FYS5429/9429 February 12

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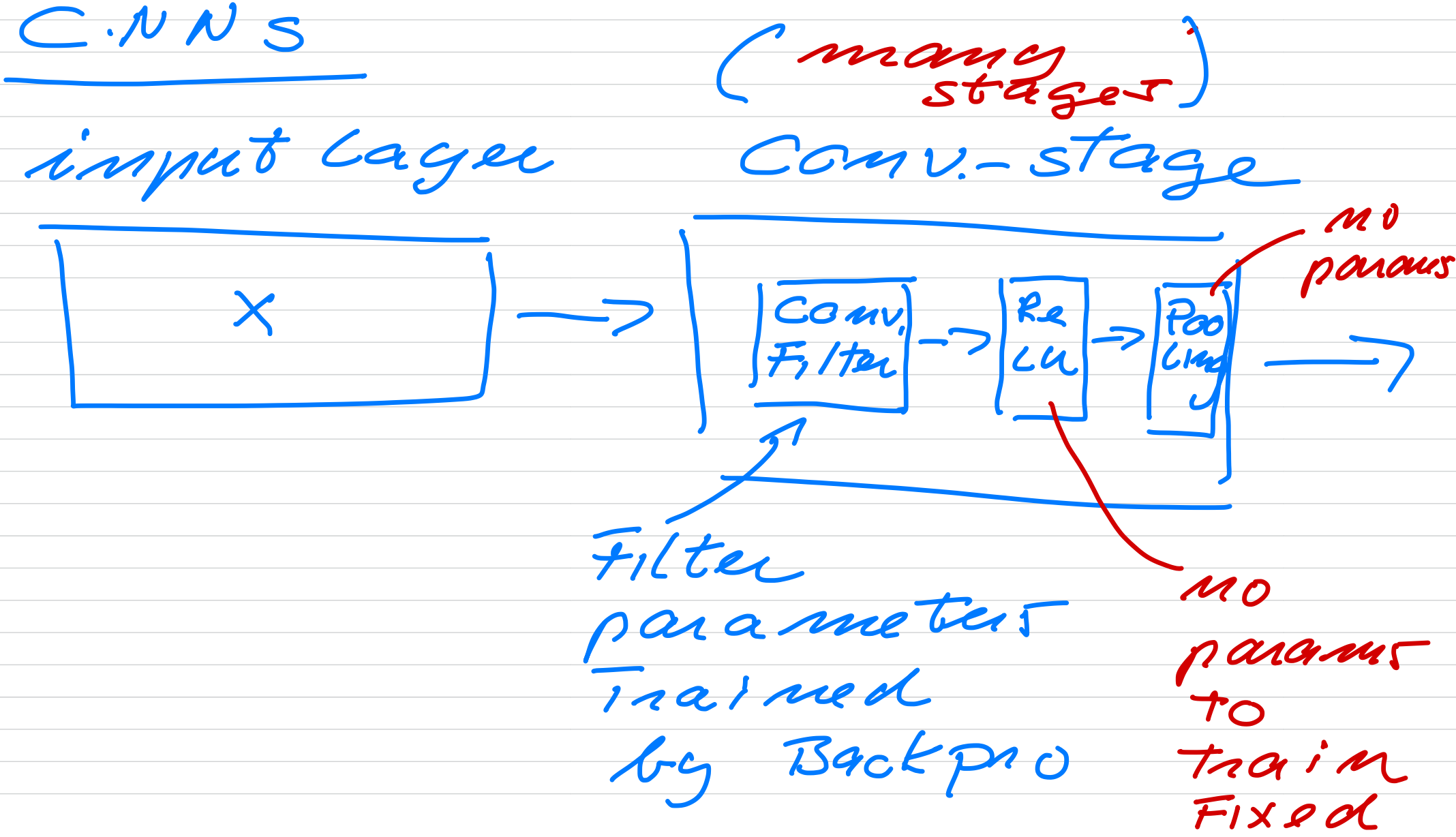

