

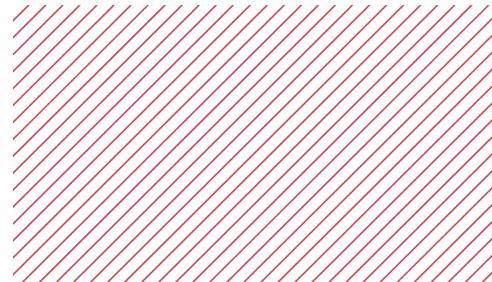
академия
больших
данных



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group

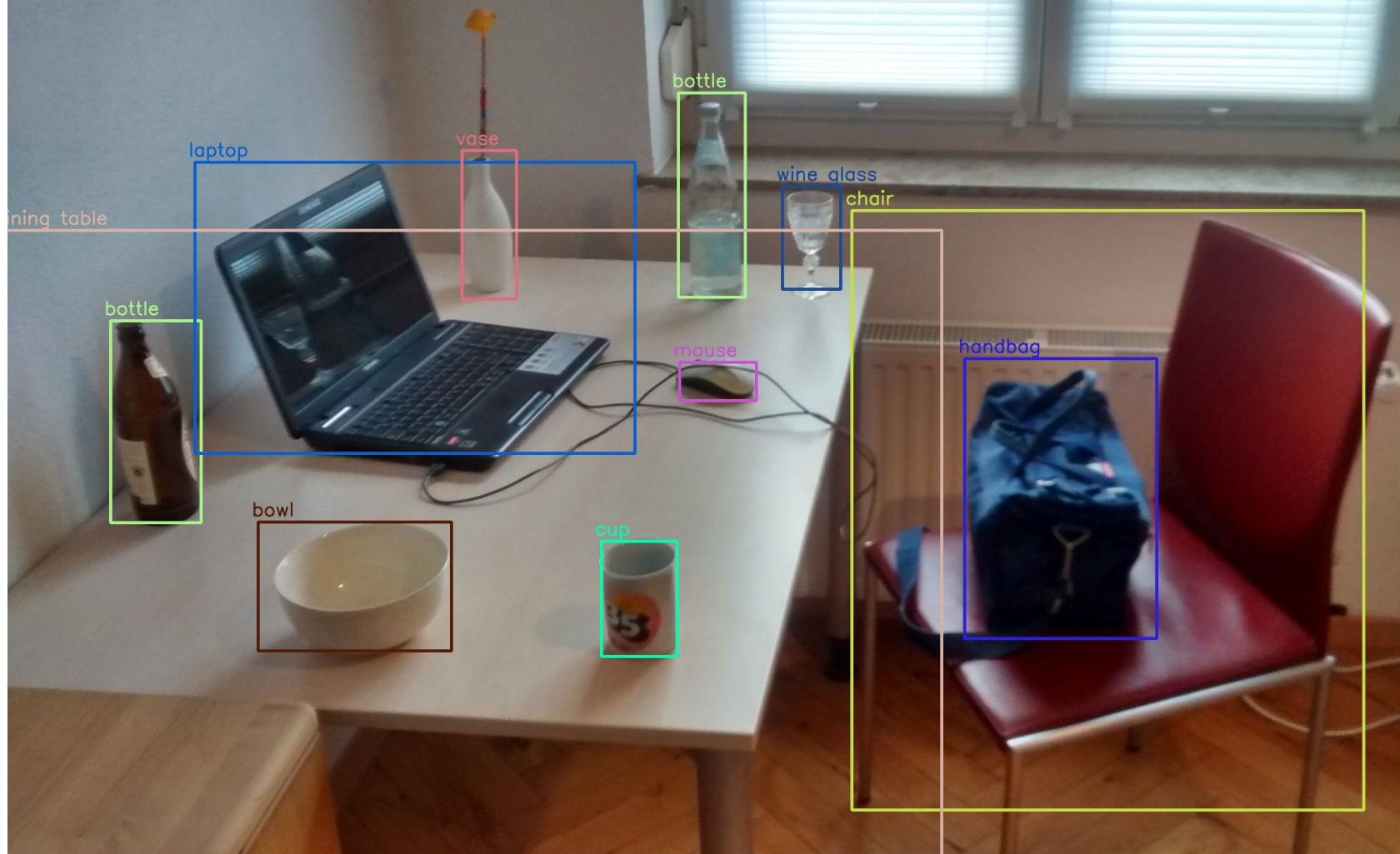
Detection task (seminar)

Lestsov Boris



Ссылка на эту презентацию:

http://tiny.cc/made_cv





FasterRCNN

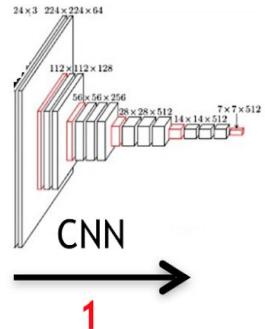


Detection repo

<https://github.com/facebookresearch/maskrcnn-benchmark>

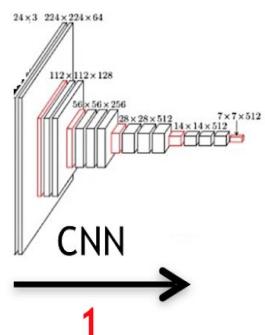


Faster RCNN, algorithm



Faster RCNN, algorithm

1. Pre-trained network: extracting features

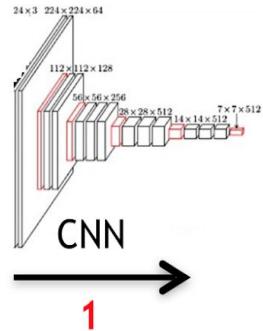


Feature Maps

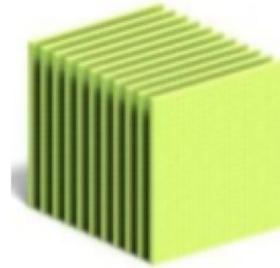


Faster RCNN, algorithm

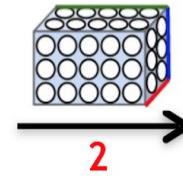
1. Pre-trained network: extracting features



Feature Maps

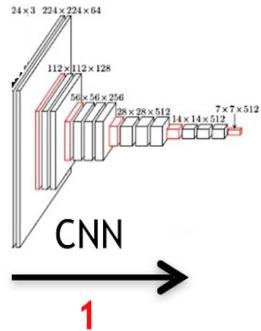


RPN

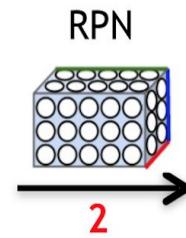
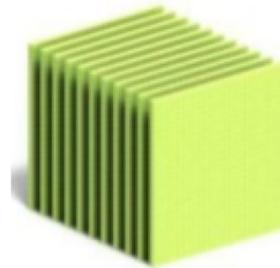


Faster RCNN, algorithm

2. Region proposal network

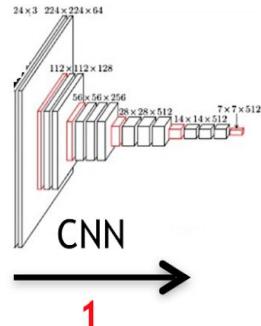


Feature Maps

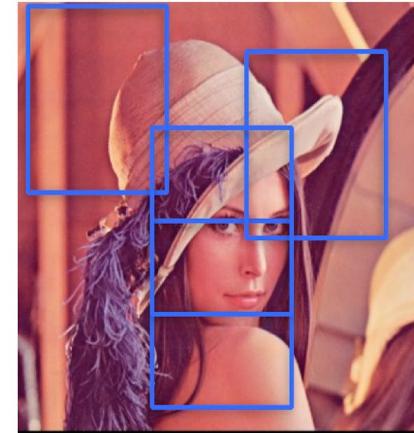
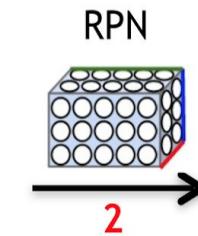
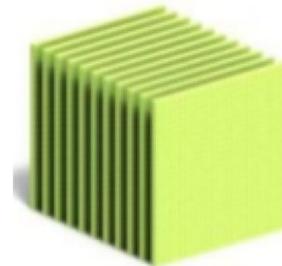


Faster RCNN, algorithm

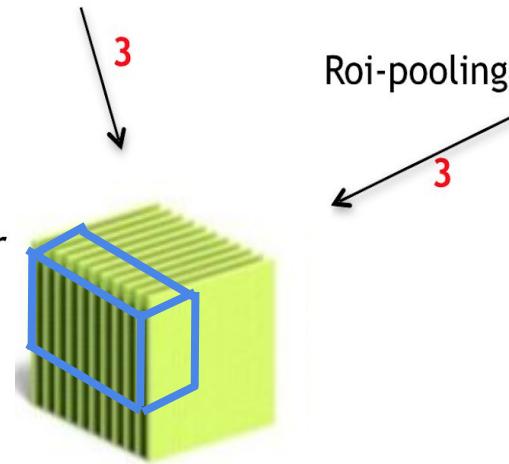
2. Region proposal network



Feature Maps

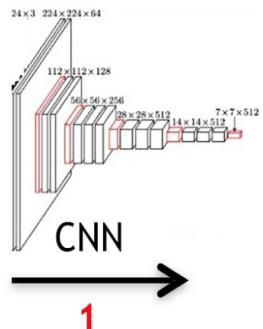


Roi-pooling

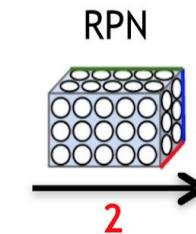
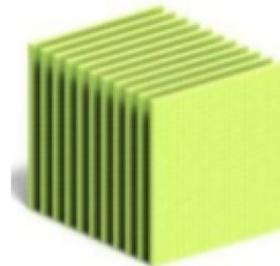


Faster RCNN, algorithm

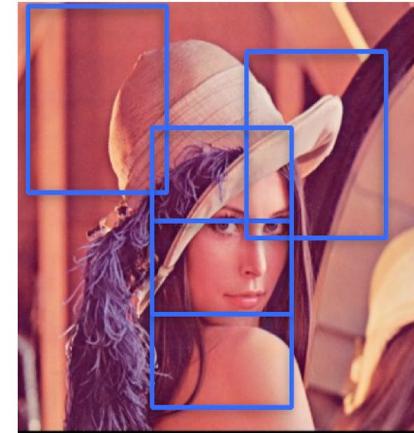
3. Roi-pooling: extract corresponding tensor



Feature Maps



Roi-pooling



3

3

Classifier

A 3D representation of a stack of green rectangular blocks with a blue bounding box drawn around a subset of them, representing the classifier stage. A red arrow labeled '4' points from the Roi-pooling step to the classifier.

