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Case Studies

Why look at case studies?

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Outline

Classic networks:

- LeNet-5
- AlexNet
- VGG

ResNet

Inception

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Case Studies

Classic networks

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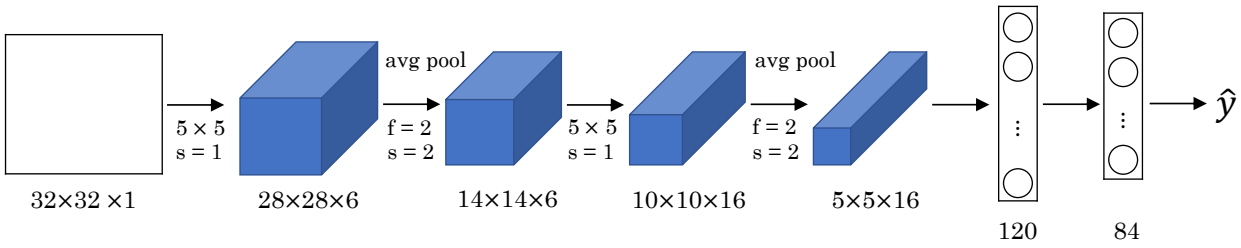
LeNet - 5



[LeCun et al., 1998. Gradient-based learning applied to document recognition]

