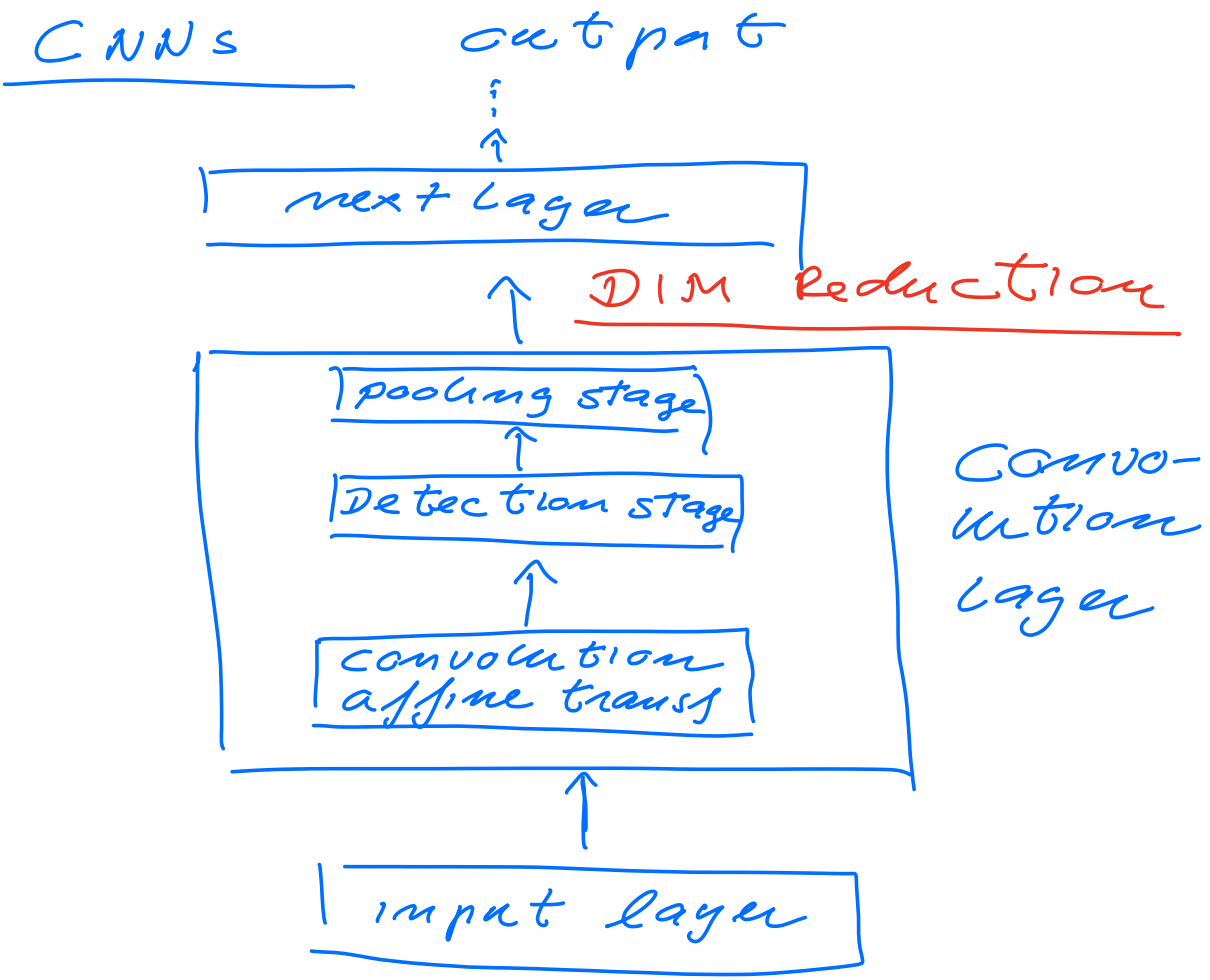
Lecture Jan 12, 2022

CNNs



Convolution stage

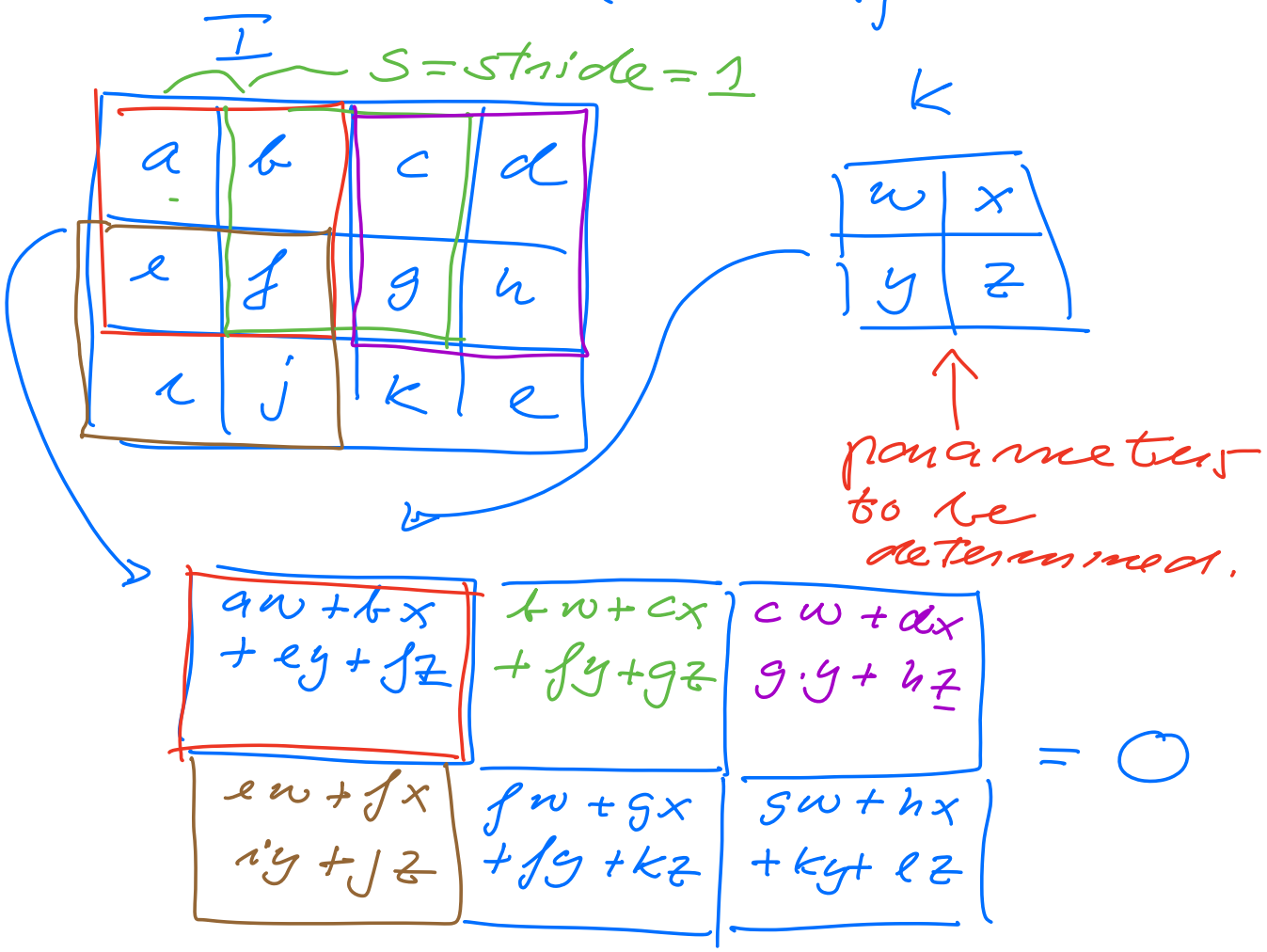
$$\begin{bmatrix} w_{11} & w_{12} & \cdots \\ \vdots & & \\ w_{m1} & \cdots & \end{bmatrix}$$