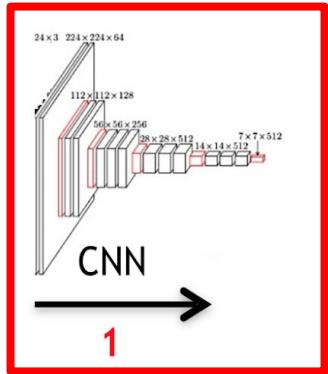
Face ?



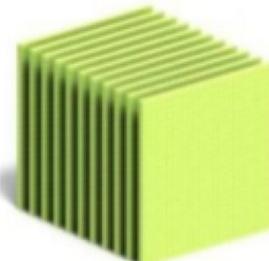
Faster RCNN, algorithm

4. Classifier: classes and the bounding box

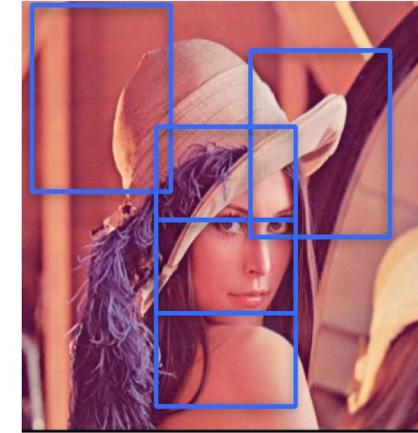
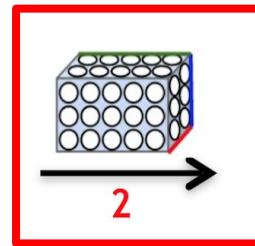
Backbone



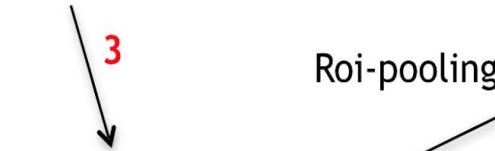
Feature Maps



RPN

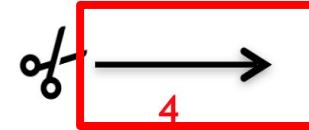
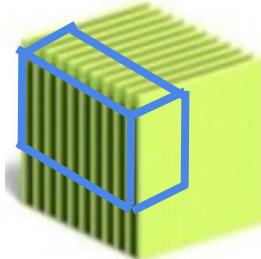


Roi-pooling



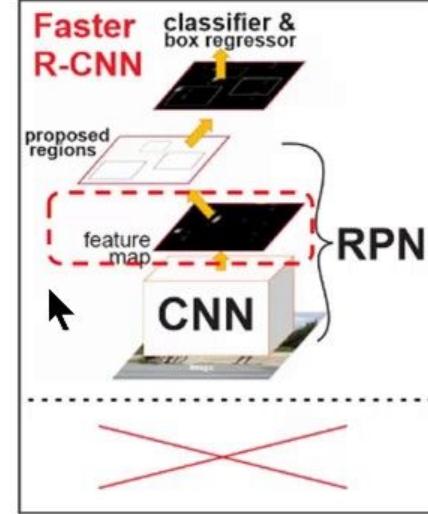
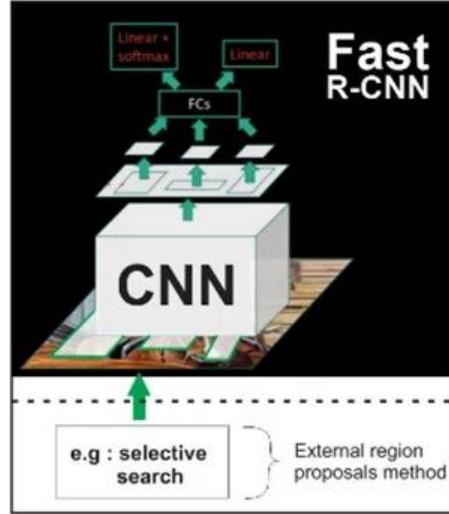
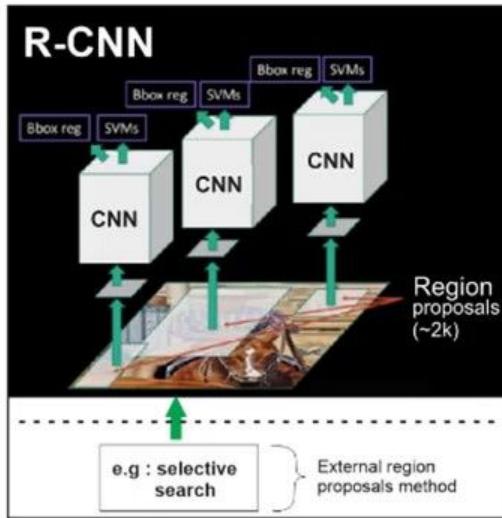
Faster RCNN, algorithm

4. Classifier: classes and the bounding box



Face ?
ROI Head





	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%

* Standford lecture notes on CNN by Fei Fei Li and Andrej Karpathy



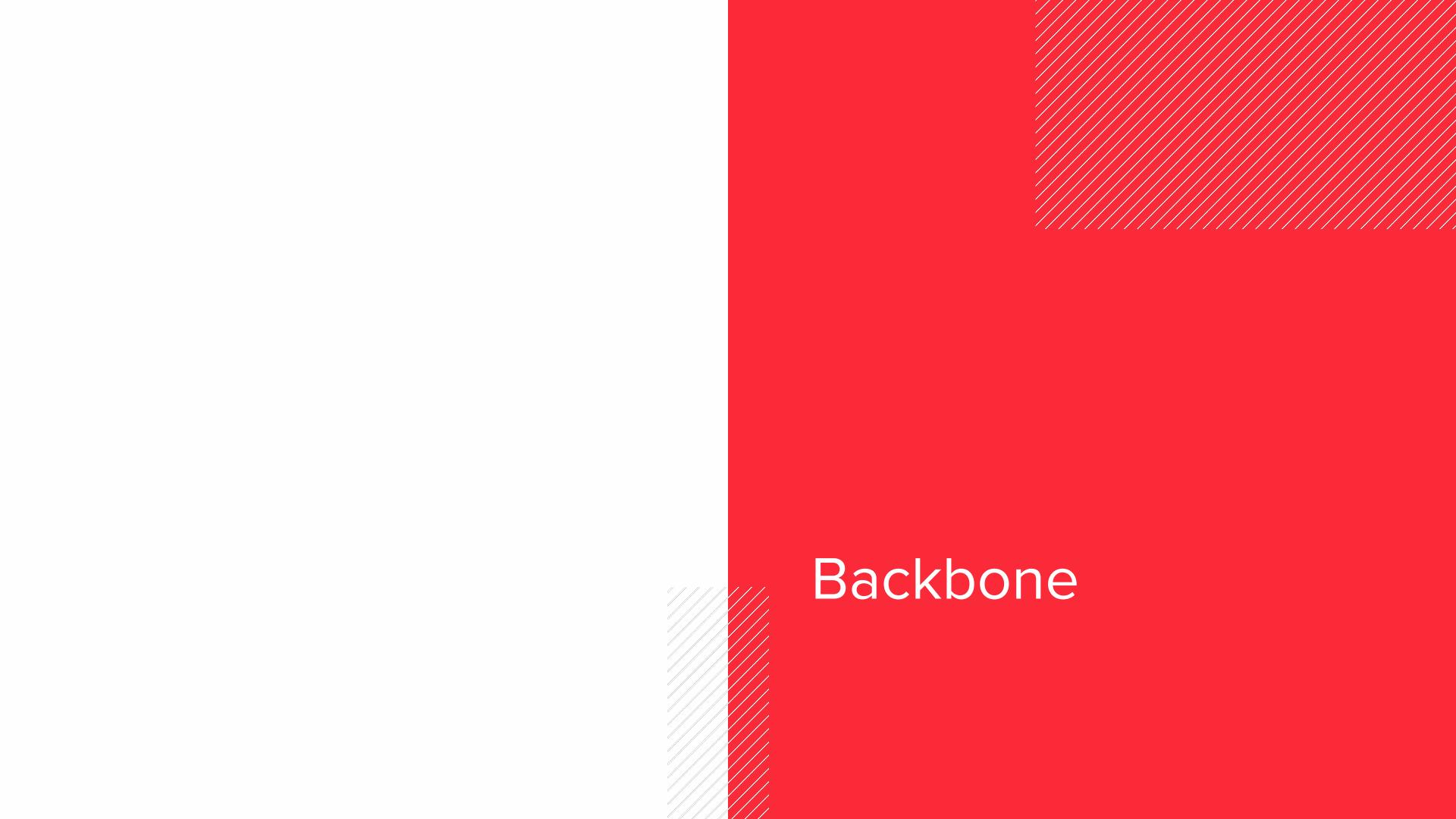
Training script

https://github.com/facebookresearch/maskrcnn-benchmark/blob/master/maskrcnn_benchmark/engine/trainer.py



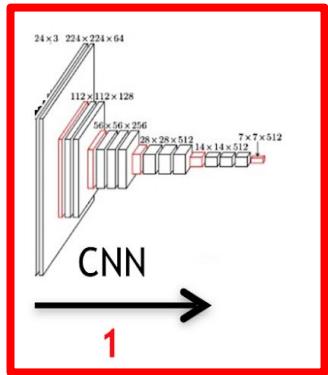
Model

https://github.com/facebookresearch/maskrcnn-benchmark/blob/master/maskrcnn_benchmark/modeling/detector/generalized_rcnn.py

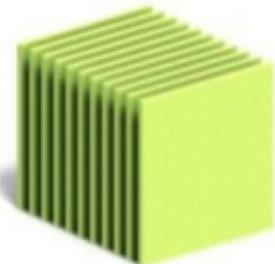


Backbone

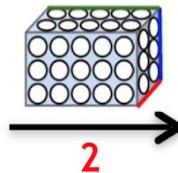
Backbone



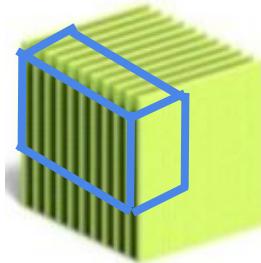
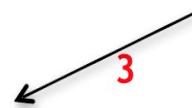
Feature Maps



RPN



Roi-pooling



Classifier



Face ?

