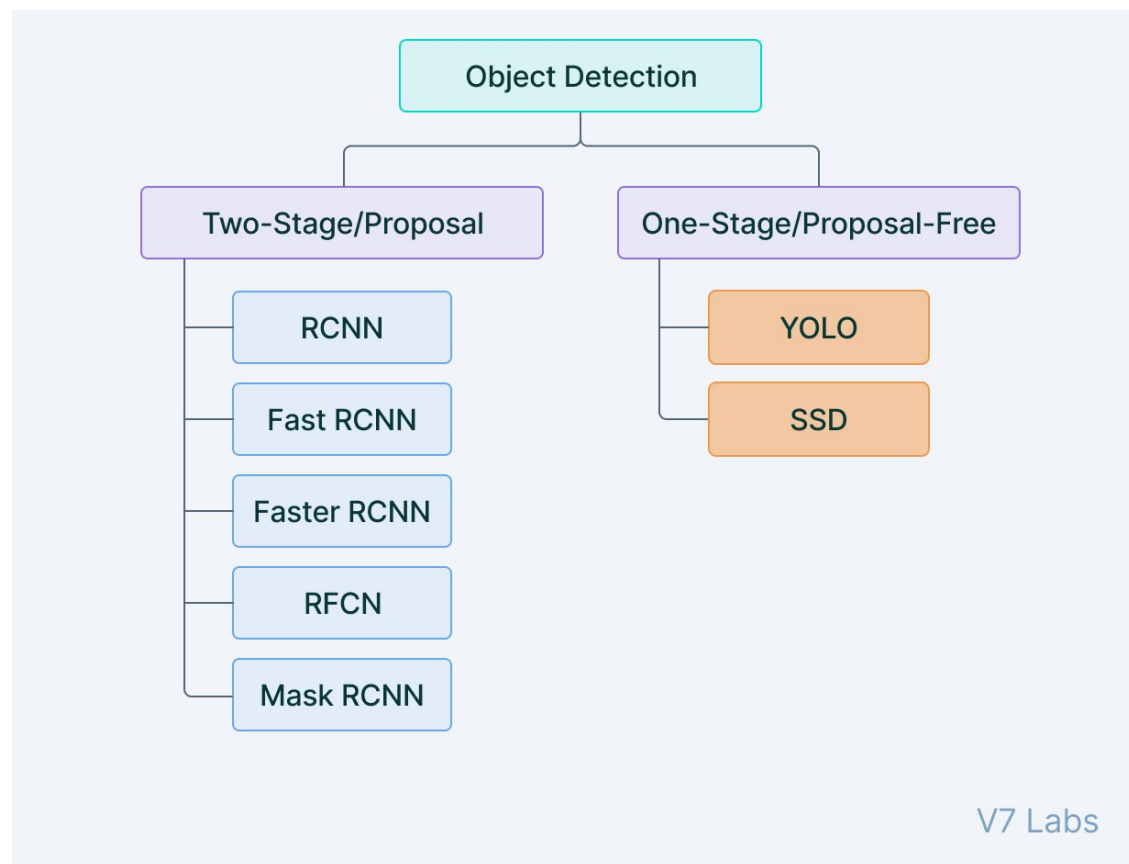
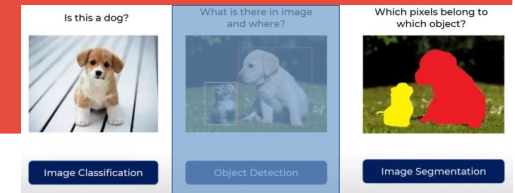