Learned

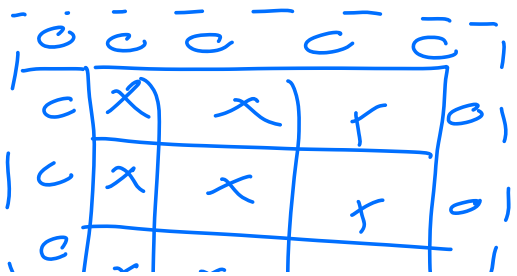
parameters

$$S(i,j) = \sum_{m,n} I(m,n)\,K(i+m, j+n)$$

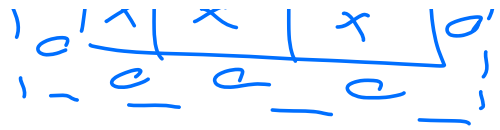
$$= (I * K)_{i,j}$$



padding



$p = 1$

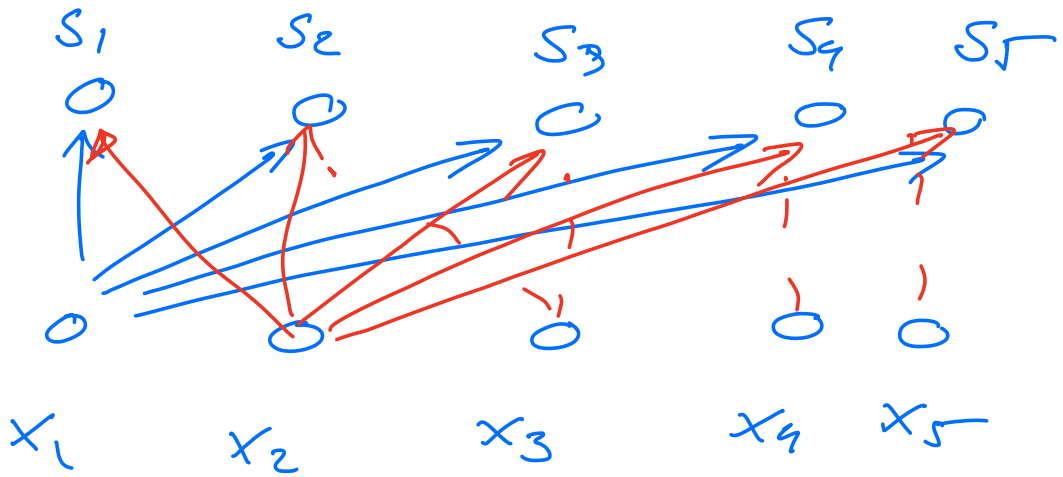


- Detection stage

  ReLU(o) →

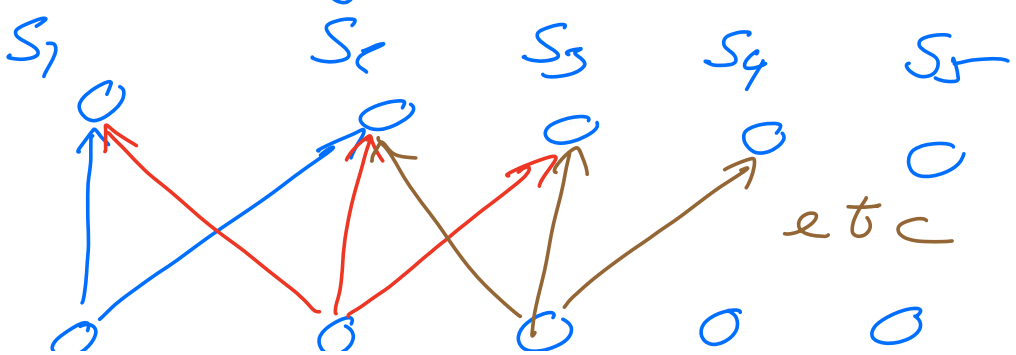
- pooling stage

  input to this stage x

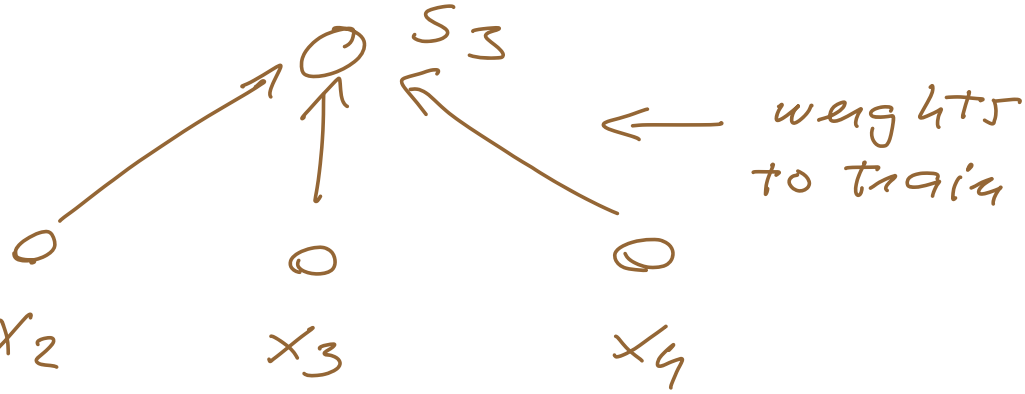


Standard NN

in CNNs we limit the number of connections.