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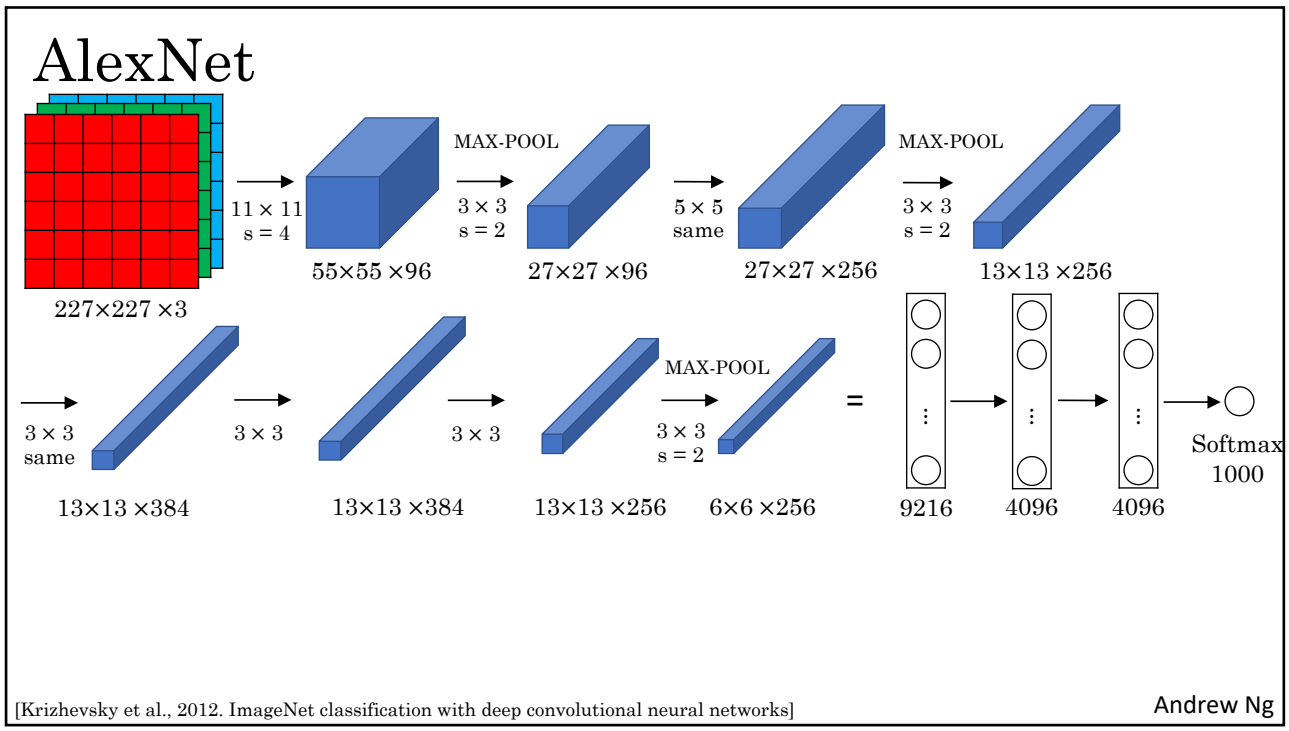
AlexNet
227×227 ×3
11 × 11
s = 4
55×55 ×96
MAX-POOL
3 × 3
s = 2
27×27 ×96
5 × 5
same
27×27 ×256
MAX-POOL
3 × 3
s = 2
13×13 ×256
3 × 3
same
13×13 ×384
3 × 3
13×13 ×384
3 × 3
13×13 ×256
MAX-POOL
3 × 3
s = 2
6×6 ×256
=
9216
4096
4096
Softmax
1000
[Krizhevsky et al., 2012. ImageNet classification with deep convolutional neural networks]
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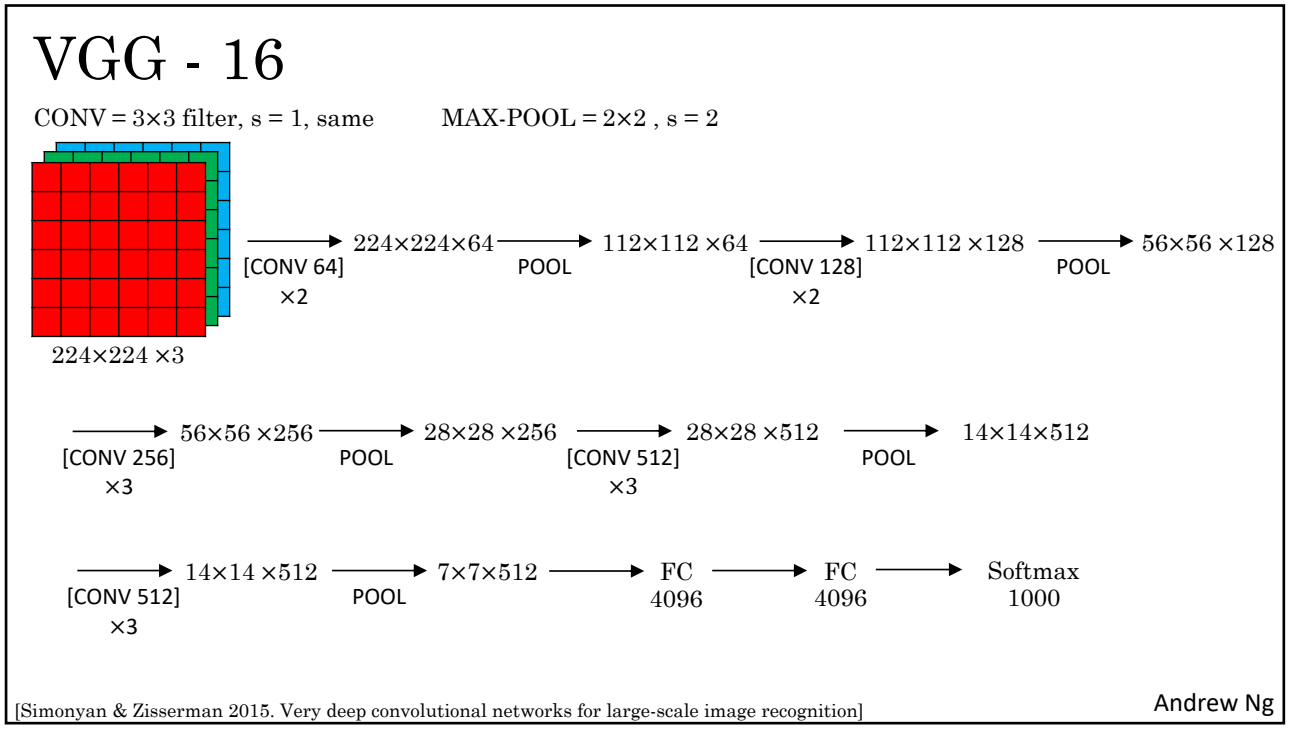
VGG - 16
CONV = 3×3 filter, s = 1, same
MAX-POOL = 2×2 , s = 2
224×224 ×3
[CONV 64]
×2
224×224×64
POOL
112×112 ×64
[CONV 128]
×2
112×112 ×128
POOL
56×56 ×128
[CONV 256]
×3
56×56 ×256
POOL
28×28 ×256
[CONV 512]
×3
28×28 ×512
POOL
14×14×512
[CONV 512]
×3
14×14 ×512
POOL
7×7×512
FC
4096
FC
4096
Softmax
1000
[Simonyan & Zisserman 2015. Very deep convolutional networks for large-scale image recognition]
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Case Studies