Faster RCNN, algorithm

4. Classifier: classes and the bounding box

$\mathcal{F}(x)$ x

weight layer

relu

weight layer

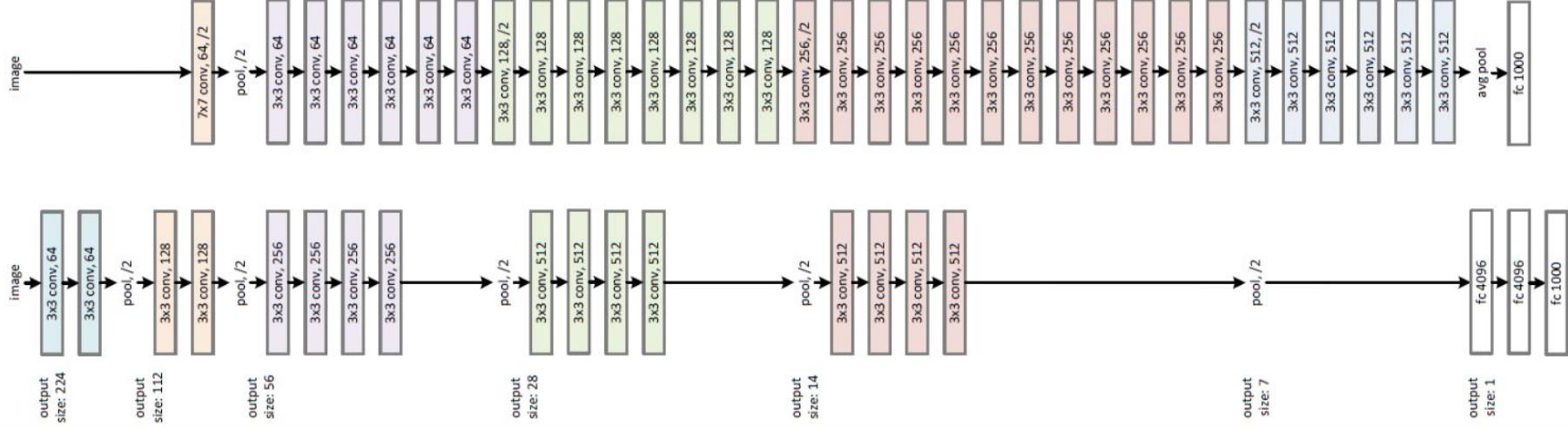
 $\mathcal{F}(x) + x$

relu

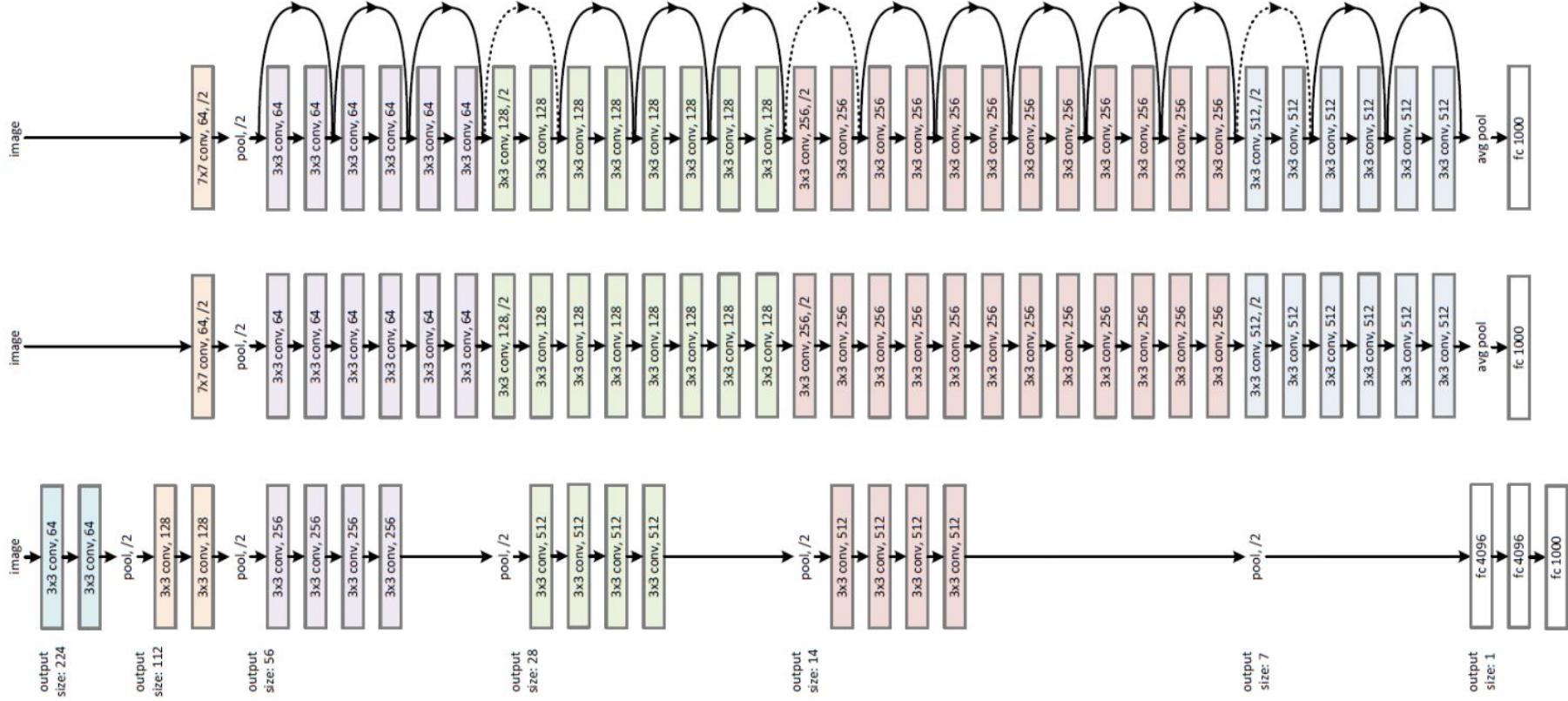
 x

identity

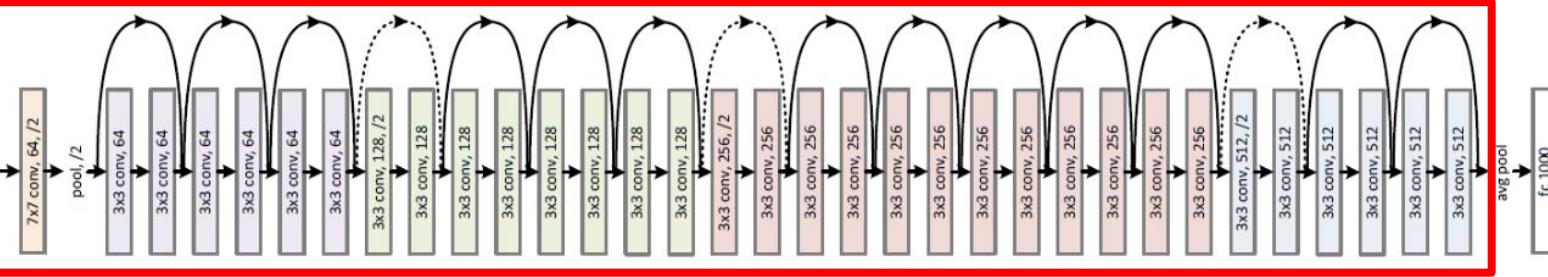
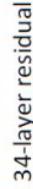
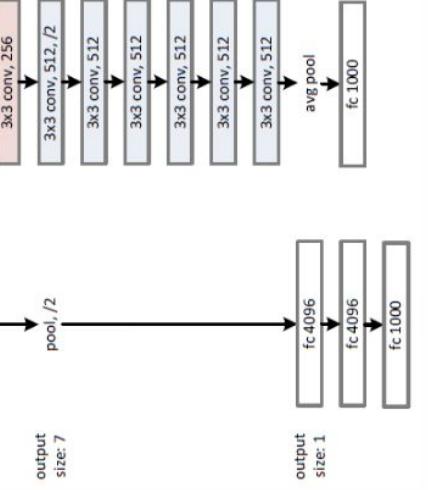
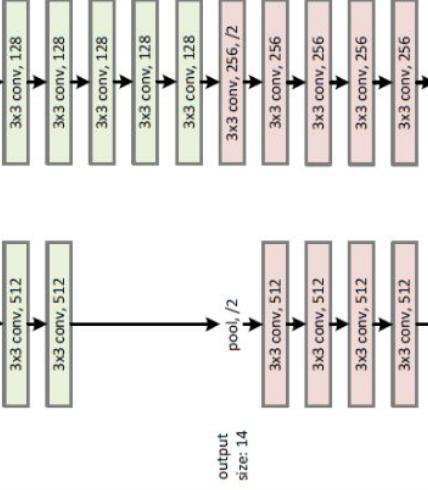
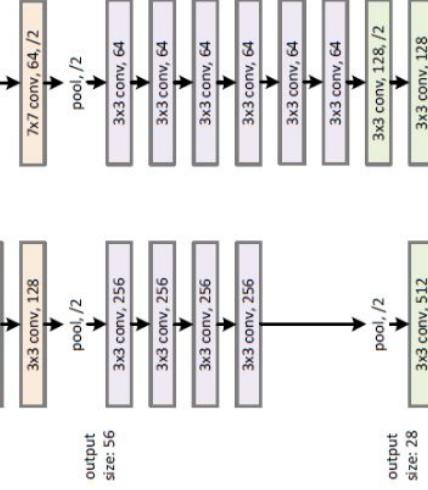
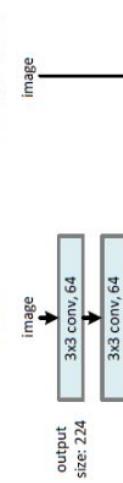
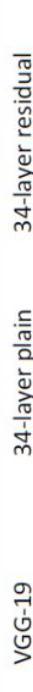
VGG-19



