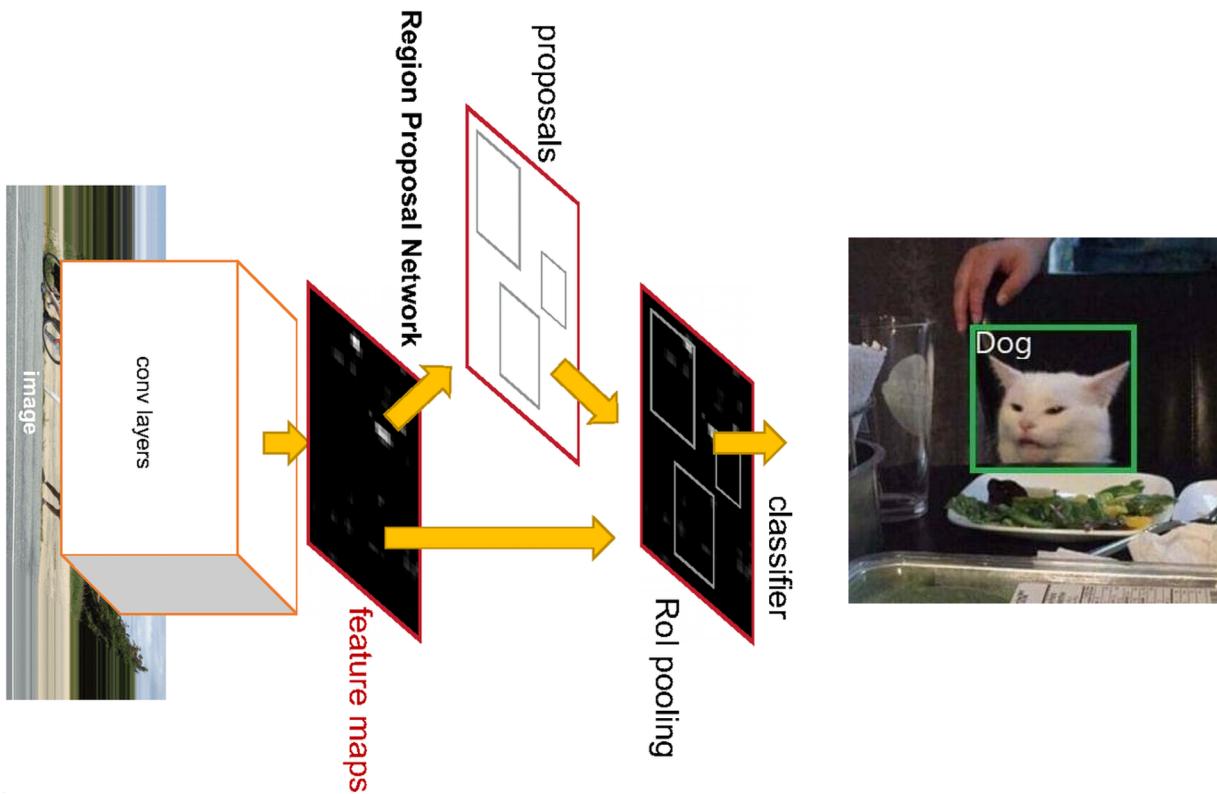
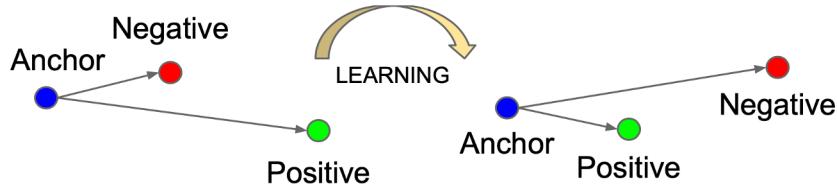