Residual Networks (ResNets)

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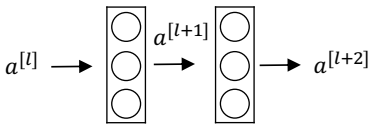
Residual block



$$z^{[l+1]} = W^{[l+1]}\, a^{[l]} + b^{[l+1]} \qquad a^{[l+1]} = g(z^{[l+1]}) \qquad z^{[l+2]} = W^{[l+2]} a^{[l+1]} + b^{[l+2]} \qquad a^{[l+2]} = g(z^{[l+2]})$$

[He et al., 2015. Deep residual networks for image recognition]

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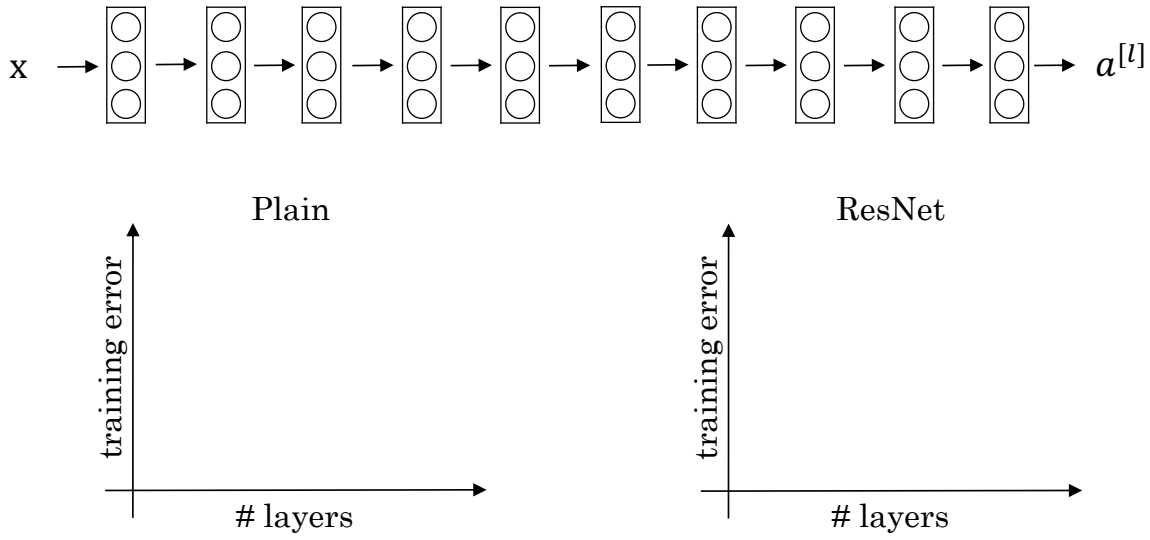
Residual Network



[He et al., 2015. Deep residual networks for image recognition]

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Case Studies

Network in Network and 1×1 convolutions

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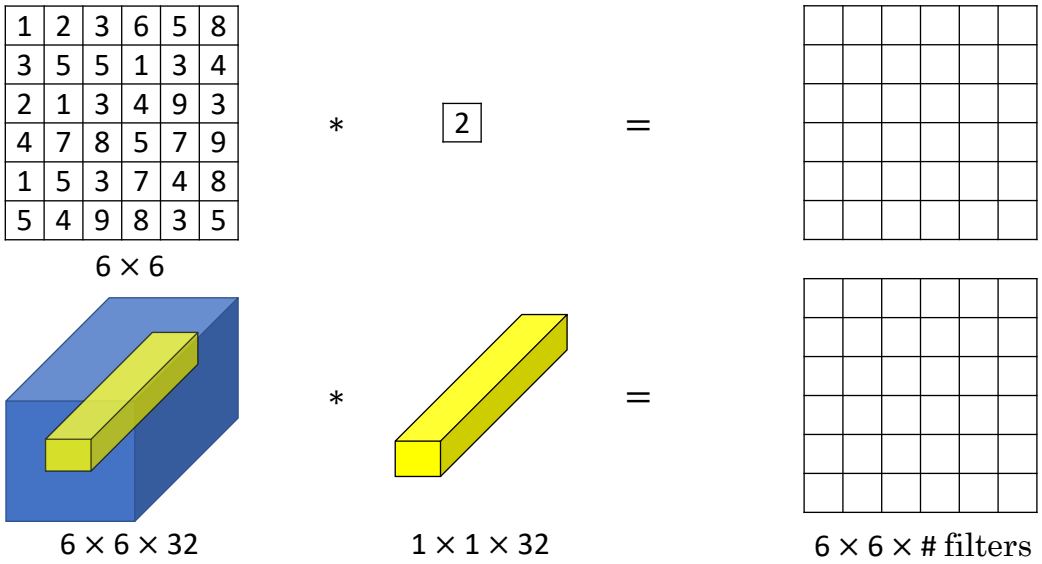
Why does a 1 × 1 convolution do?



