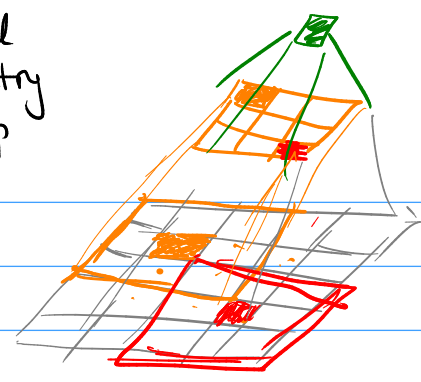
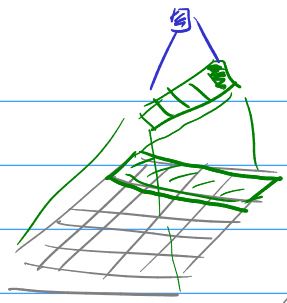


ILSVRC) ① VGG

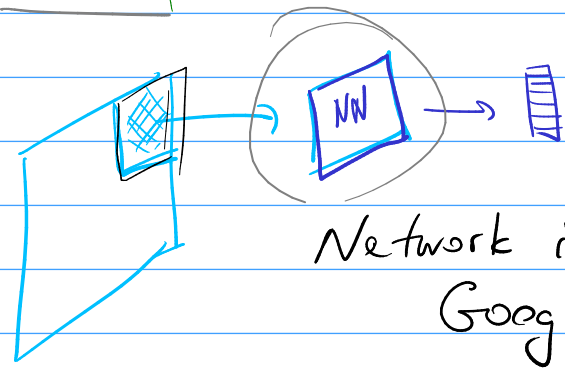
Visual Geometry Group

$n \times n$
 $n \times 1$
 $1 \times n$
 (22)



121 11×11
 18 $5 \times 3 \times 3$
 25 (45)

②

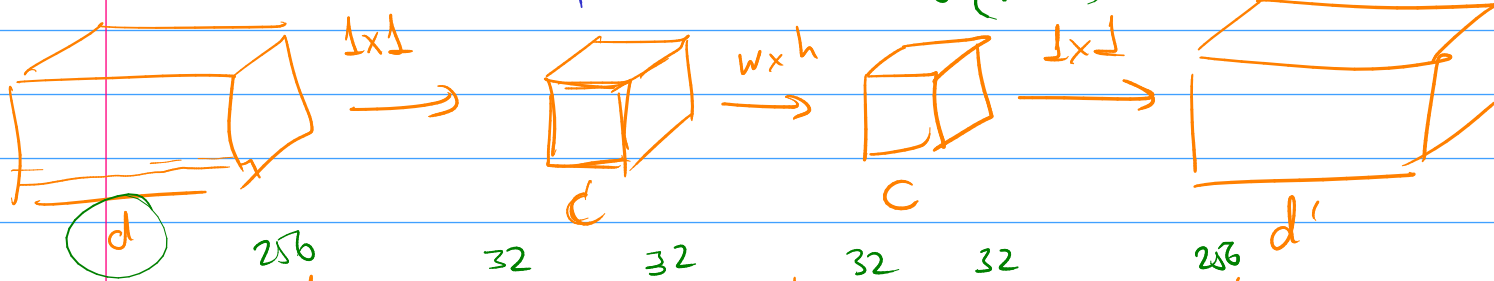
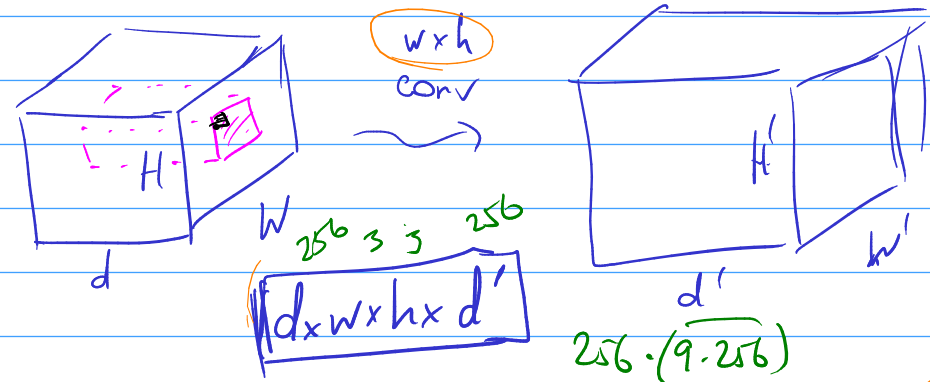


