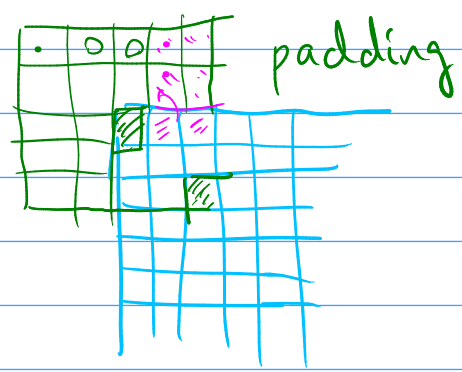
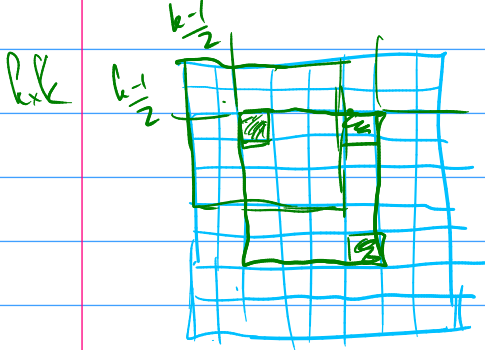
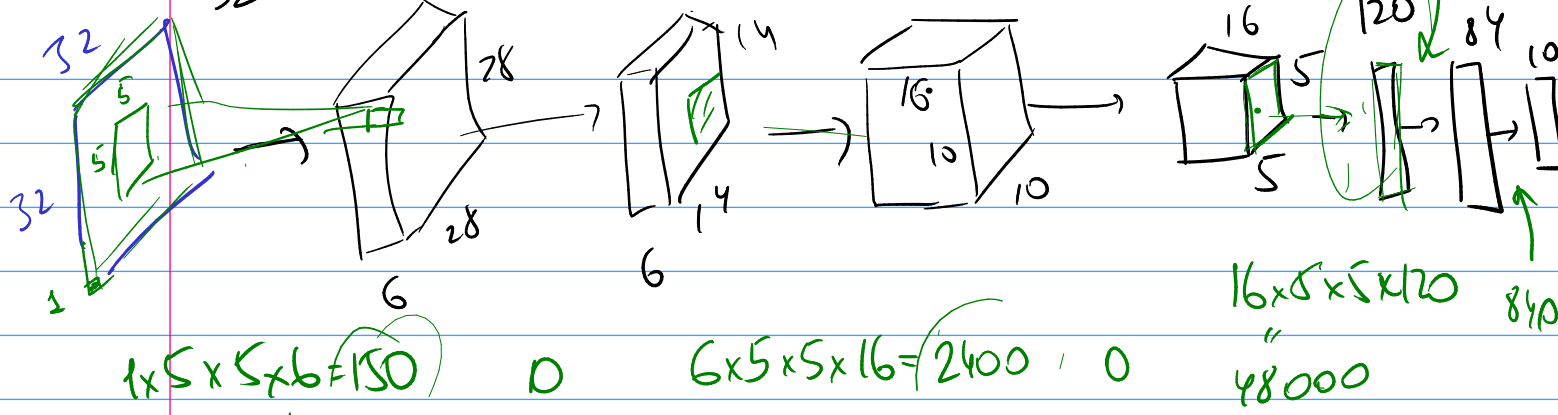


LeNet

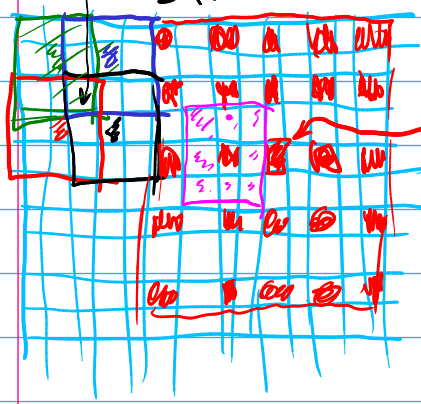
$$32^2 \times 6 \times 28^2$$

$$14^2 \times 6 \times 10^2 \times 16$$

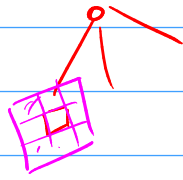
$$120 \times 84 \approx 10k$$



strided conv.



dilated / atrous conv.

