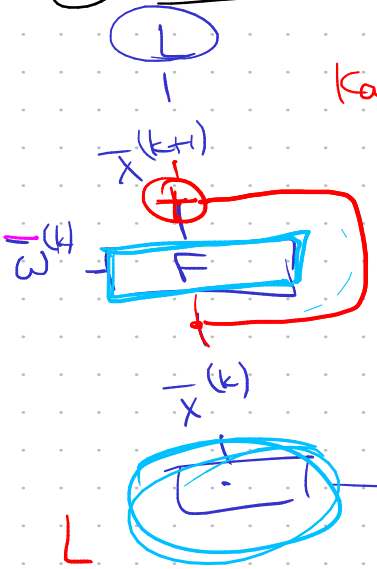
③ Residual connections

Kaiming He



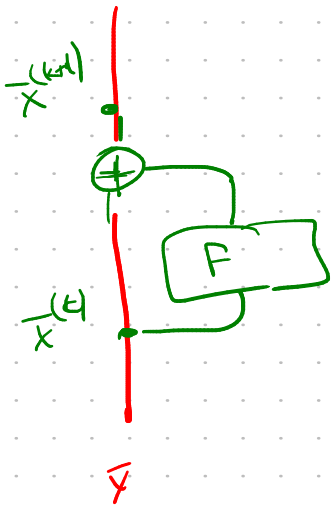
$$\frac{\partial L}{\partial w} = \frac{\partial L}{\partial x^{(k+1)}} \frac{\partial x^{(k+1)}}{\partial x^{(k)}} \frac{\partial x^{(k)}}{\partial w}$$

F' ∇F

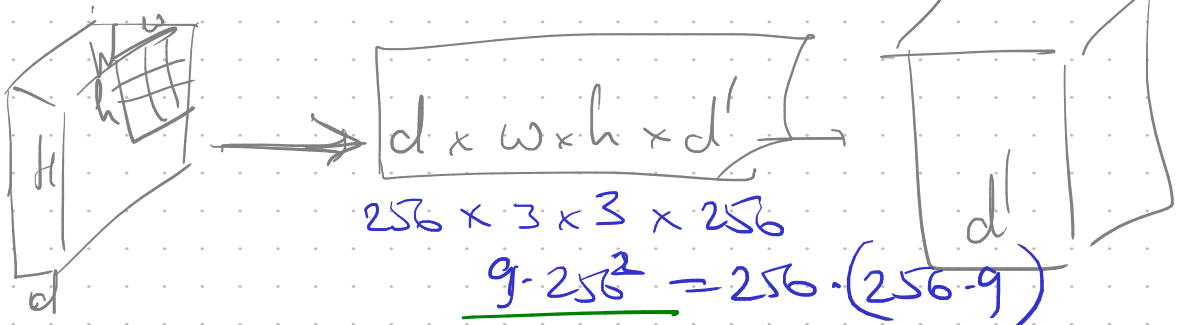
$$x^{(k+1)} = F(x^{(k)})$$

$$x^{(k+1)} = F(x^{(k)}) + x^{(k)}$$

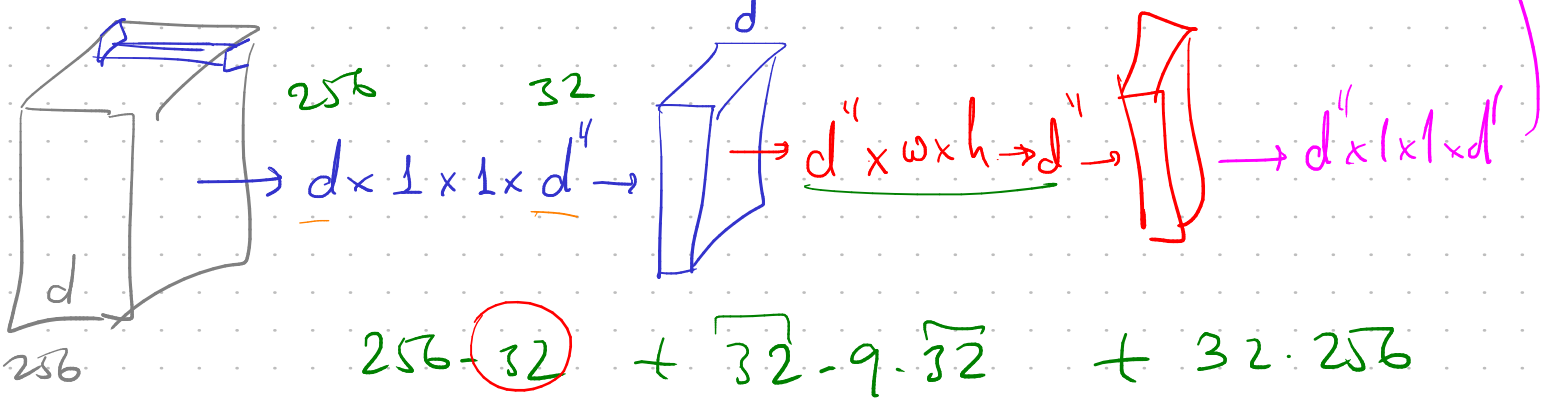
$$F: x^{(k)} \mapsto x^{(k+1)} - x^{(k)}$$