Image Segmentation

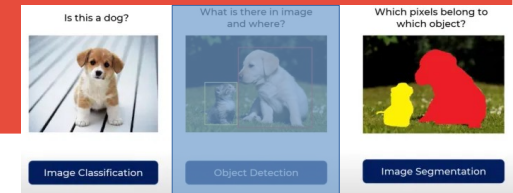
Classification



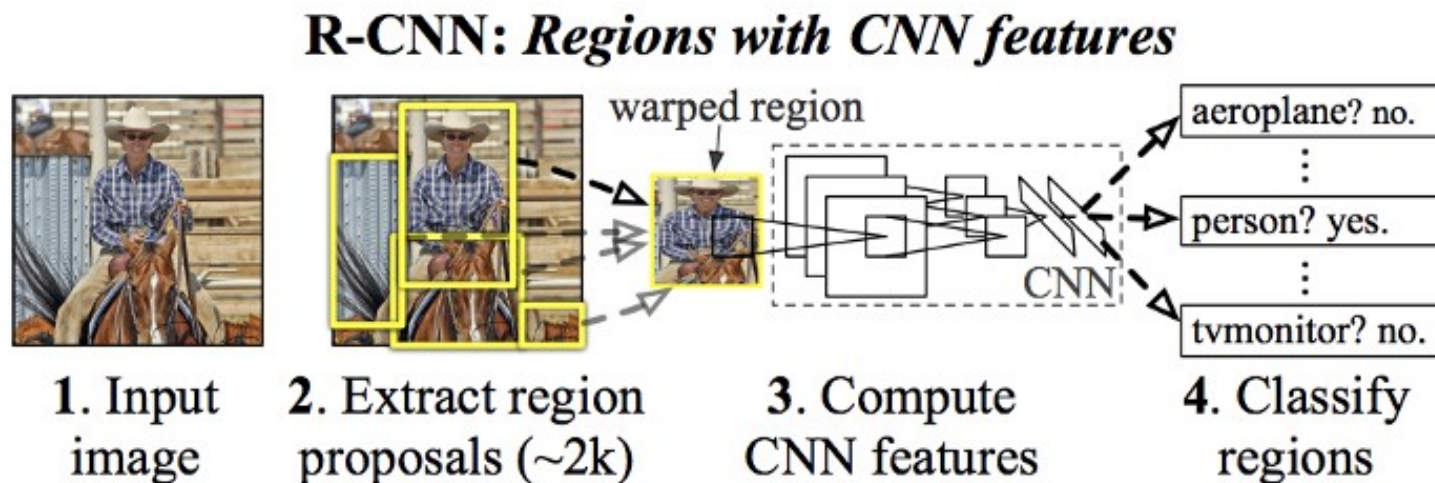
Object Detection



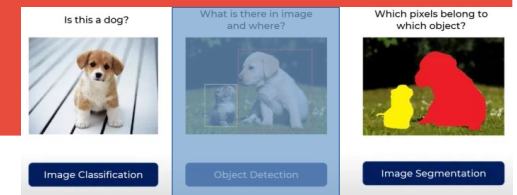
Object Detection - RCNN



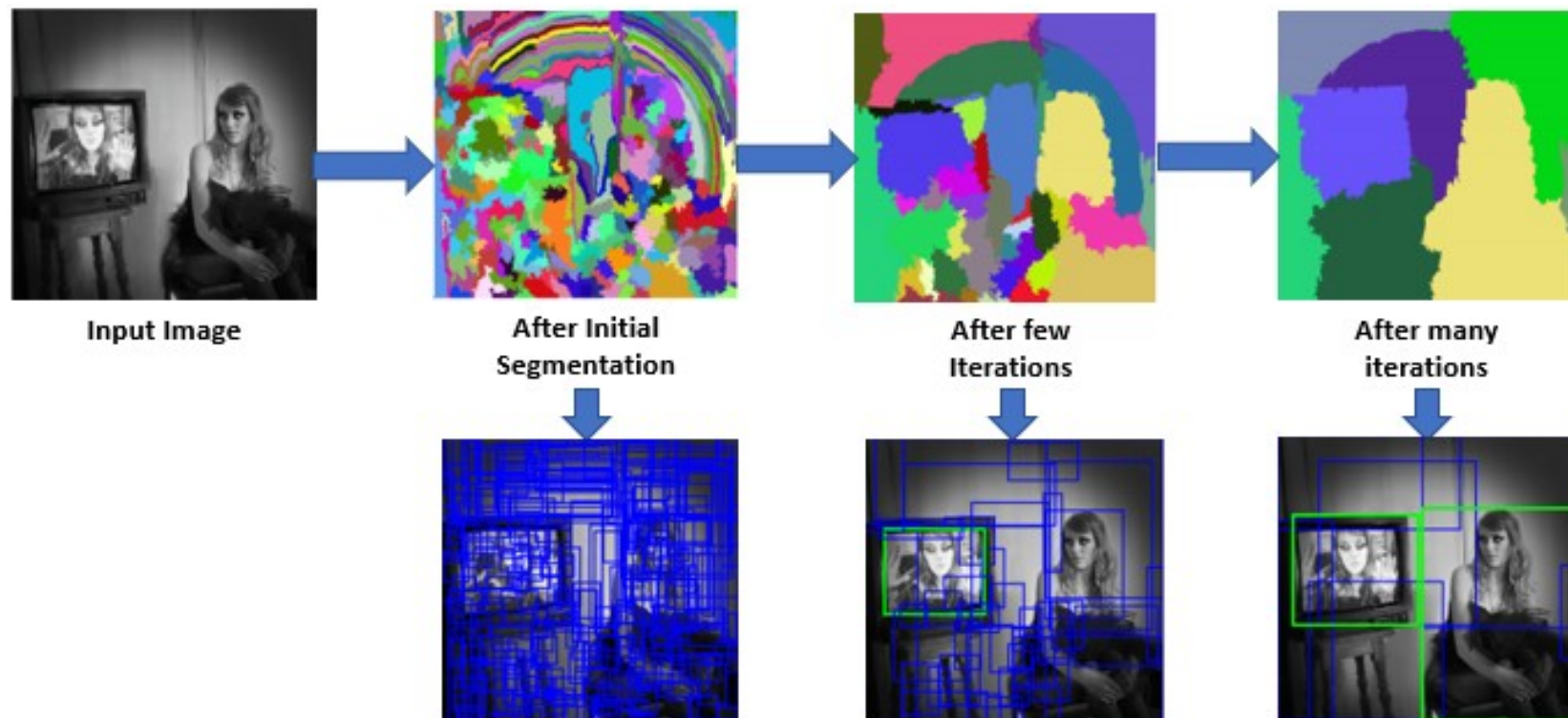
- Region Based Convolutional Neural Network (2014) - Ross Girshick