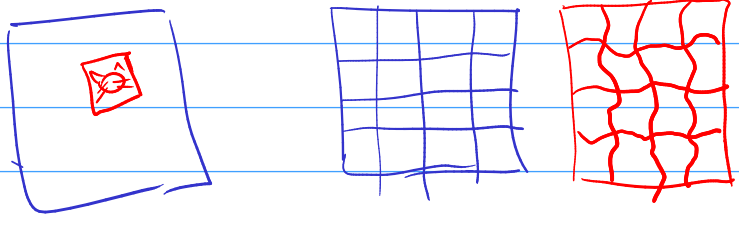


MCONN
Dan Ciresan

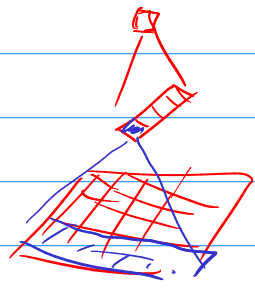
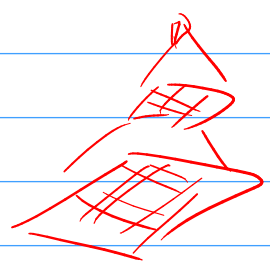
ILSVRC

$$\left. \begin{aligned}
 &3 \times 11 \times 11 \times 48 \\
 &48 \times 5 \times 5 \times 128 \\
 &128 \times 3 \times 3 \times 96 \\
 &192 \times 3 \times 3 \times 192 \\
 &192 \times 5 \times 3 \times 128 \\
 &7 \times 7 \times 128 \times 2048
 \end{aligned} \right\} \times 2$$

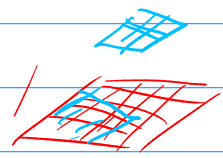
Augmentations



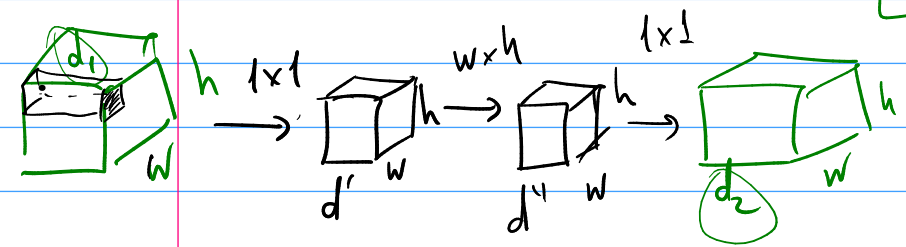
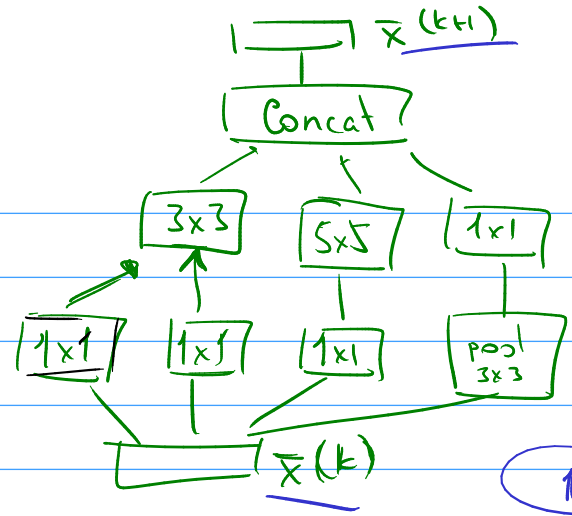
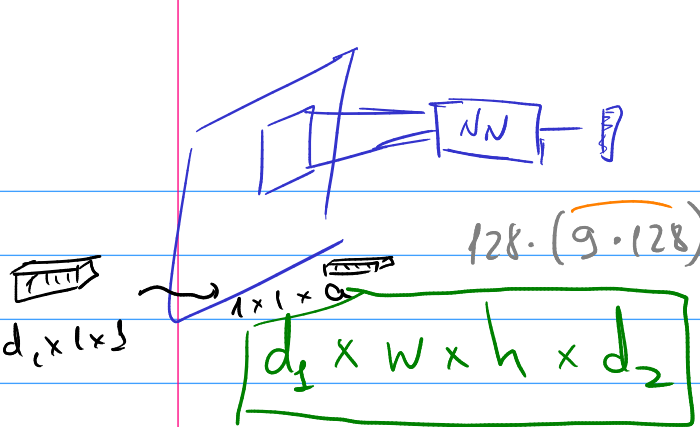
$$C_1 \times C_2 \times 5 \times 5 = 25$$



$$\begin{aligned}
 &25 \\
 &10
 \end{aligned}$$



$$\begin{aligned}
 &3 \times 3 + 3 \times 3 = \\
 &= 18 \\
 &\times \\
 &C_1 \times C_2
 \end{aligned}$$