④ Bottleneck / split-transform-merge

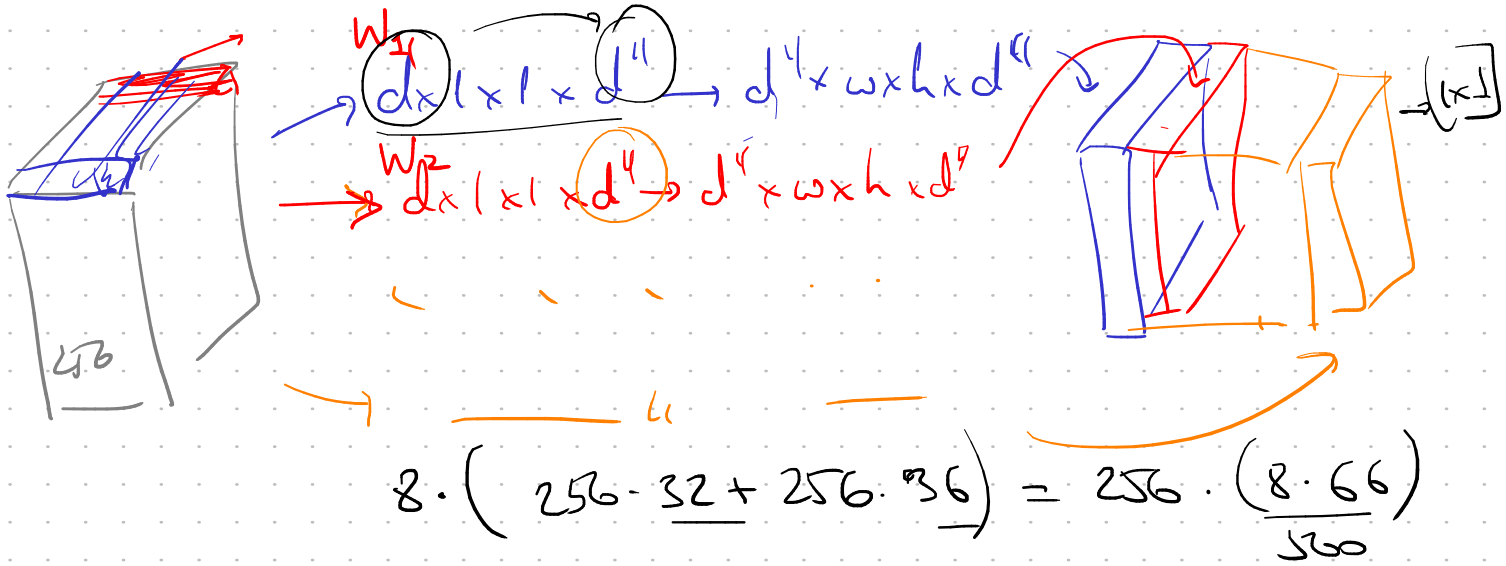


$$9 \cdot 256^2 = 256 \cdot (256 - 9)$$



$$256 \cdot 32 + 32 \cdot 9 \cdot 32 + 32 \cdot 256$$

$$= 256(32 + 9 \cdot 4 + 32) = 256 \cdot 100$$



$$8 \cdot (256 \cdot 32 + 256 \cdot 36) = 256 \cdot \frac{(8 \cdot 66)}{360}$$