- Selective Search Algorithm (Region Proposal)
- CNN (Classification)



Object Detection - RCNN

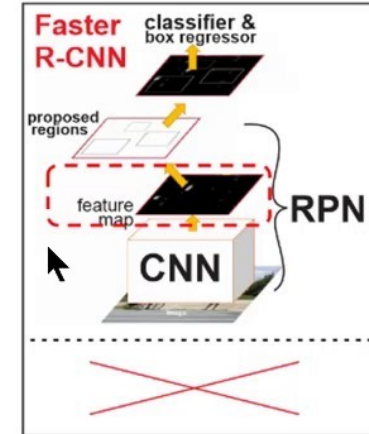
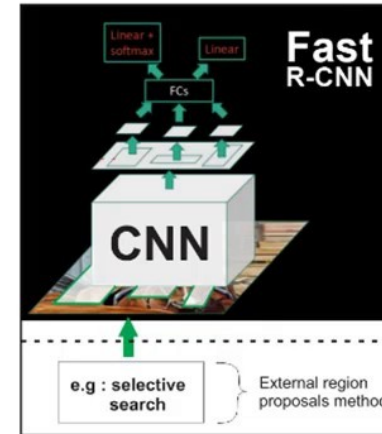
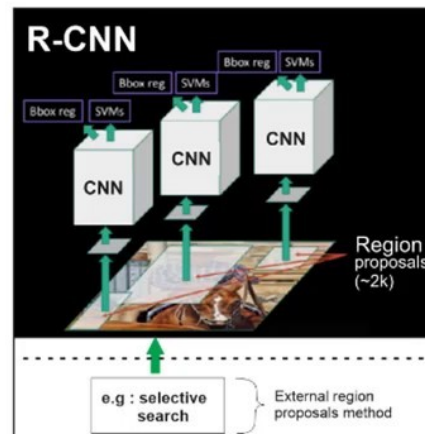
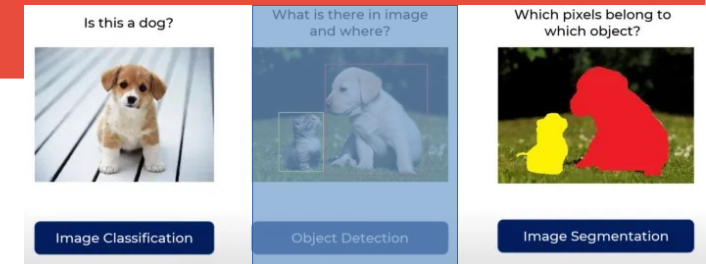