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

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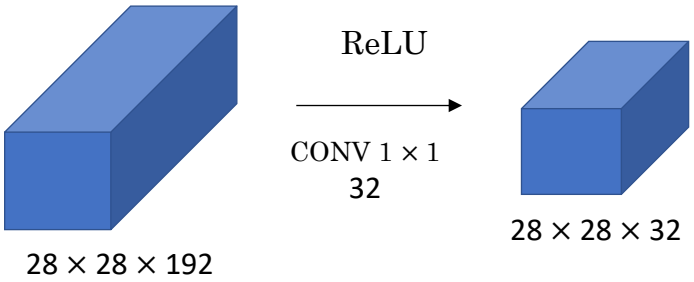
Using 1×1 convolutions



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

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Case Studies

Inception network motivation

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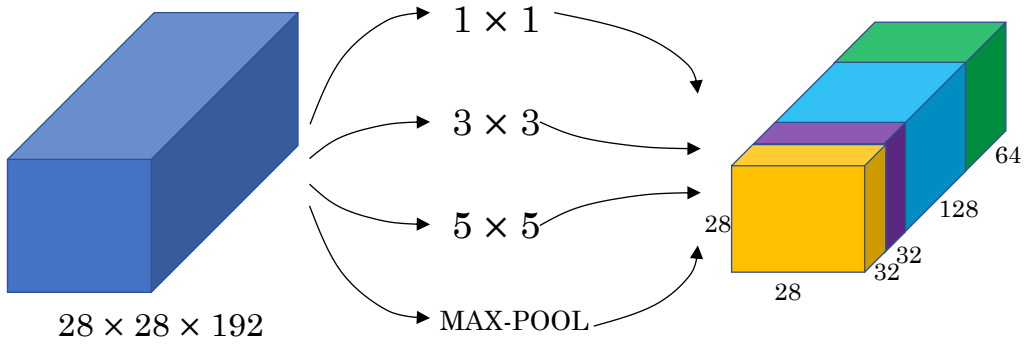
Motivation for inception network



[Szegedy et al. 2014. Going deeper with convolutions]

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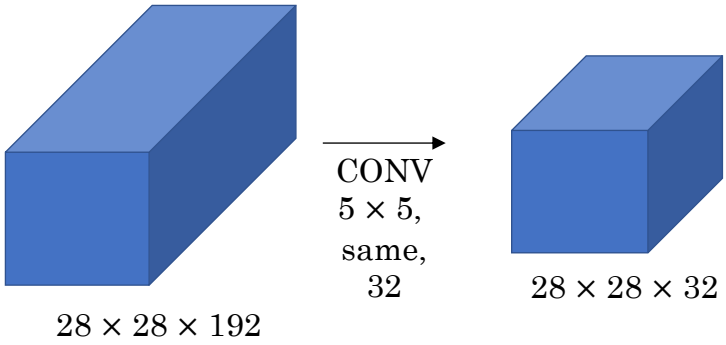
The problem of computational cost