Network in Network

GoogLeNet - Inception units

③ Bottleneck

1×1 conv
 $d \times 1 \times 1 \times d'$

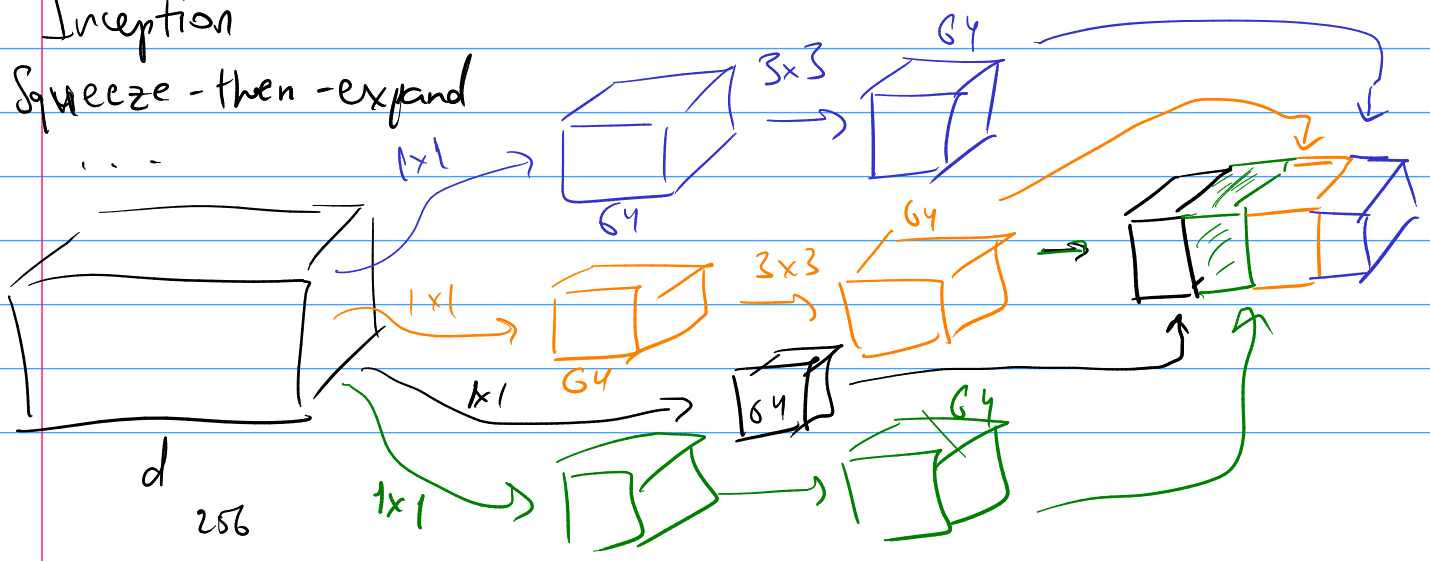


$$d \times 1 \times 1 \times C + C \times w \times h \times C + C \times 1 \times 1 \times d'$$