Seminar 5: Other



Metric Learning



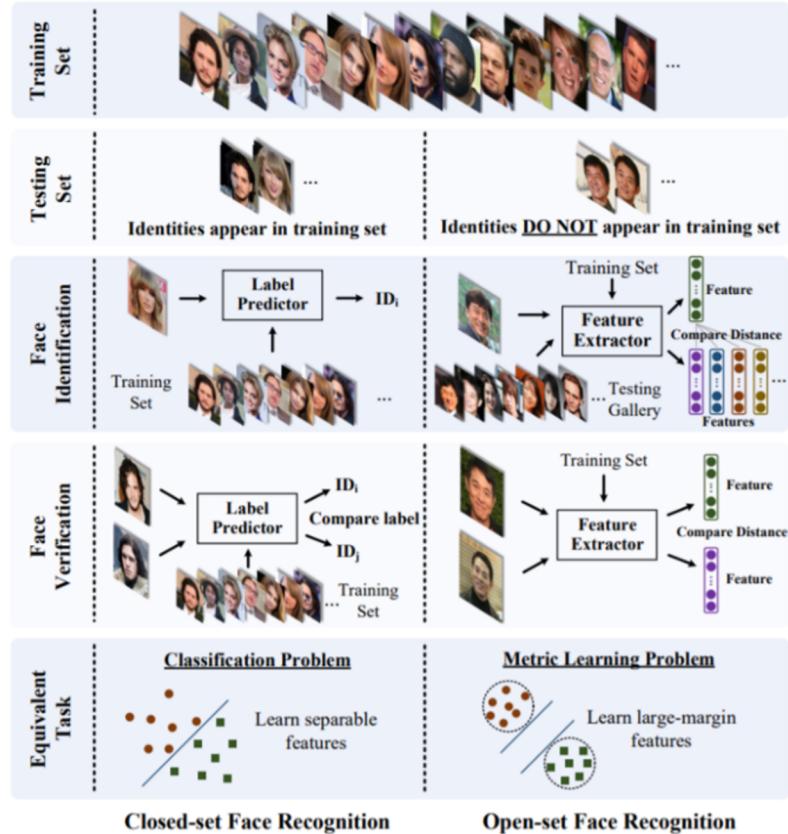
Now we are in a position to understand the mathematical equation of the *Triplet Loss Function*.

$$\sum_i^N \left[\|f(x_i^a) - f(x_i^p)\|_2^2 - \|f(x_i^a) - f(x_i^n)\|_2^2 + \alpha \right]$$

Mathematical Equation of Triplet Loss Function.

$$L(W, Y, \vec{X}_1, \vec{X}_2) = (1 - Y) \frac{1}{2} (D_W)^2 + (Y) \frac{1}{2} \{ \max(0, m - D_W) \}^2$$

Figure 3 — Actual Contrastive Loss function



Remark:Dropout2D

<https://pytorch.org/docs/stable/generated/torch.nn.Dropout2d.html>

Spatial Dropout -- Dropout2D

- Dropout2d will drop full feature maps (channels)

```
import torch

m = torch.nn.Dropout2d(p=0.5)
input = torch.randn(1, 3, 5, 5)
output = m(input)

output
```

tensor([[[[-0.0000, 0.0000, 0.0000, 0.0000, -0.0000],
 [0.0000, -0.0000, 0.0000, 0.0000, 0.0000],
 [0.0000, -0.0000, 0.0000, -0.0000, 0.0000],
 [0.0000, 0.0000, -0.0000, 0.0000, -0.0000],
 [-0.0000, 0.0000, 0.0000, -0.0000, 0.0000]],

 [[-3.5274, 0.8163, 0.2440, 1.2410, 1.5022],
 [-1.2455, 6.3875, -2.6224, 0.0261, 1.7487],
 [1.6471, 0.7444, -2.1941, -2.0119, -1.5232],
 [0.3720, -1.5606, 0.7630, 0.9177, -0.1387],
 [-1.2817, -3.5804, 0.4367, -0.1384, -0.8148]],

