Case Studies

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deeplearning.ai

Network in Network and 1×1 convolutions

# Why does a 1 × 1 convolution do?

1	2	3	6	5	8
3	5	5	1	3	4
2	1	3	4	9	3
4	7	8	5	7	9
1	5	3	7	4	8
5	4	9	8	3	5

$6 \times 6 \times 1$

$*$ $\boxed{2}$ $=$

2	4	6	...		

So one way to think about the 1X1 convolution is that it is basically having a fully connected neural network that applies to each of the 32 different positions.

32 → # filters. $n_c^{[l+1]}$

ReLU

$*$ $=$

ReLU

Network in Network

$6 \times 6 \times 32$

$1 \times 1 \times 32$

$6 \times 6 \times$ # filters

[Lin et al., 2013. Network in network]

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Using 1×1 convolutions

ReLU

CONV 1 × 1

~~32~~

192

28 × 28 × ~~32~~ 192

$28 \times 28 \times 192$

$1 \times 1 \times 192$

n_H, n_W, n_c
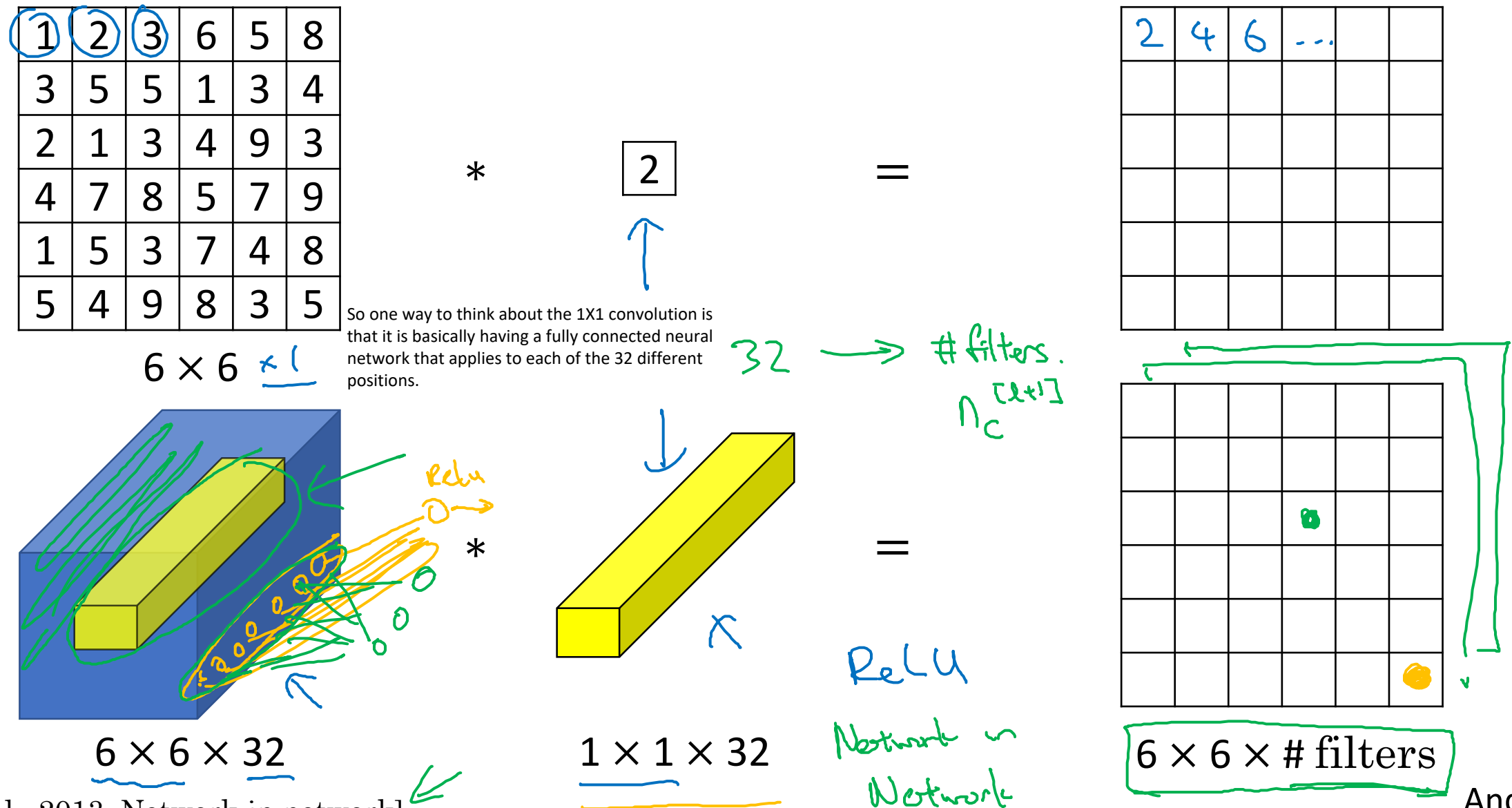
32 filters.
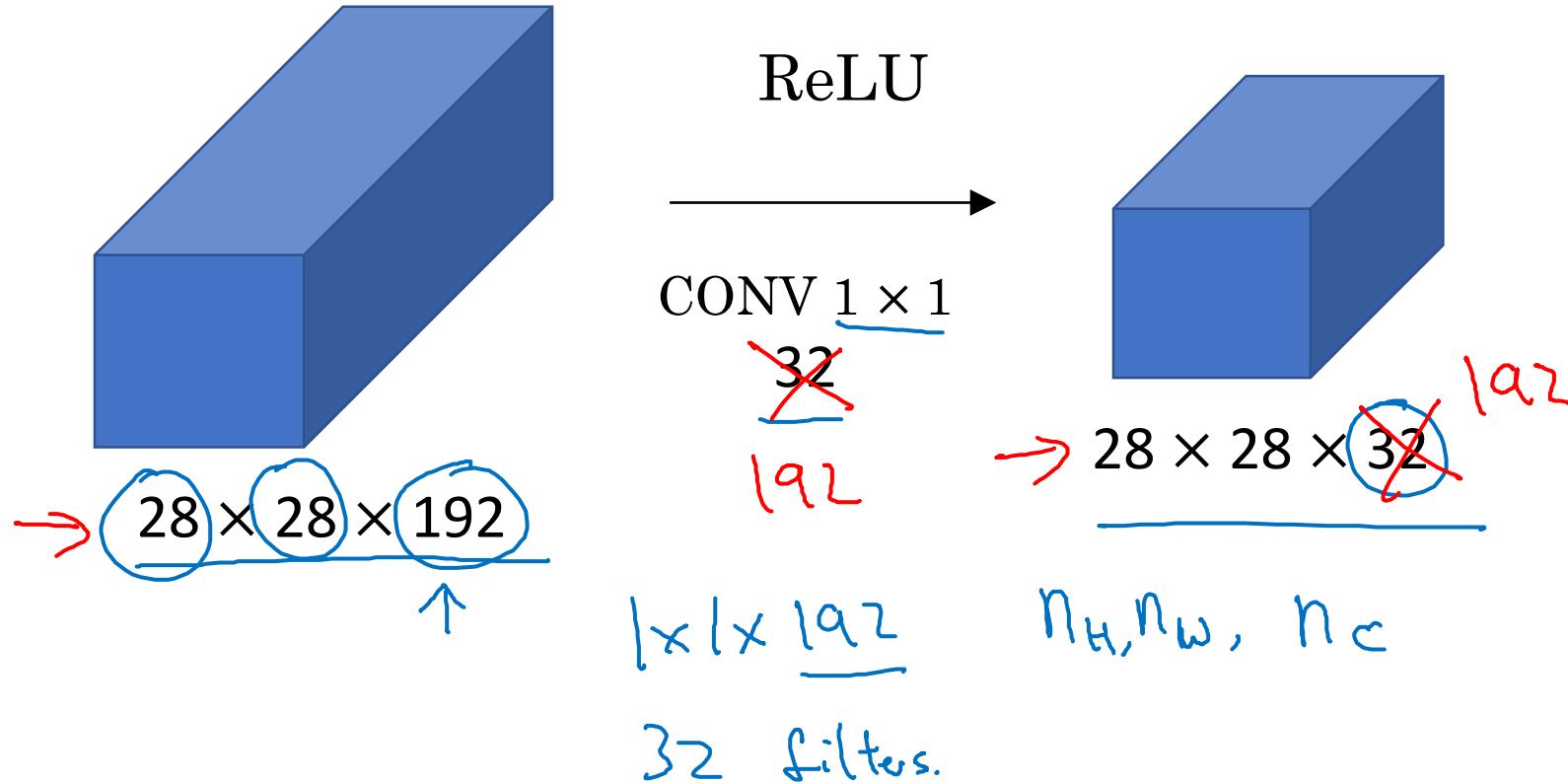
So this is a way to let you shrink nC as well, whereas pooling layer, I used just to shrink nH and nW, the height and width of these volumes.

If you want to keep the number of channels at 192, that's fine, too. And the effect of a 1X1 convolution is it just adds nonlinearity. It allows you to learn the more complex function of your network by adding another layer that inputs 28X28X192, and outputs 28X28X192.

[Lin et al., 2013. Network in network]

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