- Selective Search Algorithm (Region Proposal)



Object Detection - RCNN

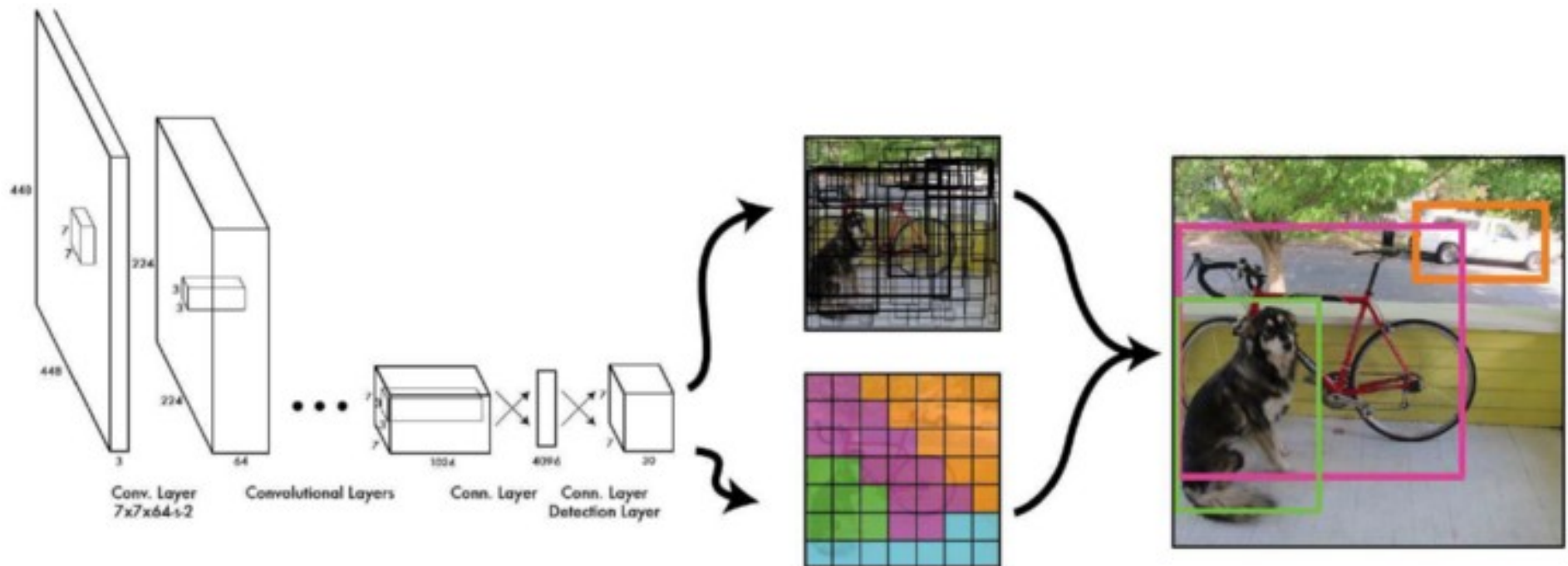
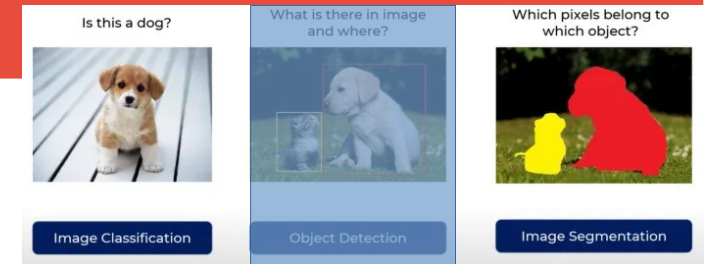
- R-CNN: Selective Search->CNN
- Fast: End-to-end (Sel. Search->ROI Pooling->FC)
- Faster: Region Proposal Network (RPN)