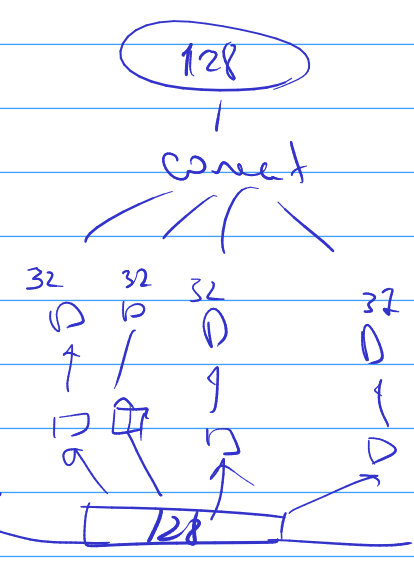


$$d_1 \times 1 \times 1 \times d_1' + d_1' \times w \times h \times d_1'' + d_1'' \times 1 \times 1 \times d_2$$

$(128) \quad (32) \quad 32 \quad 3 \quad 3 \quad 32 \quad (32) \quad (128)$

$$128 \cdot 32 + 32^2 \cdot 9 + 32 \cdot 128$$

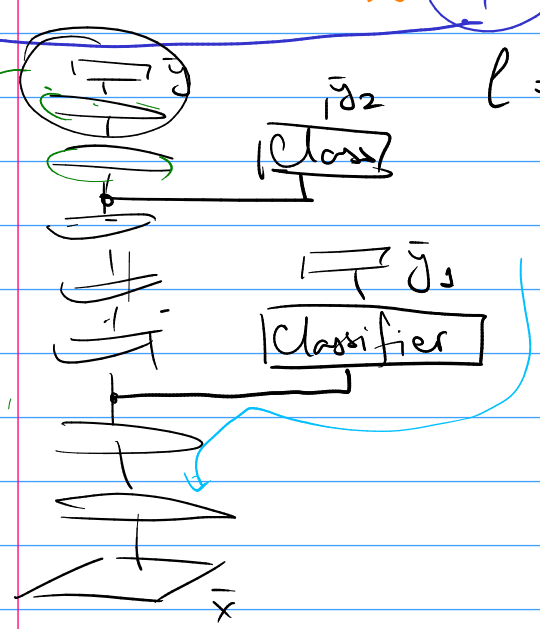
$$128(32 + 8 \cdot 9 + 32)$$



136 $\cdot 4$

$$l = l(\bar{y}_1, \bar{T}) + \lambda_1 l(\bar{y}_1, \bar{T}) + \lambda_2 l(\bar{y}_2, \bar{T})$$

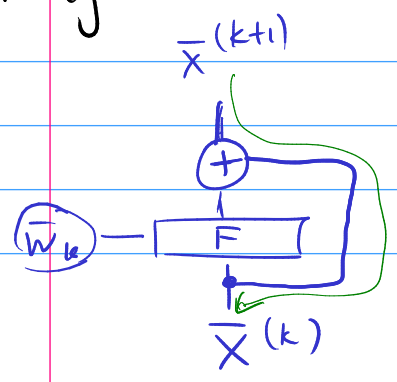
Auxiliary classifiers



aiming to

Residual connection

Constant error carousel
LSGM



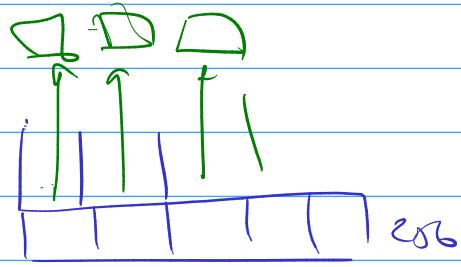
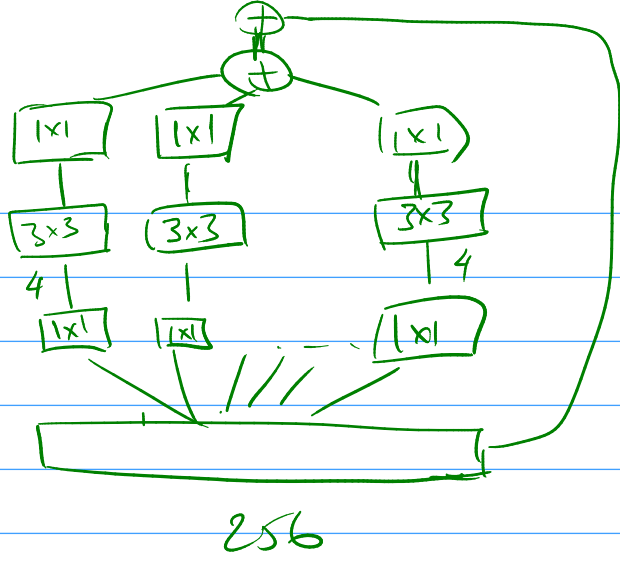
$$\bar{x}^{(k+1)} = F(\bar{x}^{(k)})$$

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

$$\frac{\partial x_i^{(k+1)}}{\partial x_j^{(k)}} = 1 + \frac{\partial F}{\partial x_j^{(k)}}$$

∇F

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



$\frac{1}{2} \frac{1}{2} \frac{1}{2}$