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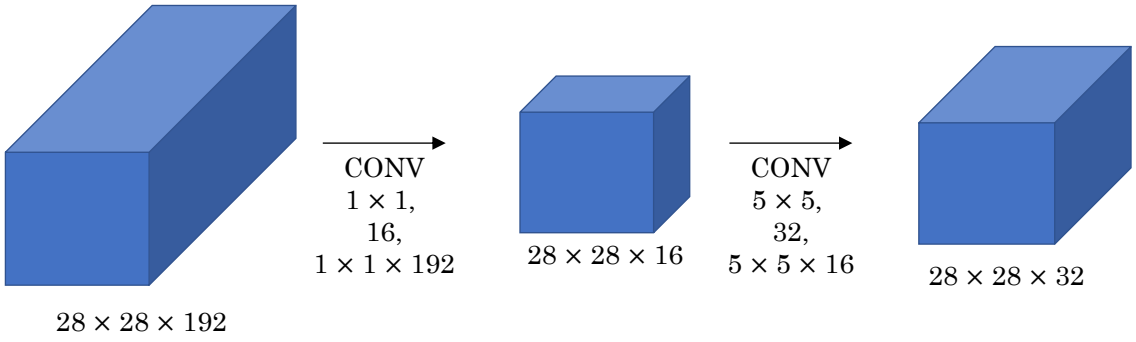
Using 1×1 convolution



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Inception network

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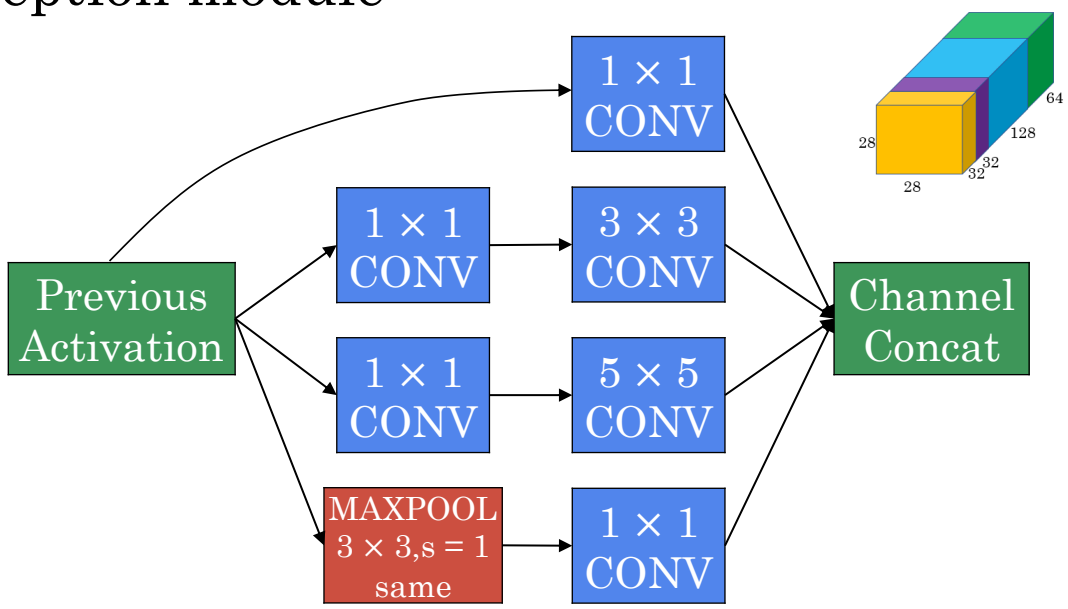
Inception module



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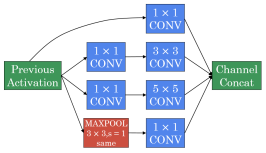
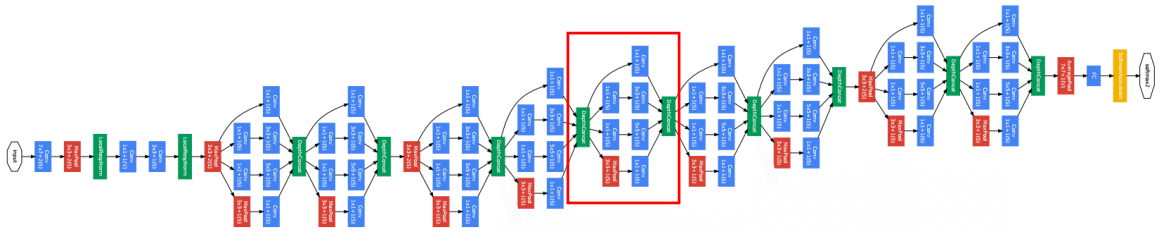
Inception network





[Szegedy et al., 2014, Going Deeper with Convolutions]

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http://knowyourmeme.com/memes/we-need-to-go-deeper

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