34-layer plain



34-layer residual

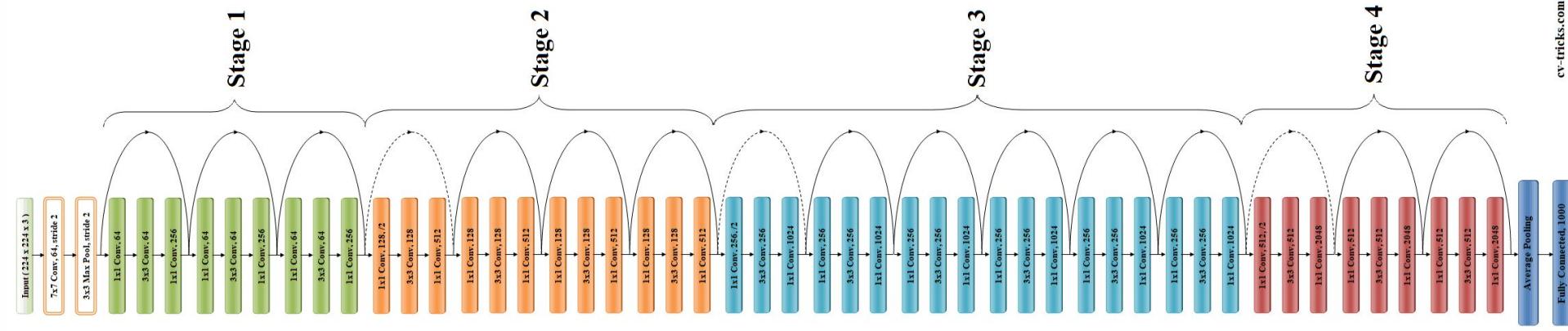




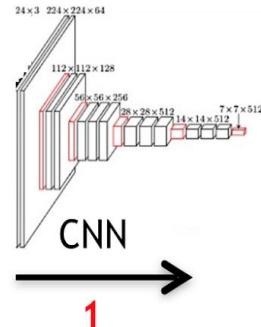
Backbone

https://github.com/facebookresearch/maskrcnn-benchmark/blob/master/maskrcnn_benchmark/modeling/backbone/resnet.py

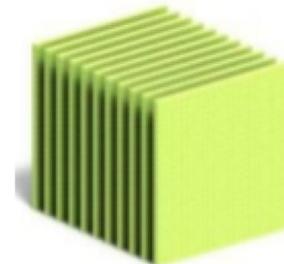
Resnet50



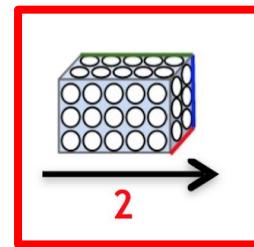
Region Proposal Network



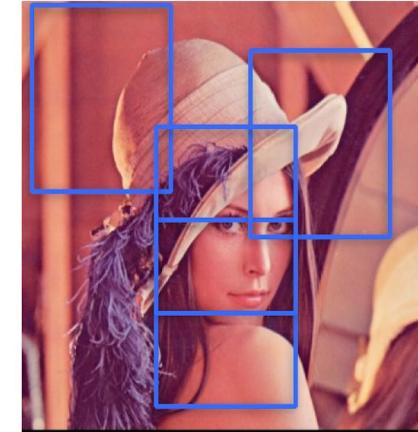
Feature Maps



RPN

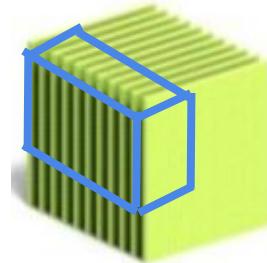


Roi-pooling



3

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4

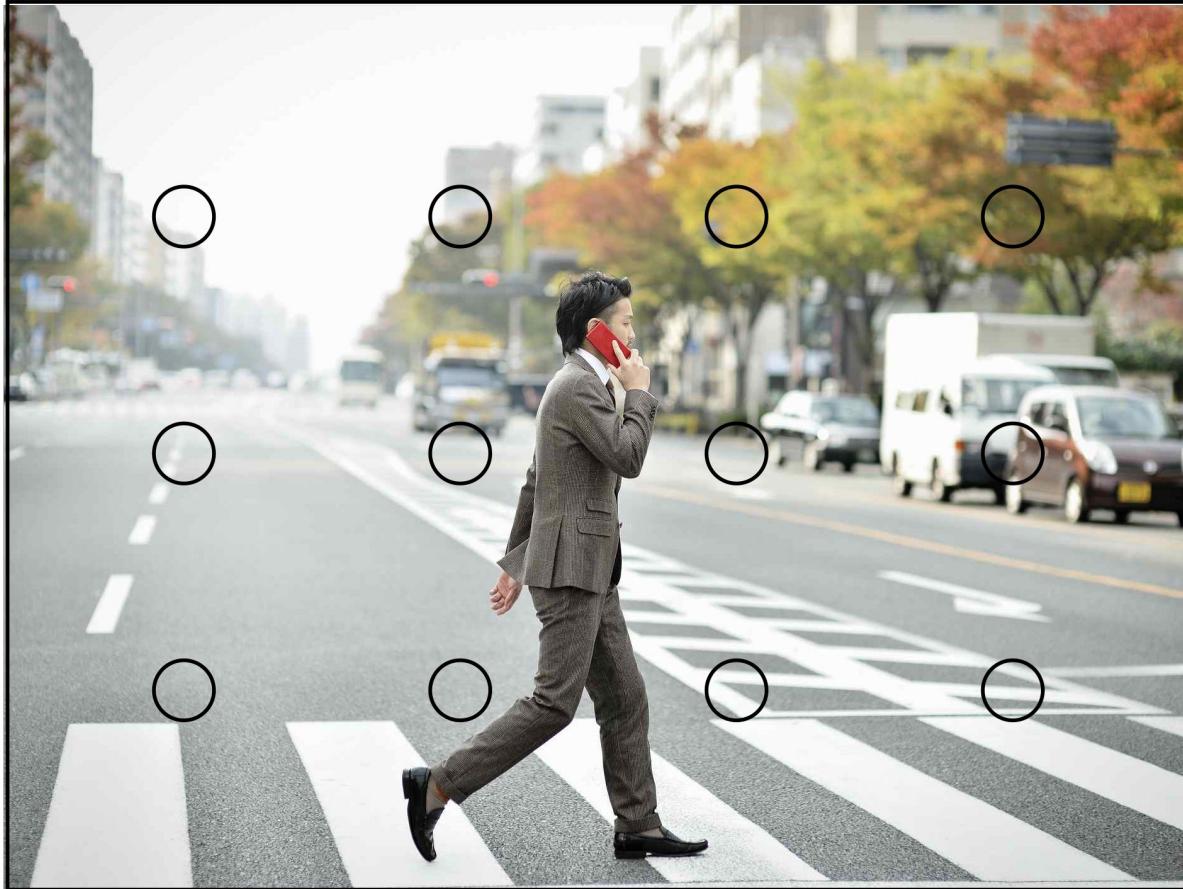
A diagram showing a black arrow pointing to the right, with a black circle containing a question mark at its end, representing the final classification step where the network determines if the detected region contains a face.

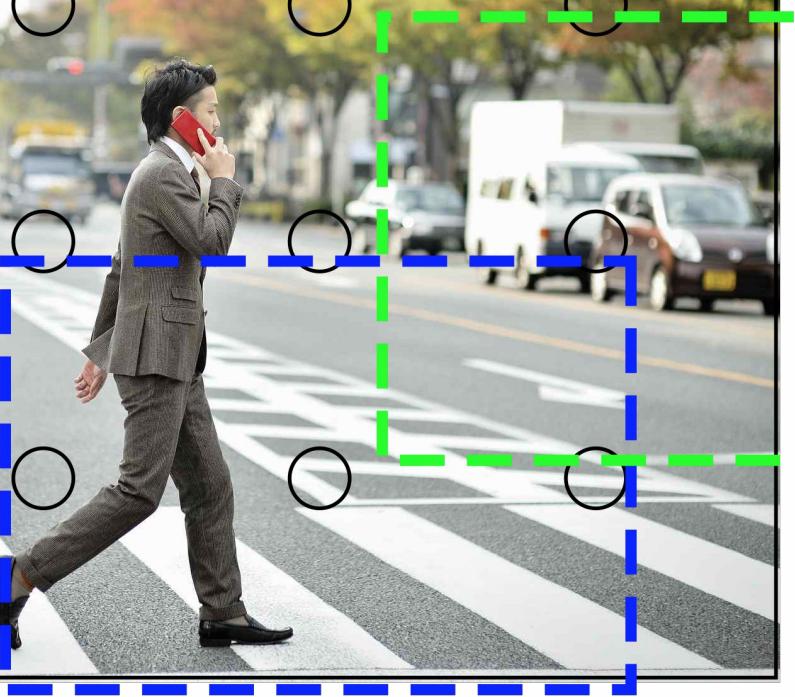
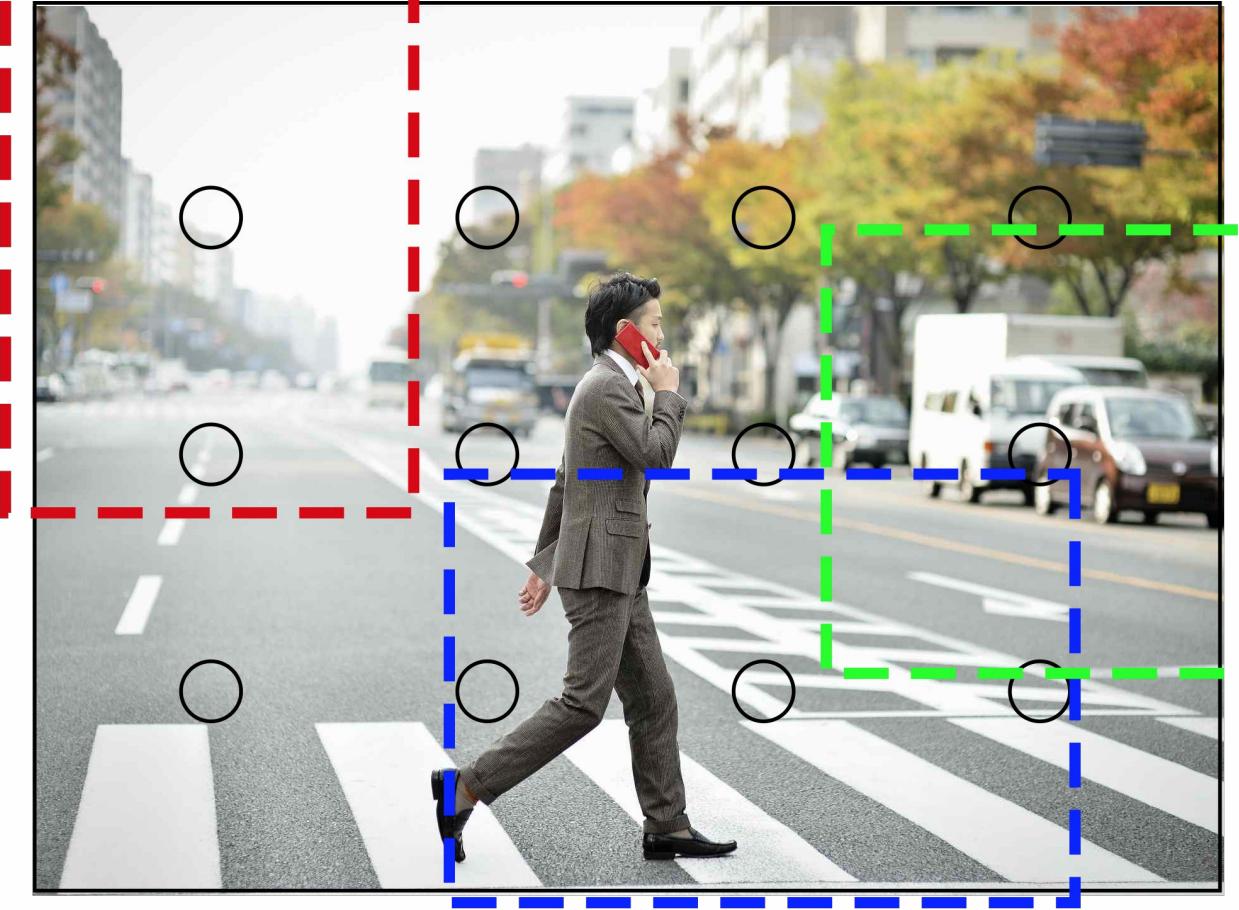
Face ?