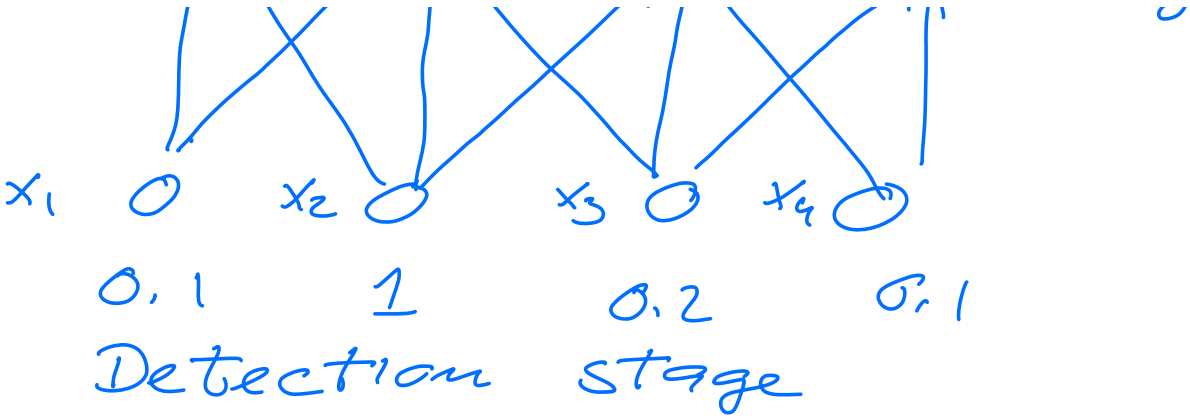


x_1 x_2 x_3 x_4 x_5

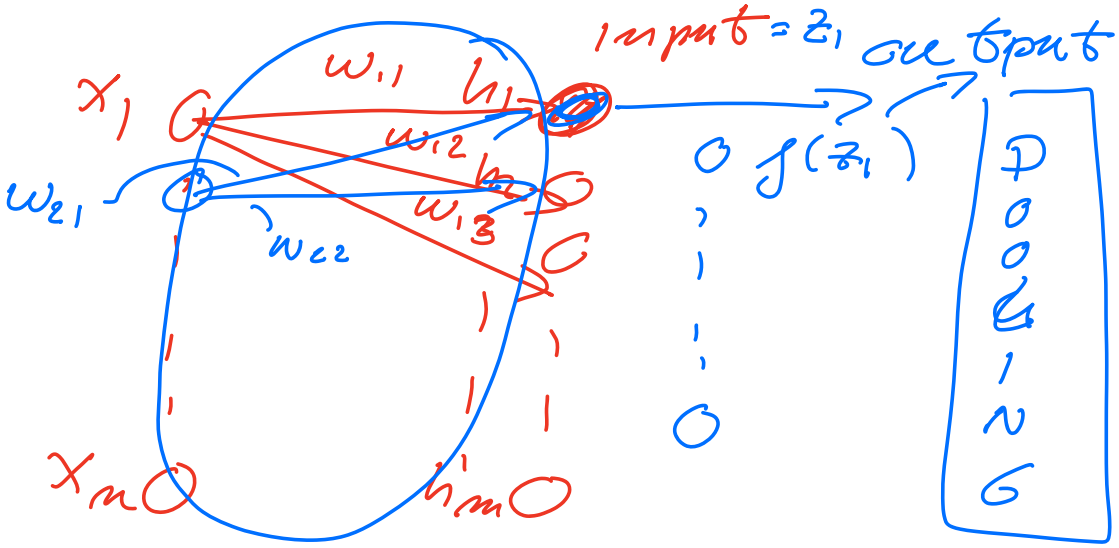


A pooling stage replaces the output from the detection stage with a summary statistics of the nearby outputs

Max pooling reports the max output within a given neighborhood of outputs.


x_1
x_2
x_3
x_4
0.1
1
0.2
0.1
Detection stage

CNN


x_1
w_{21}
w_{11}
w_{12}
w_{13}
w_{22}
h_1
h_2
h_m
x_n
input = z_1
output
$f(z_1)$
POOLING