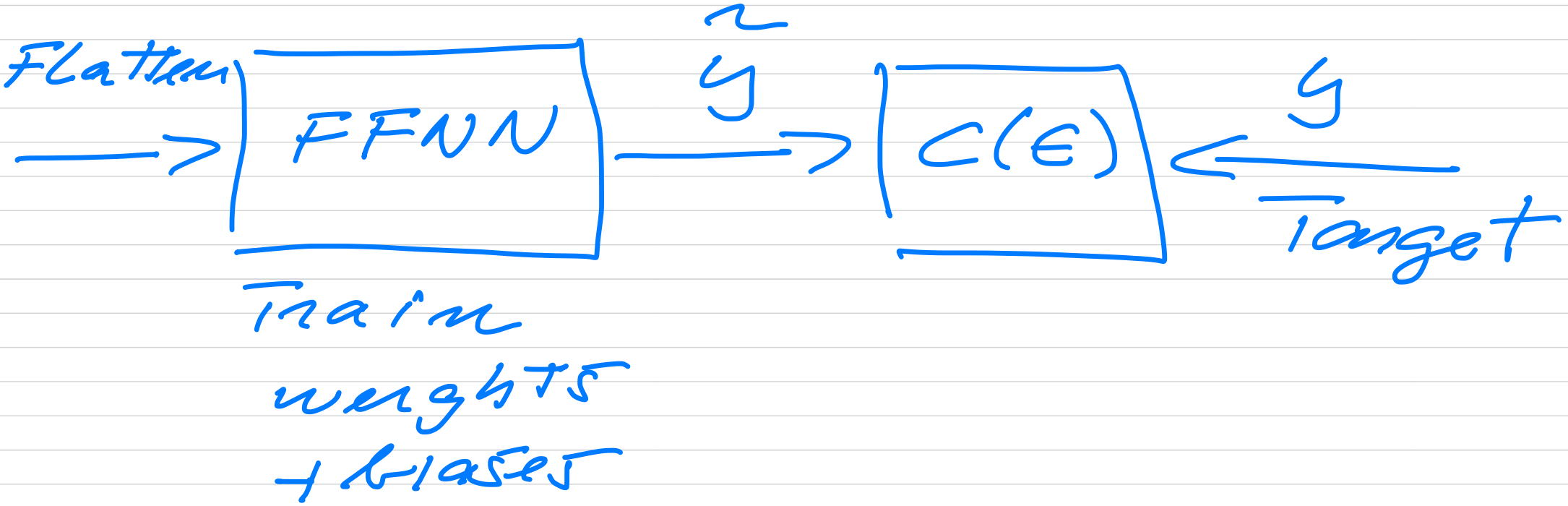
Flatten
FFNN
$\hat{y}$
C(ϵ)
y
Target
Train
weights
+ biases

Input (3x3)

Stride = S = 1

Filter W (2x2)

x_{00}	x_{01}	x_{02}
x_{10}	x_{11}	x_{12}
x_{20}	x_{21}	x_{22}

X

×

w_{00}	w_{01}
w_{10}	w_{11}

W

$x_{00} w_{00} + x_{01} w_{01} + x_{10} w_{10} + x_{11} w_{11}$	$x_{01} w_{00} + x_{02} w_{01} + x_{11} w_{10} + x_{12} w_{11}$
$x_{10} w_{00} + x_{11} w_{01} + x_{20} w_{10} + x_{21} w_{11}$	$x_{11} w_{00} + x_{12} w_{01} + x_{21} w_{10} + x_{22} w_{11}$

Add a new parameter Padding

$P = 0$

Parameters in Filter to train $4 (w_{00}, w_{01}, w_{10}, w_{11})$

$+ \text{bias} = 5$

$N_1 =$ dim of X $(N \times N)$

$F_1 =$ dim of W $(F \times F)$

Dimensionality of output

$$N_2 = (N_1 - F_1)/S + 1$$

if we add padding

$$N_2 = (N_1 - F + 2P)/S + 1$$

our case $P = 0$ $S = 1$

$N_1 = 3$ $F_1 = 2$

parameters not to be updated

$N_2 = 2$

Example 2

$N_1 = 32$

(32 x 32 x 3)

10 Filters (5x5)

stride = 1 P = 0

$(32-5)/1 + 1 = N_2 = 28$

28x28x10 replicas

with colors:

Filters: $(5x5)x3 + 1$

$= 76$

in total $76x10 = 760$

parameters

Example 3

3x3 Filter

32x32 x3 original image

Stride = 1 P = 0

$(32-3)/1 + 1 = 30$

30x30 x3

each Filter has $(3 \times 3) \times 3 + 1$

= 28 weights

+1 bias

Hyperparameters

- K = number of filters
- F = their spatial
- S = stride
- P = amount of padding.

$F = 3 \quad S = 1 \quad P = 1$

$F = 5 \quad S = 1 \quad P = 0, 1, 2$

$F = 5 \quad S = 2 \quad P = 0, 1, 2 - .$