$$256 (32 + 9 \cdot 8 + 32)$$

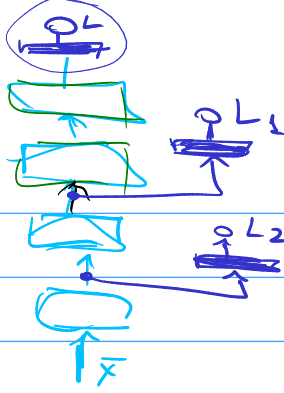
④ Inception

Squeeze - then - expand



5) Aux. classifiers

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

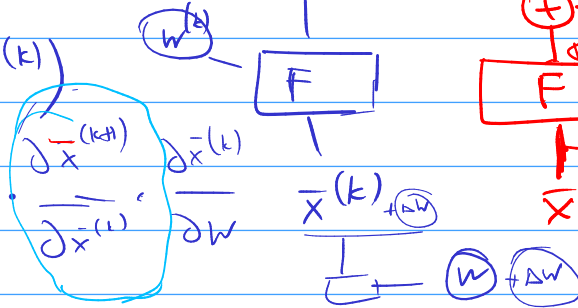


$$L = L + \underbrace{\lambda_1}_{0} L_1 + \underbrace{\lambda_2}_{0} L_2$$

6) Residual connection

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

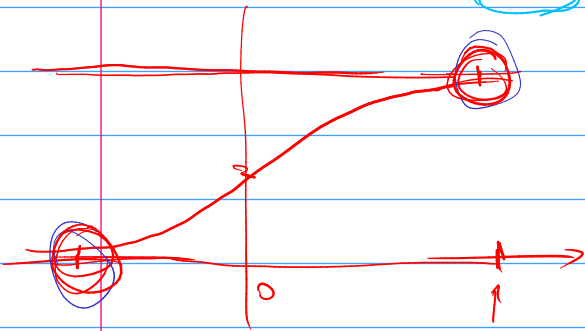
$$\frac{\partial L}{\partial w} = \frac{\partial L}{\partial \bar{x}^{(k+1)}}$$



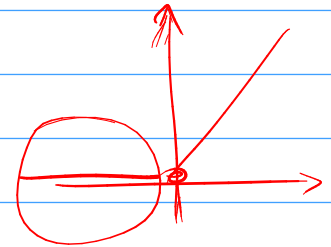
skip connection

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

$$\bar{x}^{(k)} \rightarrow \bar{x}^{(k+1)} - \bar{x}^{(k)}$$

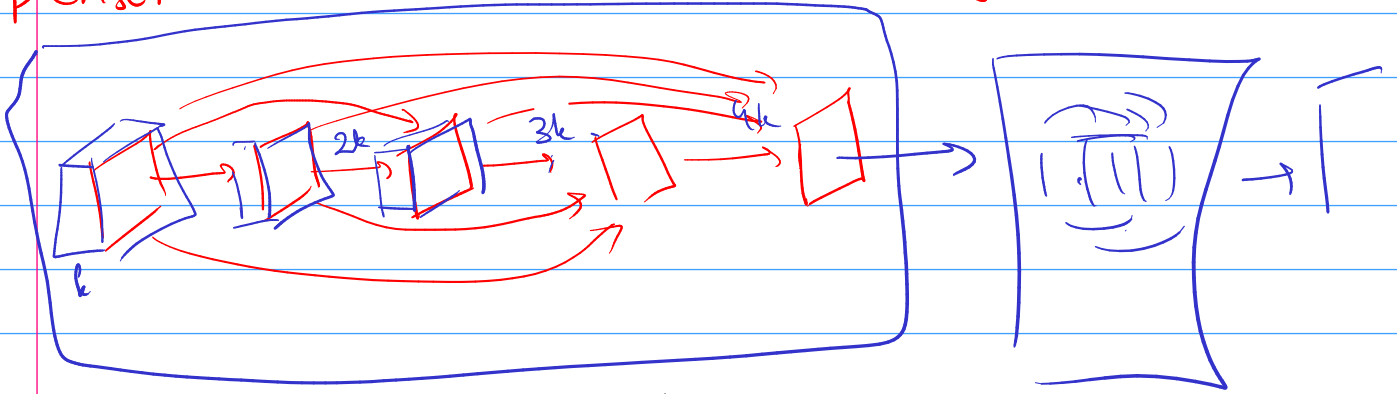


$$\frac{\partial F}{\partial \bar{x}^{(k)}} = \frac{\partial \sigma}{\partial \sigma} \frac{\partial \sigma}{\partial \sigma^{(m)}}$$

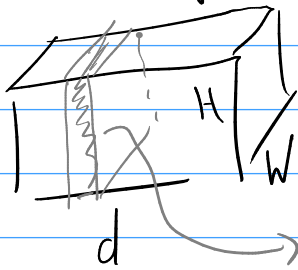


DenseNet

$$\sigma(\bar{w}^T \bar{x}) + \bar{x}$$



7) Depthwise separable convolutions



$$d \times w \times h \times d'$$

$$d \times w \times h + d \times d'$$

$$1 \times w \times h \times 1$$

$$d \times 1 \times 1 \times d'$$