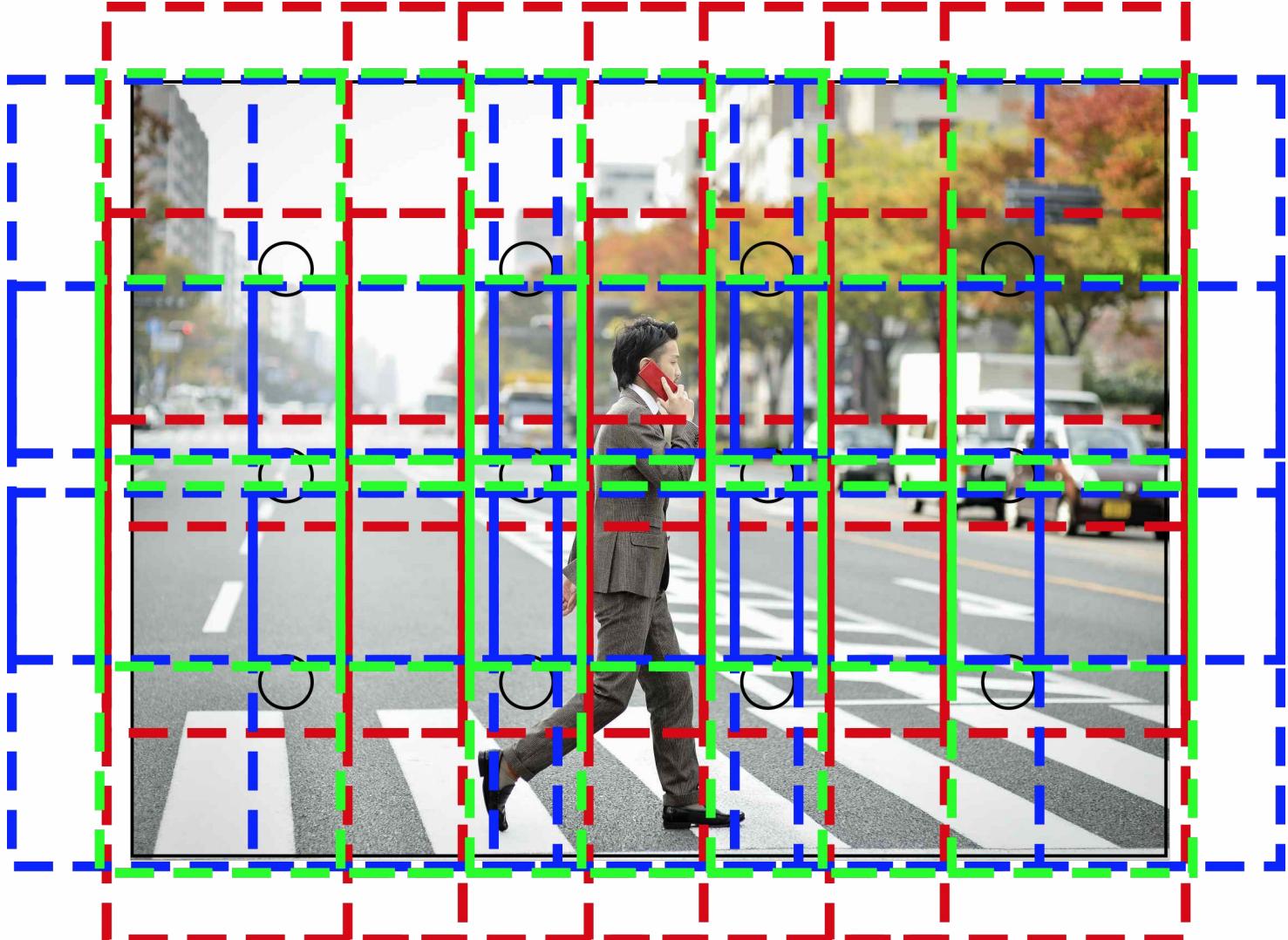
Faster RCNN, algorithm

4. Classifier: classes and the bounding box



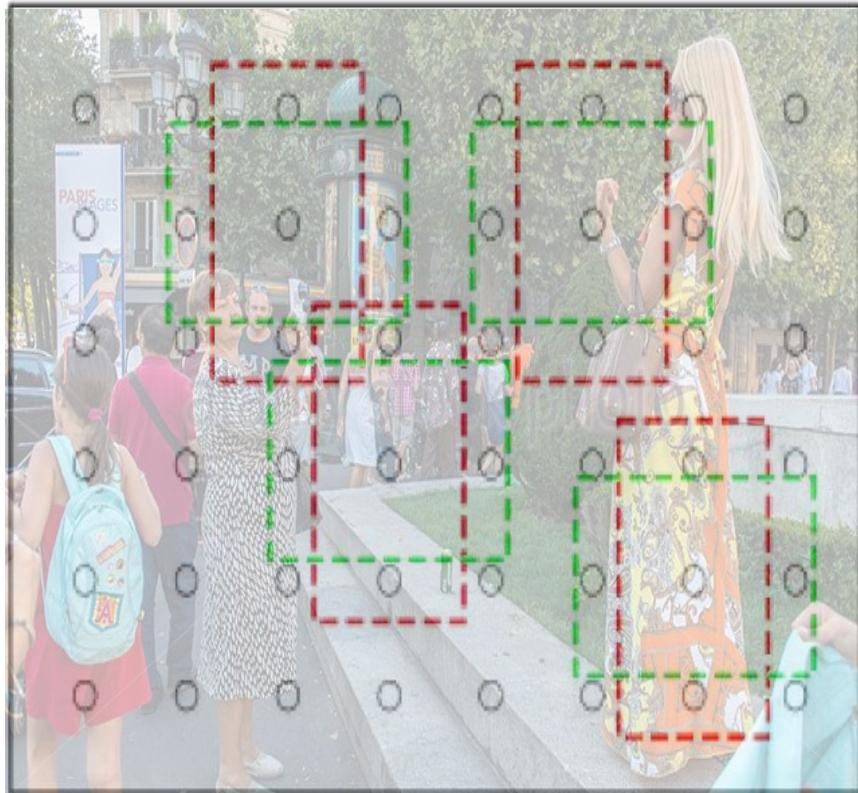




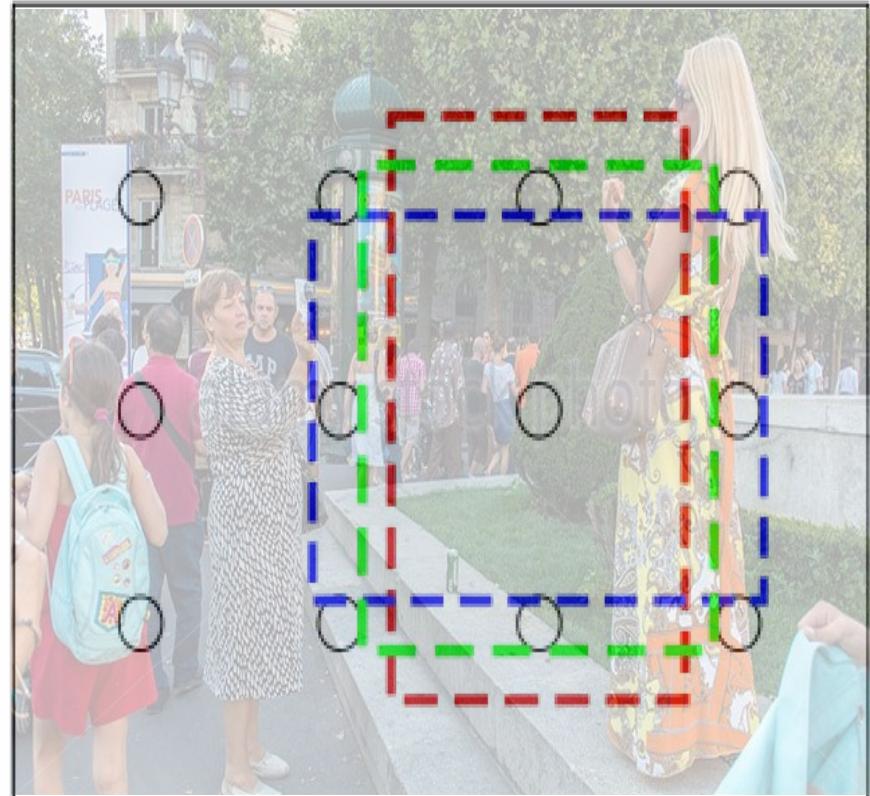