 [[-0.0000, -0.0000, -0.0000, 0.0000, 0.0000],
 [0.0000, -0.0000, -0.0000, 0.0000, 0.0000],
 [0.0000, -0.0000, 0.0000, -0.0000, -0.0000],
 [-0.0000, -0.0000, 0.0000, 0.0000, -0.0000],
 [-0.0000, 0.0000, 0.0000, 0.0000, 0.0000]]]])

Segmentation and Detection

Semantic Segmentation



Classification + Localization



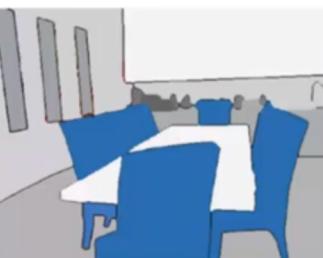
Object Detection



Instance Segmentation



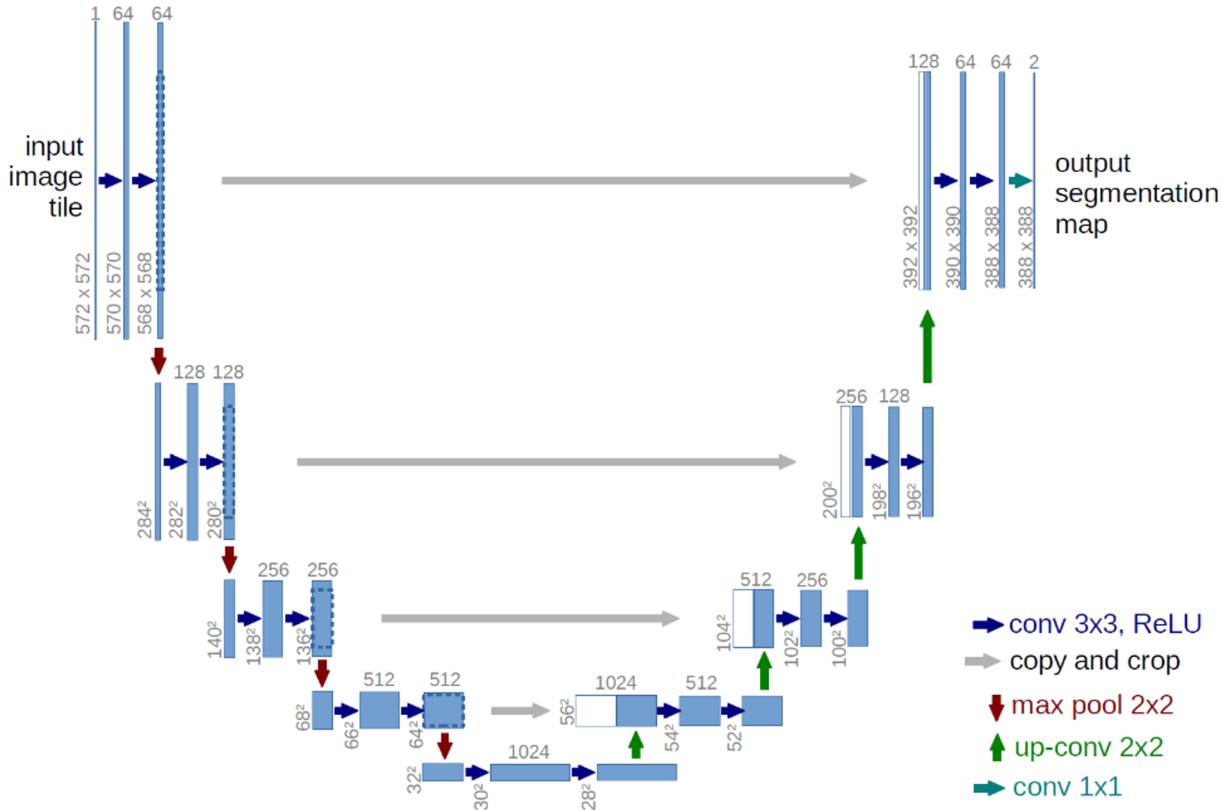
Semantic
segmentation



Instance
segmentation