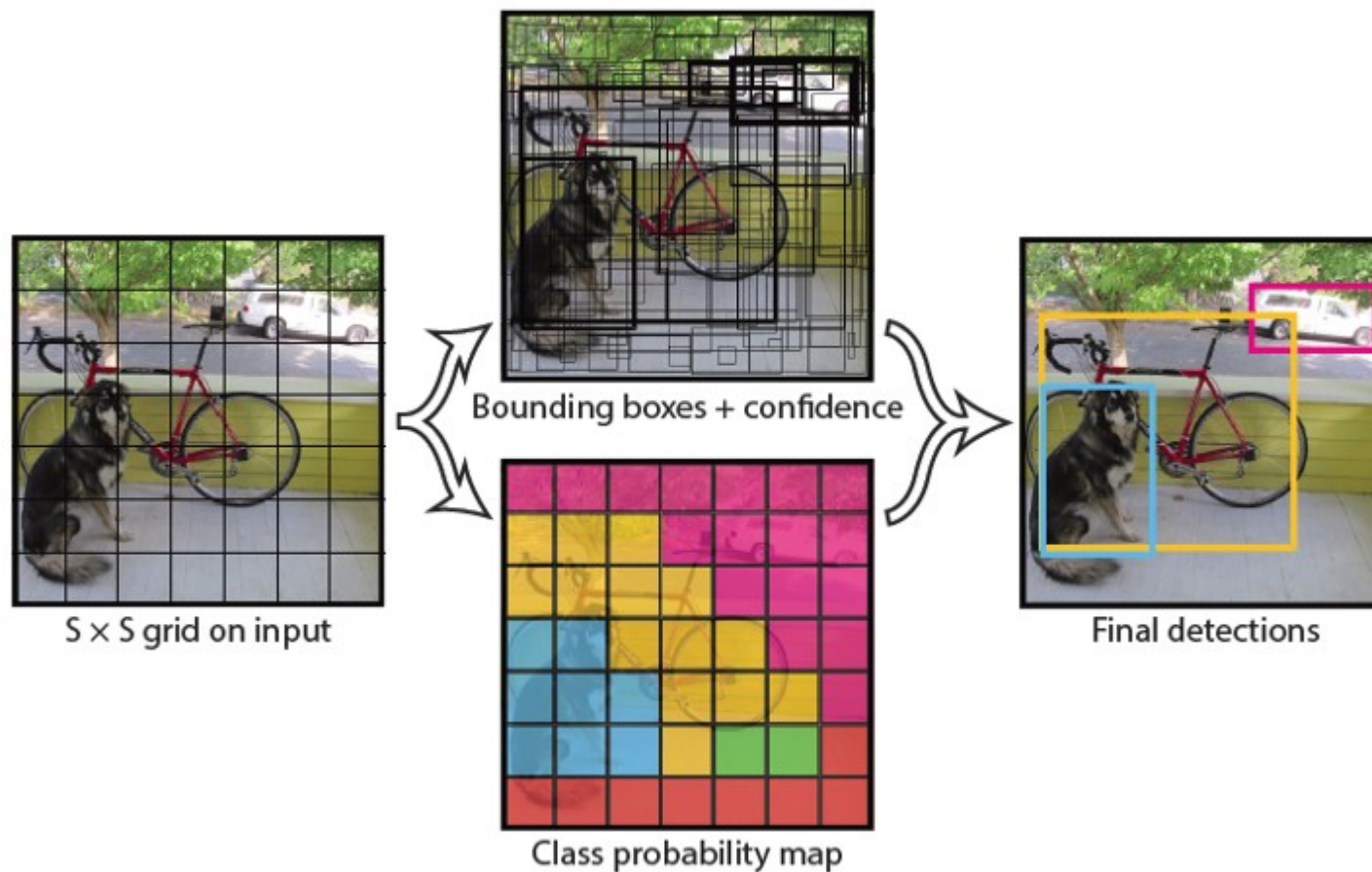
	R-CNN	Fast R-CNN	Faster R-CNN
Test time per image	50 seconds	2 seconds	0.2 seconds
Speed-up	1x	25x	250x
mAP (VOC 2007)	66.0%	66.9%	66.9%