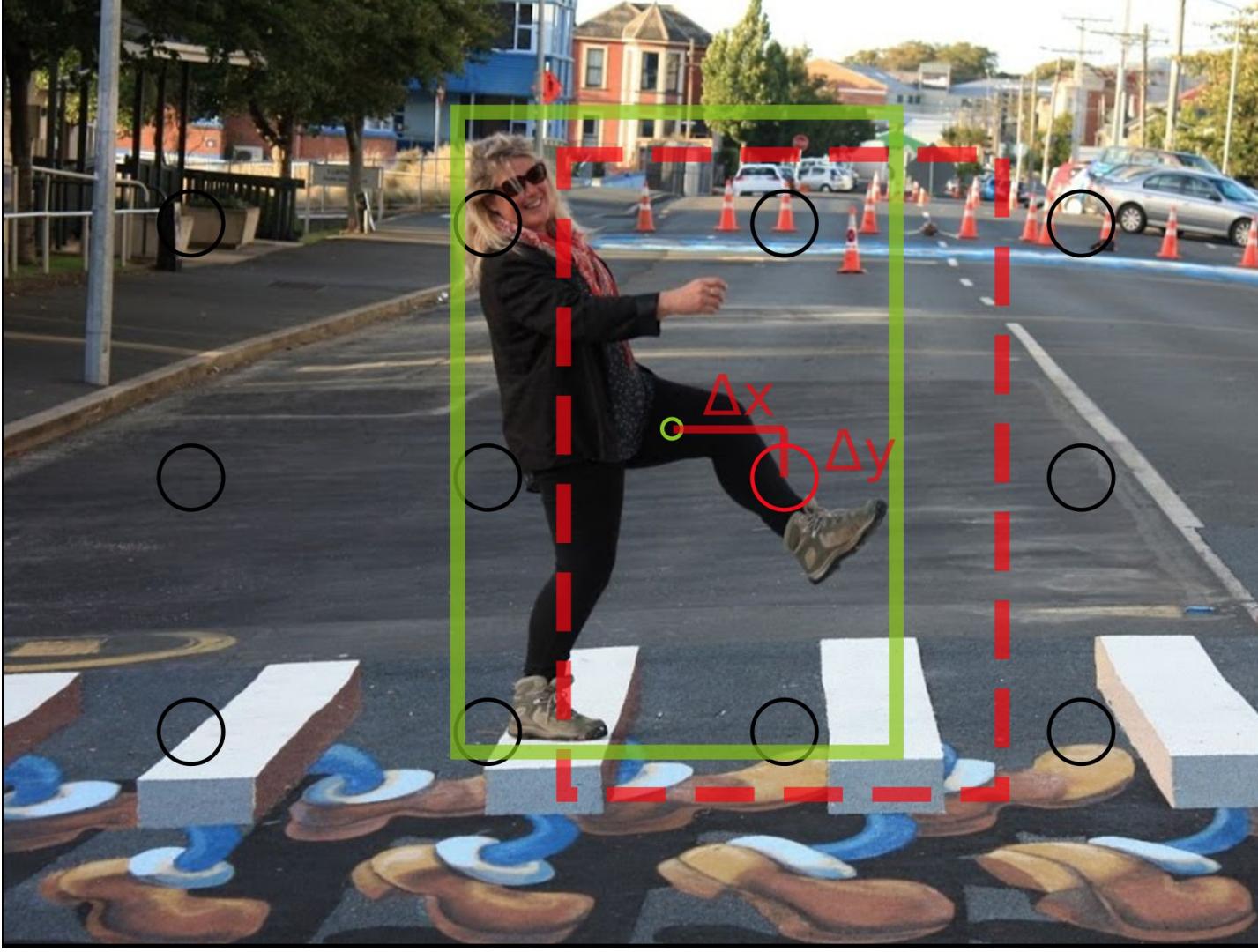
Smaller scale

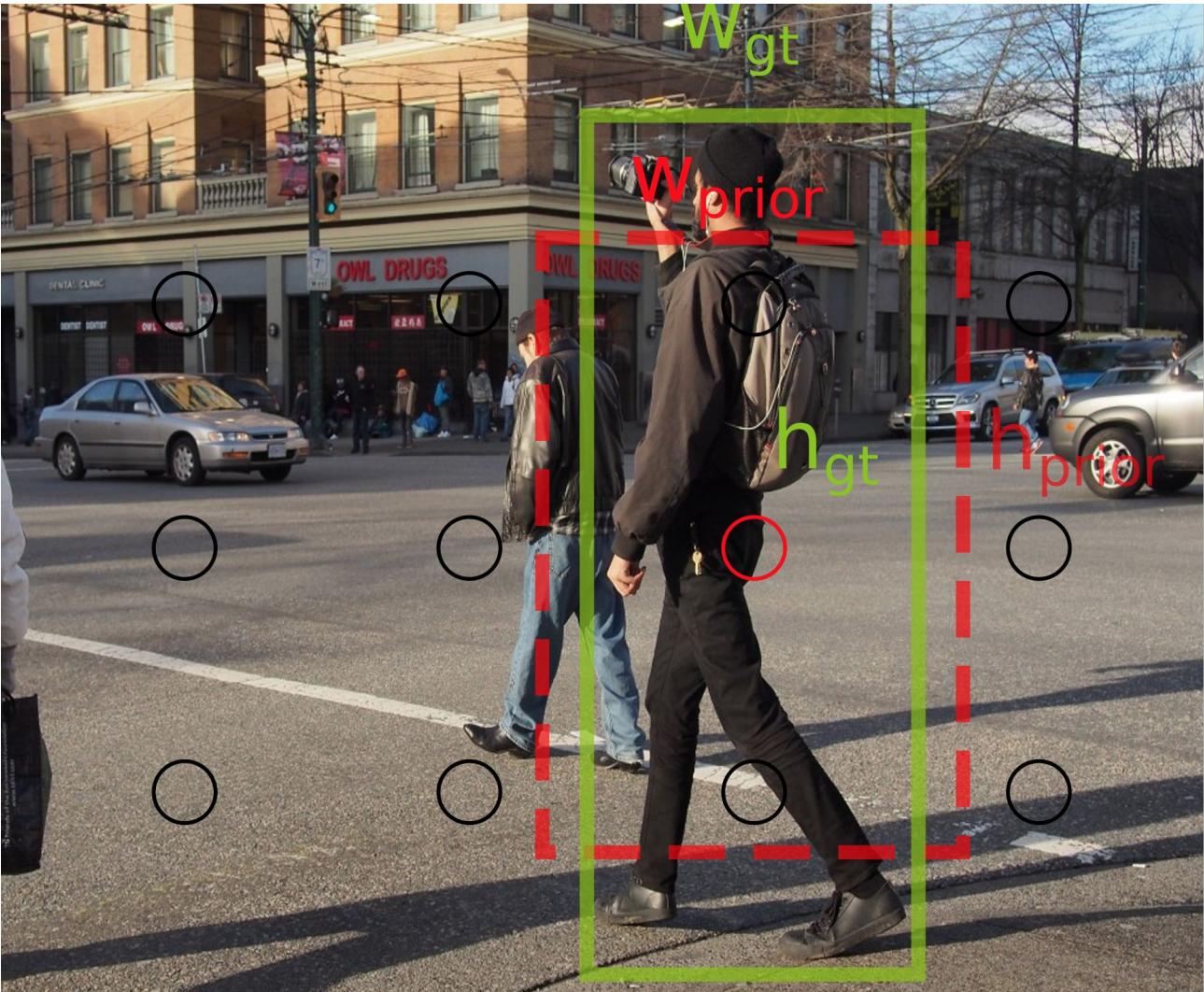


Bigger scale



Predict
 $\Delta x, \Delta y$

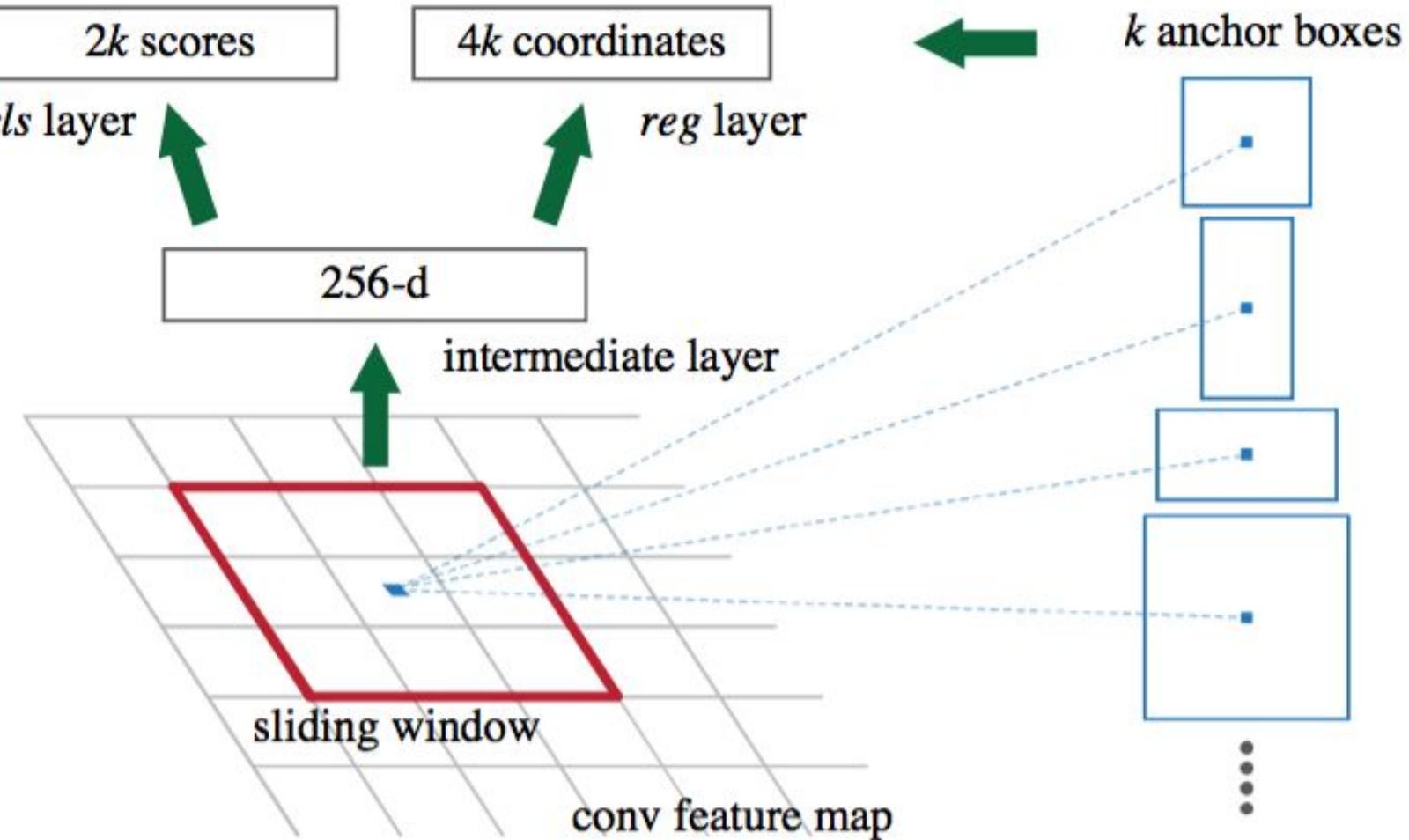




Predict S_x , S_y :