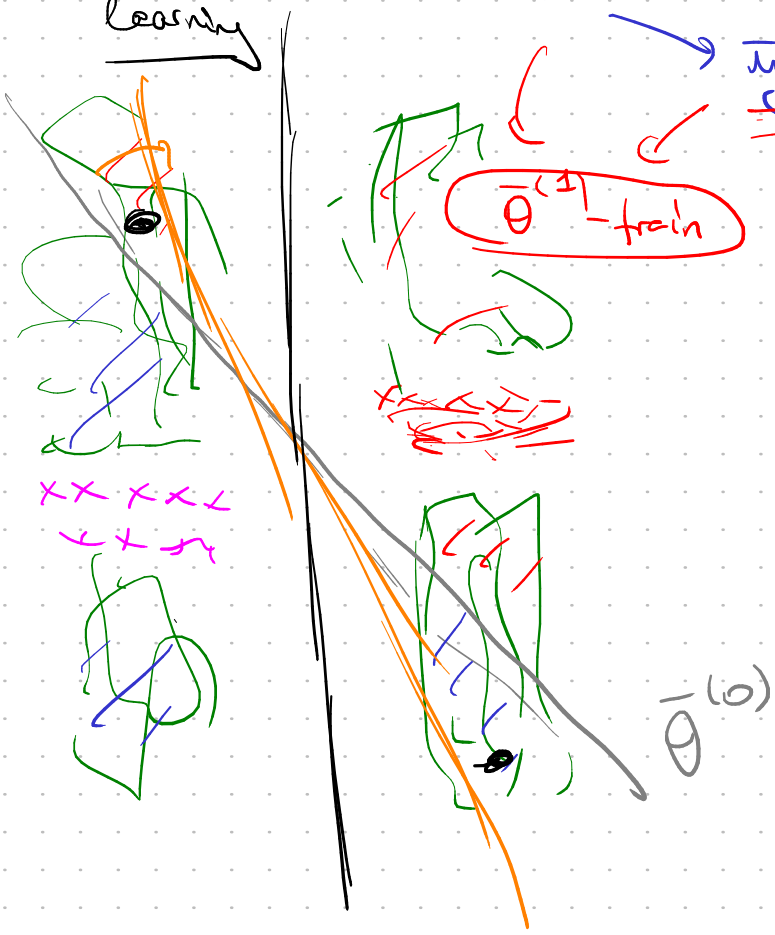
ImageNet 1K, 15M — labeled

∞ — unlabeled $\bar{x}$

Self-supervised learning

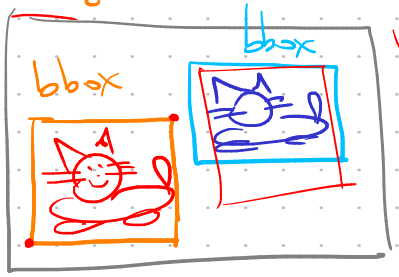
$\bar{\theta}^{(0)}$ – train on labeled

$\bar{y}^{(0)} = f(\bar{x})$

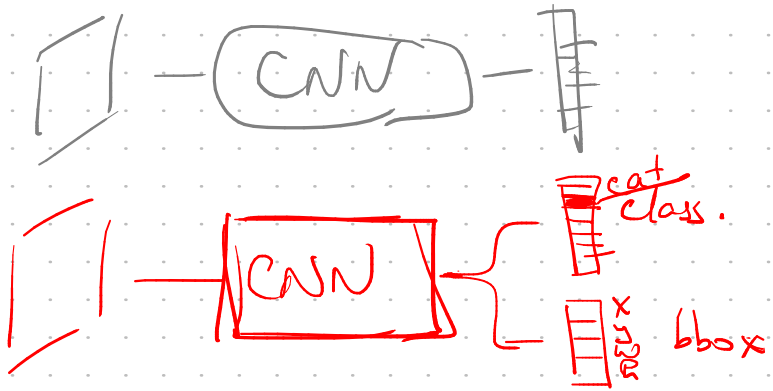


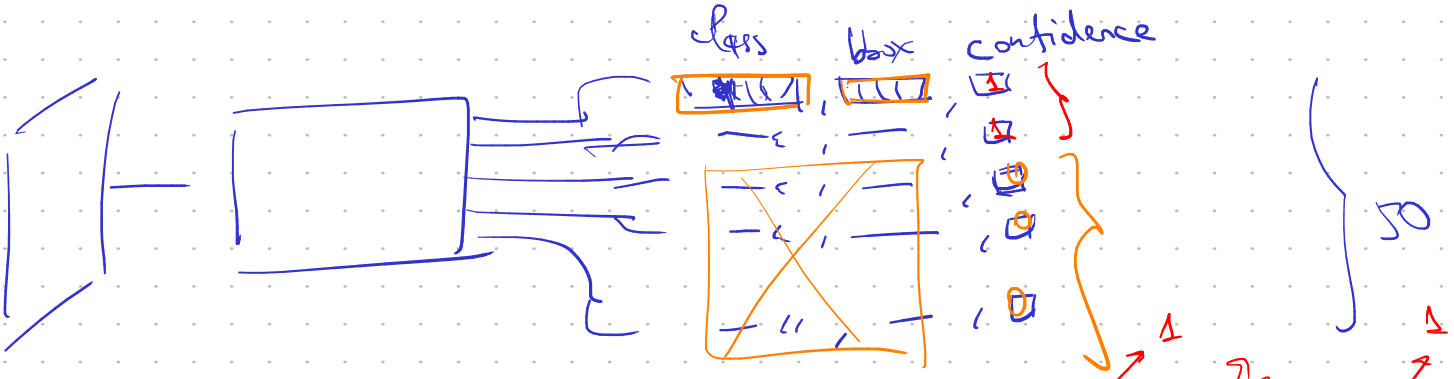
Object detection