Object Detection - Yolo

- You Look Once (2015)
- Joseph Redmon / Ross Girshick



Object Detection - Yolo



Let's Code

- YOLO Inference
 - COLAB [\[LINK\]](#)
 - CPU (local)
 - <https://github.com/Asadullah-Dal17/yolov4-opencv-python>

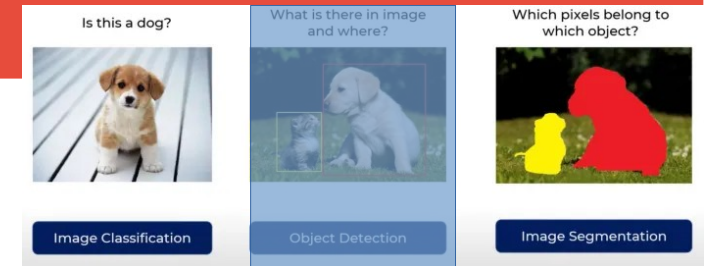
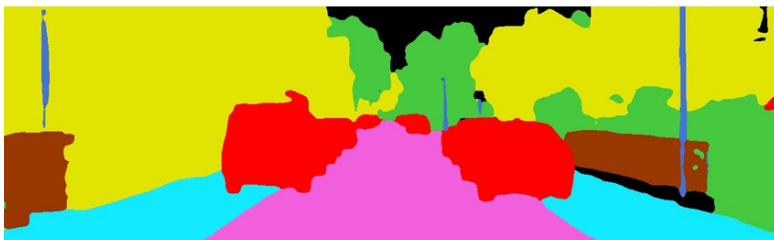


Image Segmentation

- Classification at pixel level



Road	Sidewalk	Building	Fence
Pole	Vegetation	Vehicle	Unlabel

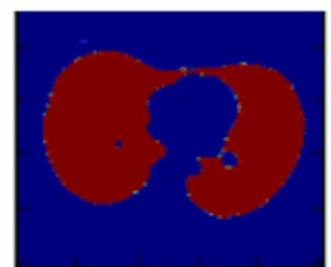
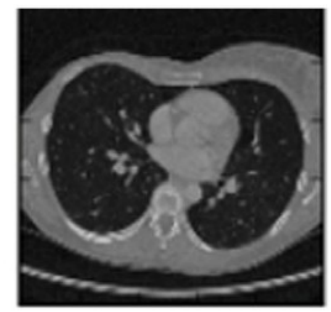
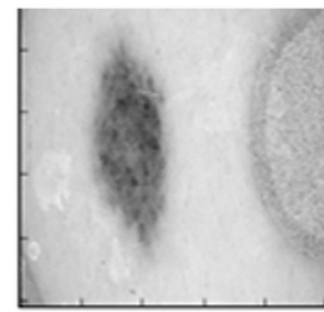
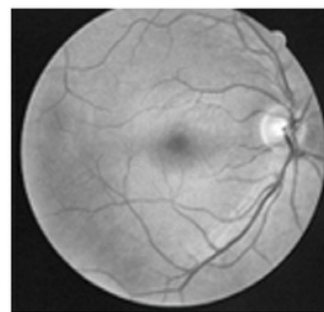