$$S_x = \frac{W_{gt}}{W_{prior}}$$

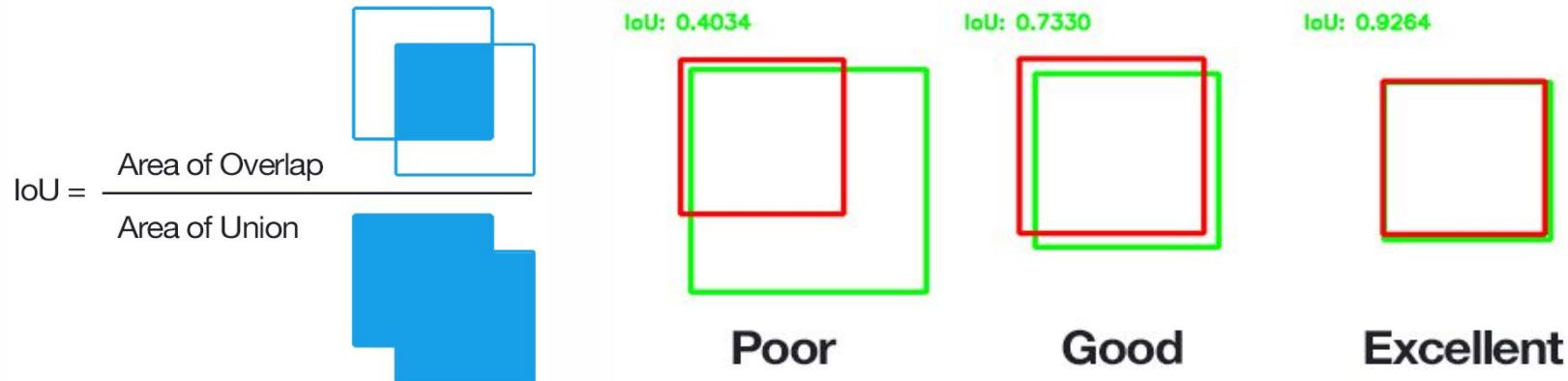
$$S_y = \frac{h_{gt}}{h_{prior}}$$



Intersection over Union (IoU)

$\text{IoU} > \text{threshold (0.5)} \Rightarrow \text{True Positive, else False Positive.}$

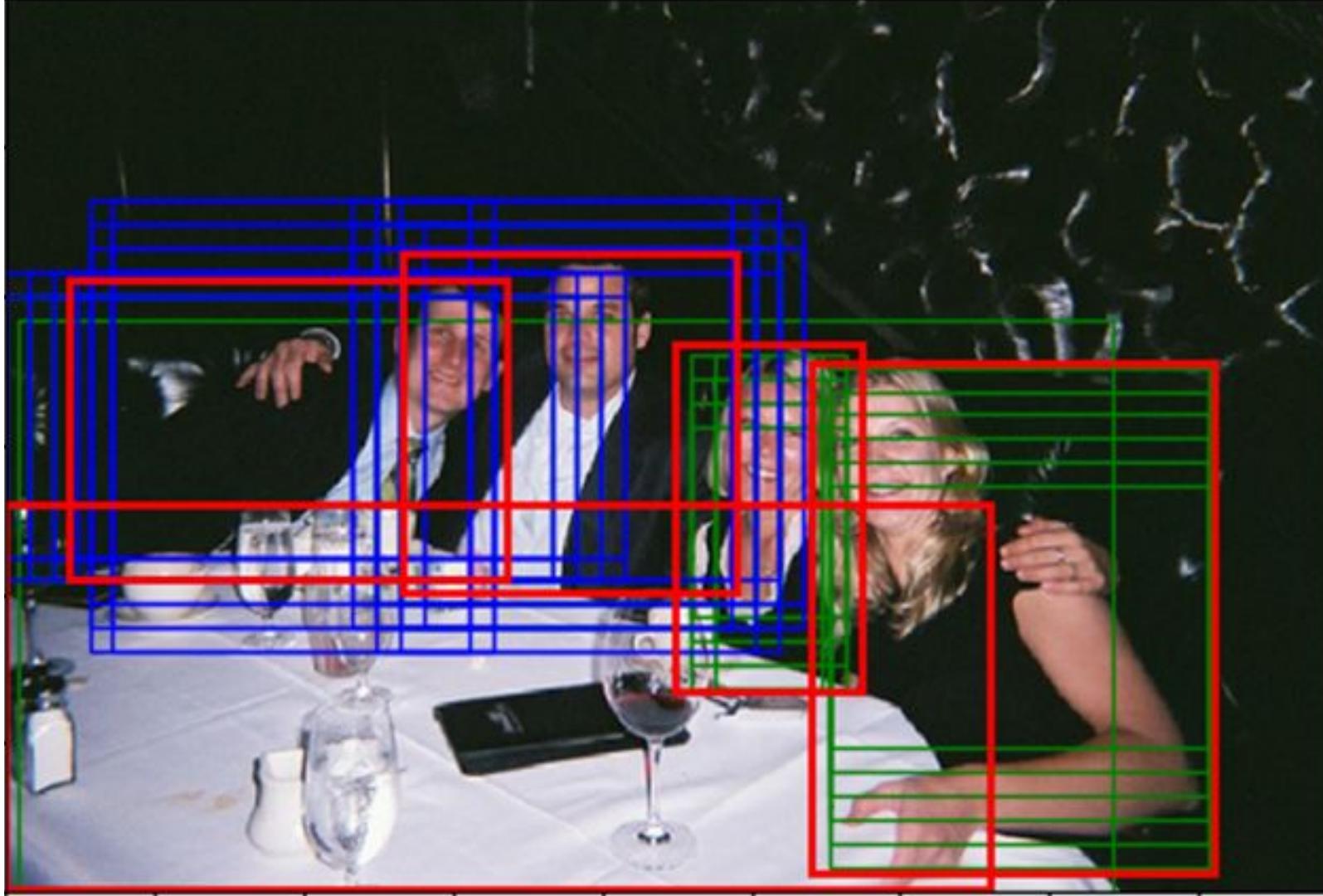
To prediction for some ground-truth object \Rightarrow **False Negative**.





RPN

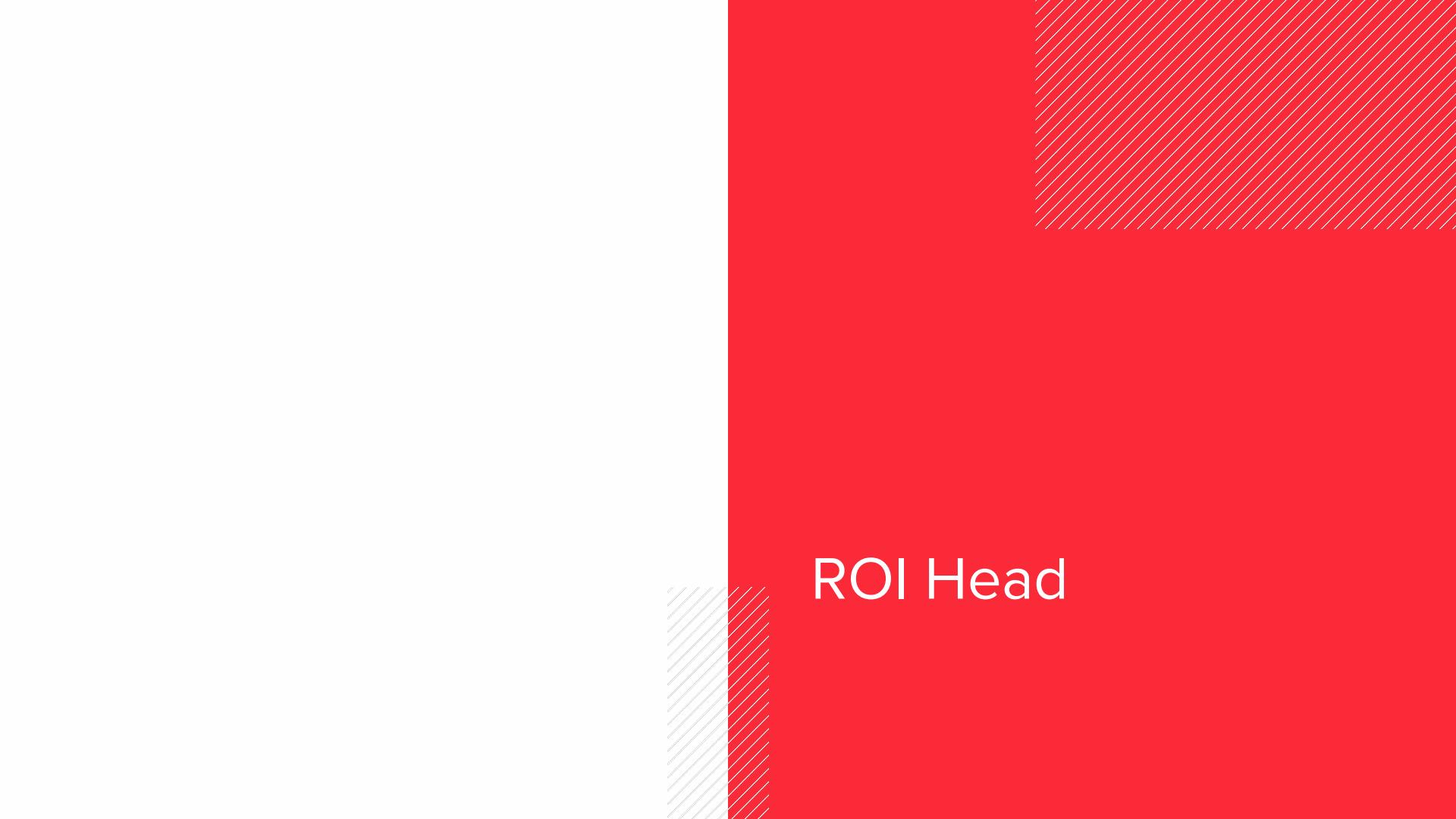
https://github.com/facebookresearch/maskrcnn-benchmark/blob/master/maskrcnn_benchmark/modeling/rpn/rpn.py