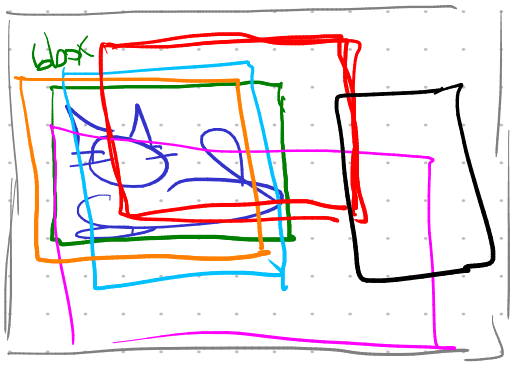
bounding box

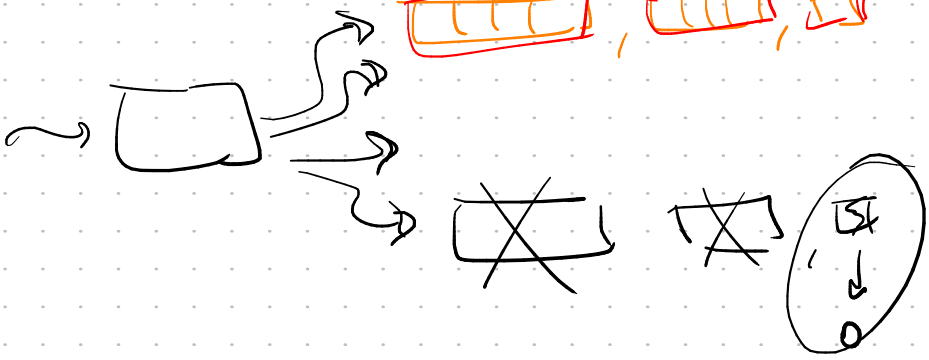


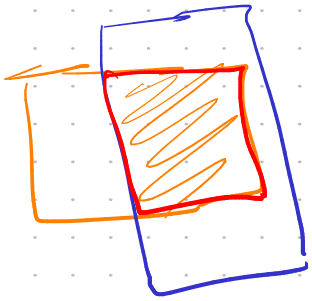
non-maximum suppression







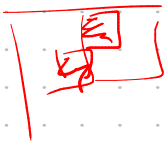


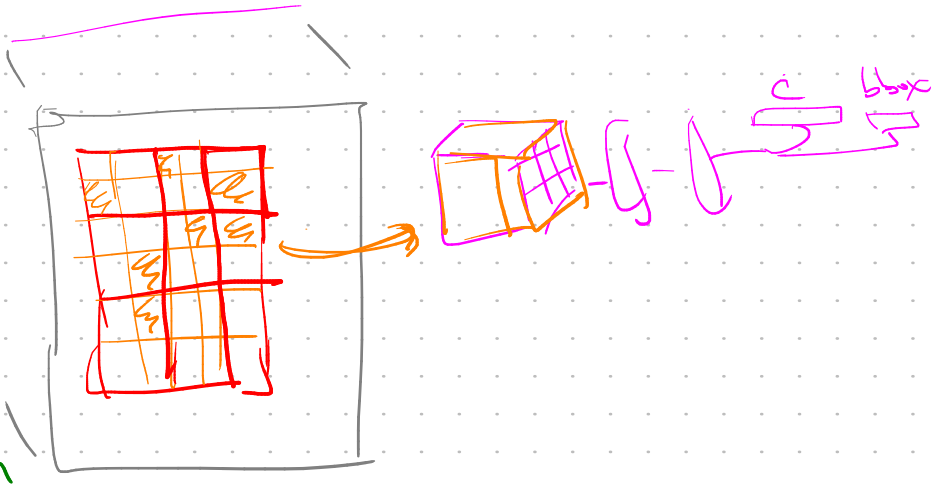


$$Jaccard(A,B) = \frac{|A \cap B|}{|A \cup B|} = IoU$$

0.7

RoI pooling





RoI Align