Image Segmentation - Mask RCNN

- Faster R-CNN with Binary Mask (2017)



Mask RCNN

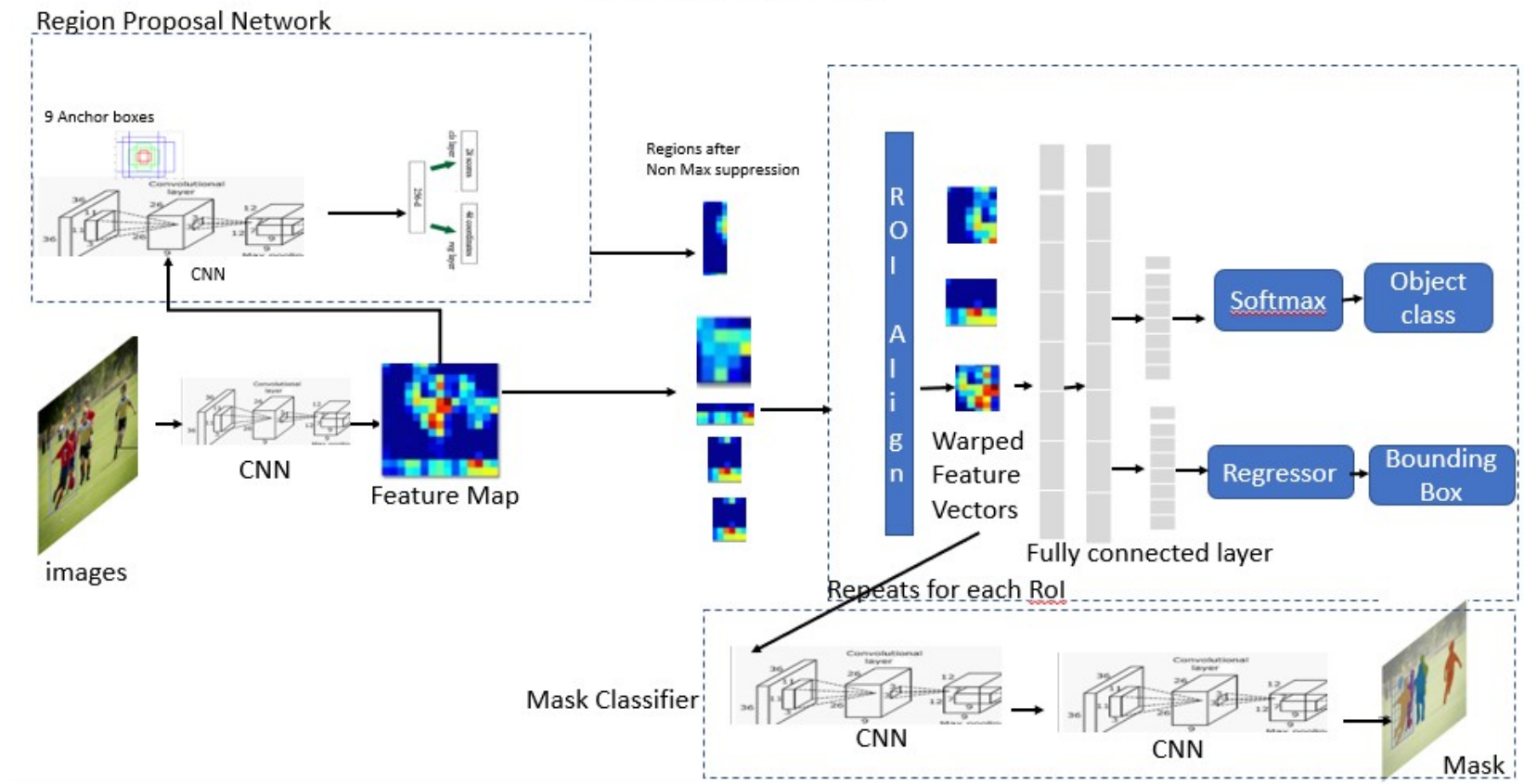