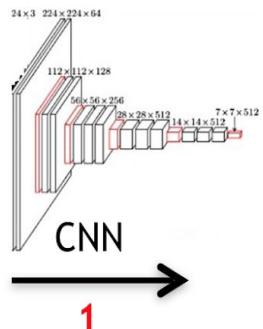


RPN

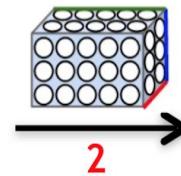
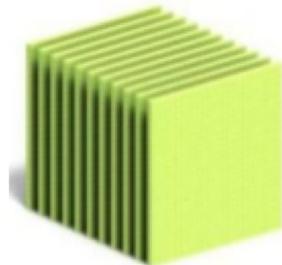
https://github.com/facebookresearch/maskrcnn-benchmark/blob/master/maskrcnn_benchmark/modeling/rpn/loss.py



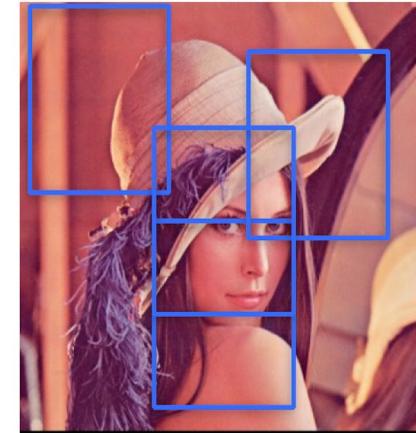
ROI Head



Feature Maps

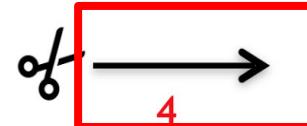
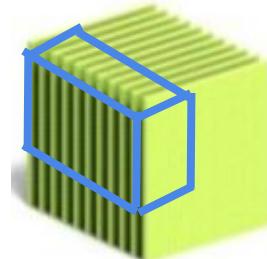


Roi-pooling



3

3



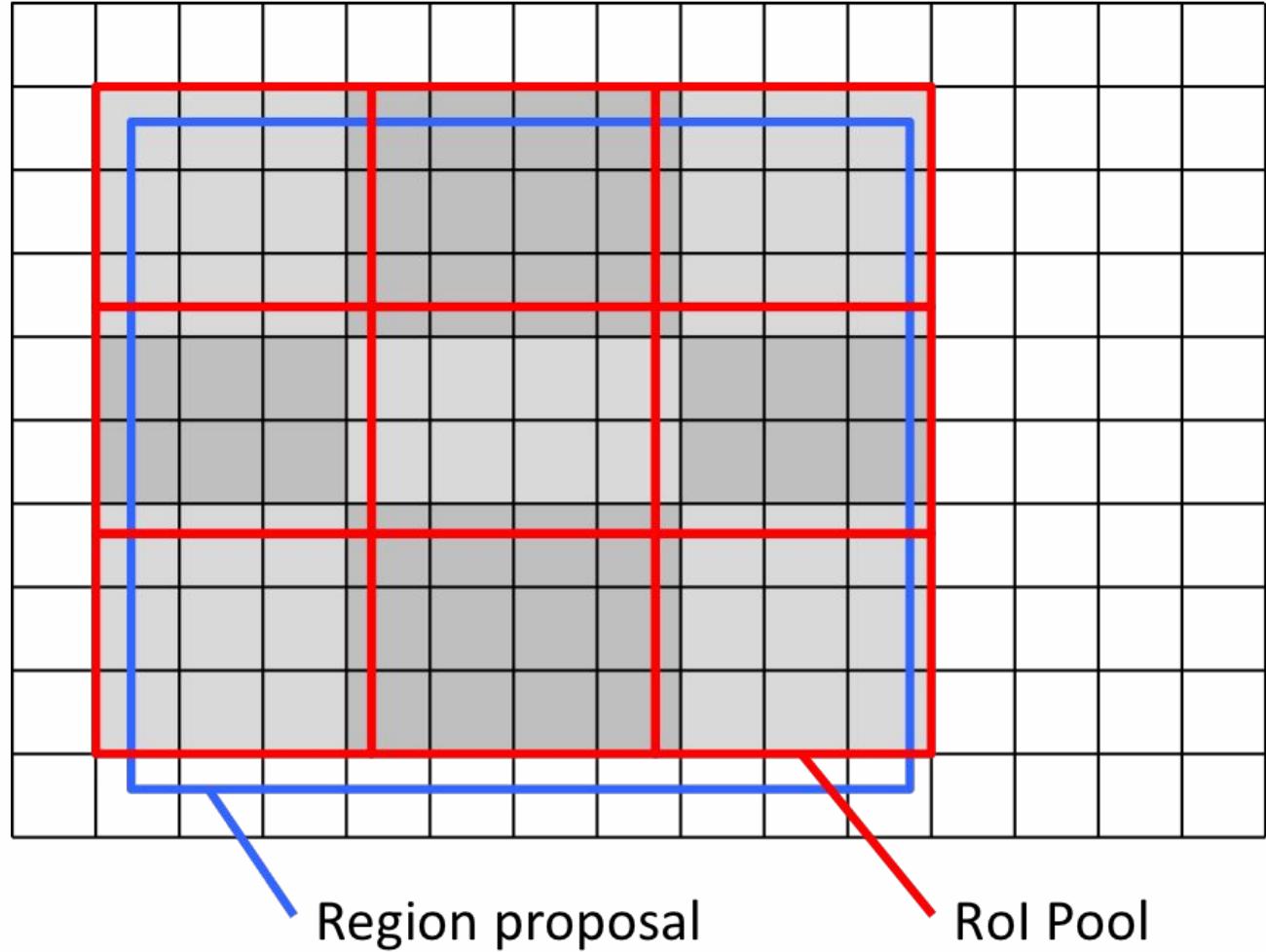
Face ?
ROI Head

Faster RCNN, algorithm

4. Classifier: classes and the bounding box

ROI Pooling

Feature map (10x15)





ROI Heads

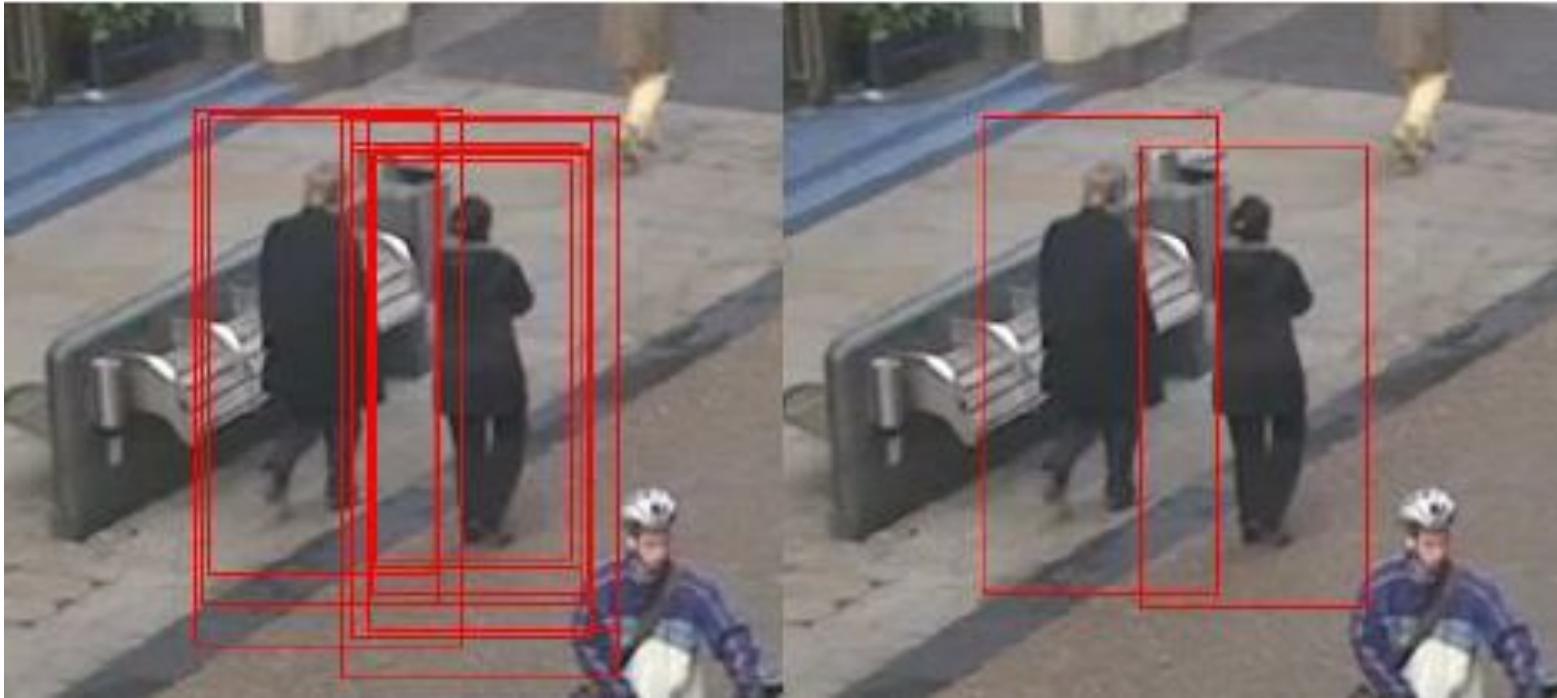
https://github.com/facebookresearch/maskrcnn-benchmark/blob/master/maskrcnn_benchmark/modeling/roi_heads/box_head/box_head.py

https://github.com/facebookresearch/maskrcnn-benchmark/blob/master/maskrcnn_benchmark/modeling/roi_heads/box_head/loss.py

... same components ...

Postprocessing

Non Maximum Suppression (NMS)





Non Maximum Suppression (NMS)

<https://pastebin.com/U3rtb08P>

Tip: Use fast CPU/GPU implementation.

Additional features



Additional features

- 1) Mask-RCNN, Pose estimation head
- 2) SSD-like approaches (YOLO, RetinaNet)
- 3) Better backbones (PNAS, EfficientNet)



Приходите на наш курс
во втором семестре!



Questions?

Contacts



+7(925)618-97-62



b.lestsov@corp.mail.ru

Boris Lestsov

академия
больших
данных





Backbone (FPN)

https://github.com/facebookresearch/maskrcnn-benchmark/blob/master/maskrcnn_benchmark/modeling/backbone/fpn.py