Segmentation



Detection

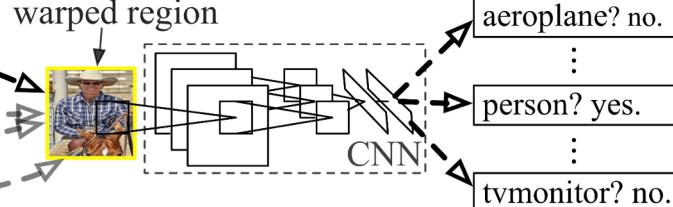
R-CNN: *Regions with CNN features*



1. Input image

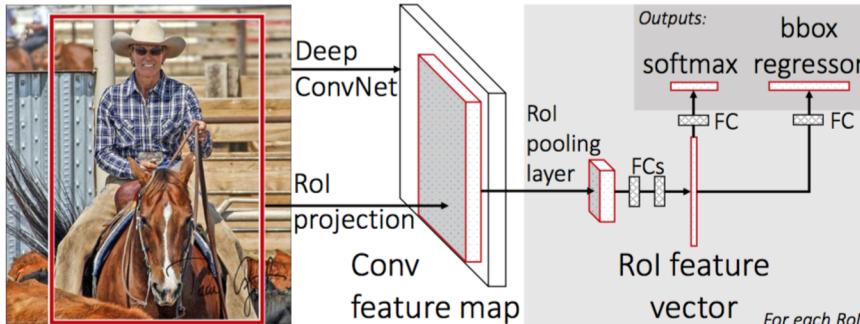


2. Extract region proposals (~2k)



3. Compute CNN features

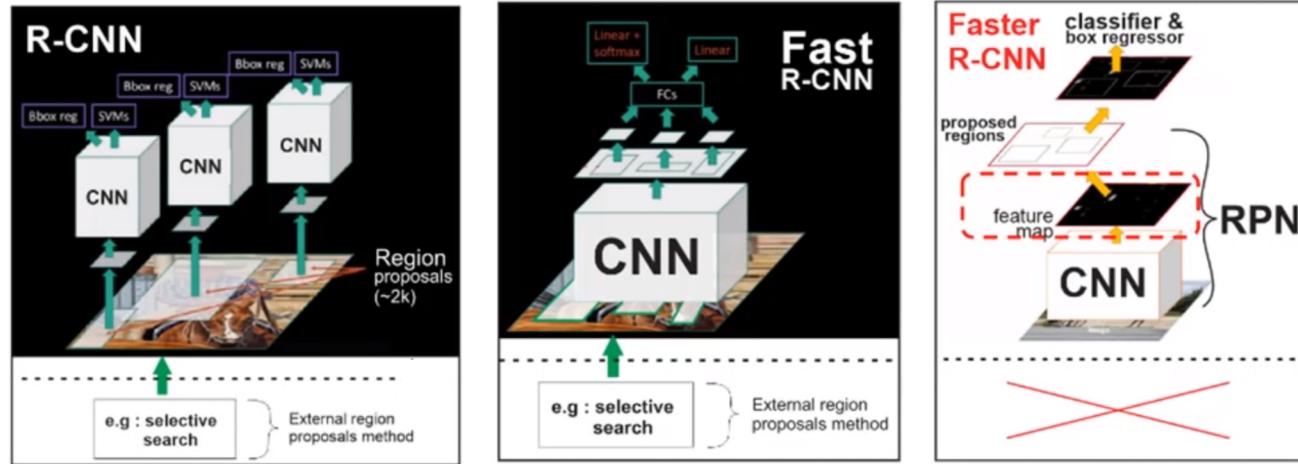
4. Classify regions



<https://habr.com/ru/company/jetinfo/systems/blog/498294/>

<https://habr.com/ru/company/jetinfo/systems/blog/498652/>

Detection fast (general idea)



	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