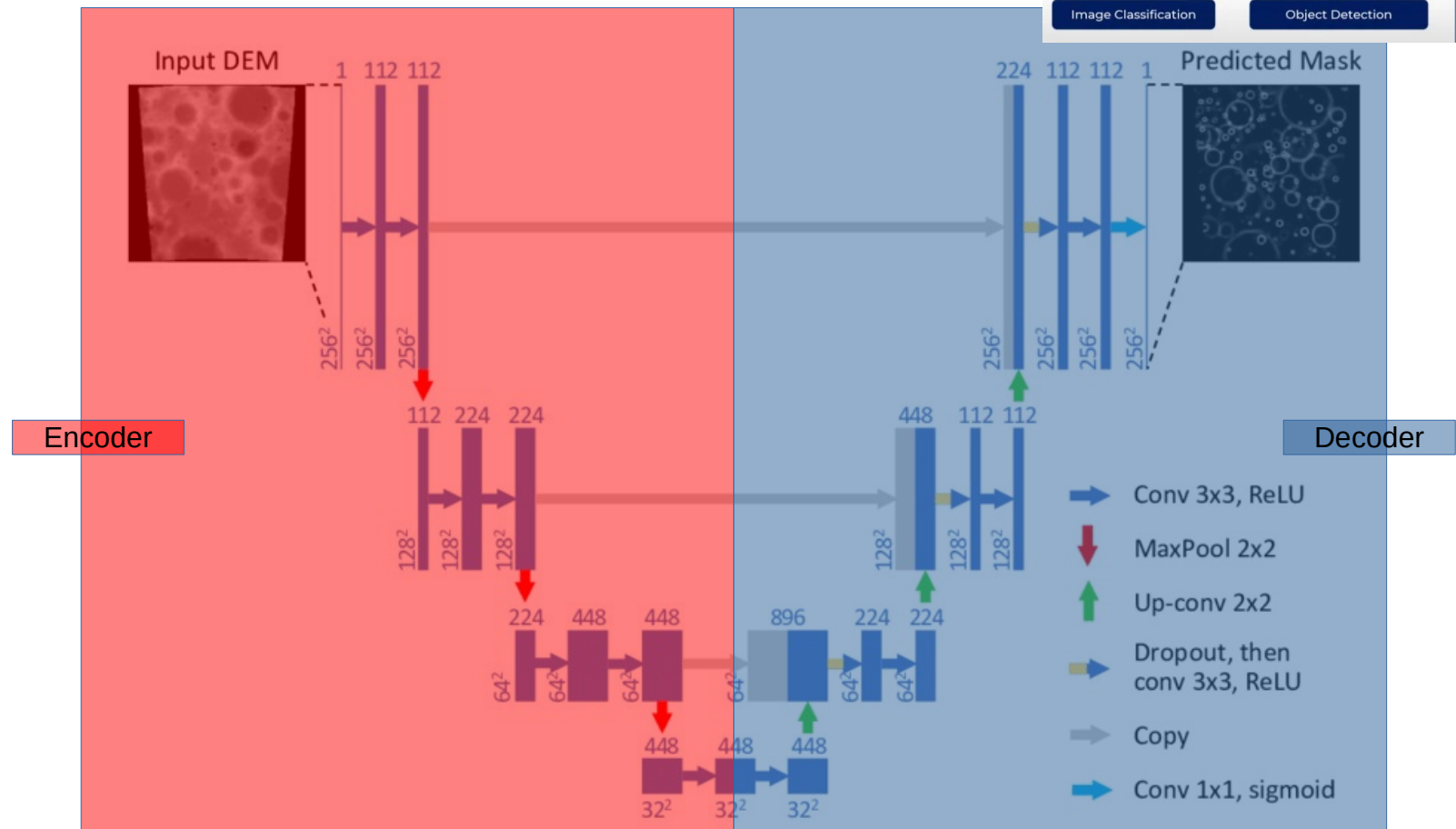


Image Segmentation - UNET

- U-Net (Encoder and Decoder)



Let's Code

- U-NET (Training and Inference)
 - [\[LINK\]](#)

