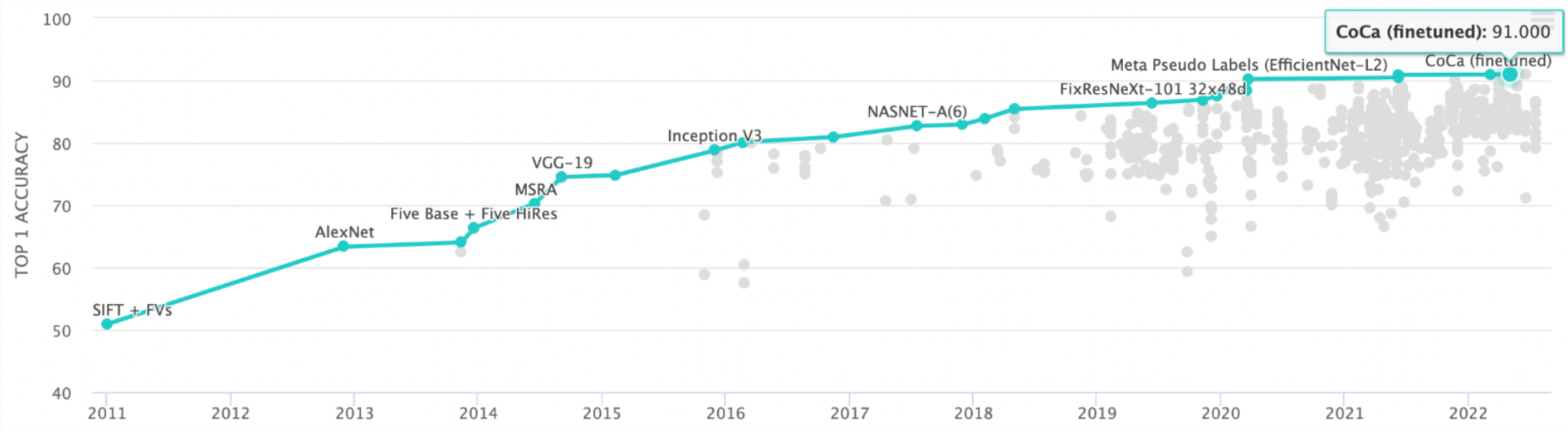
Deep Into Deep

김성찬

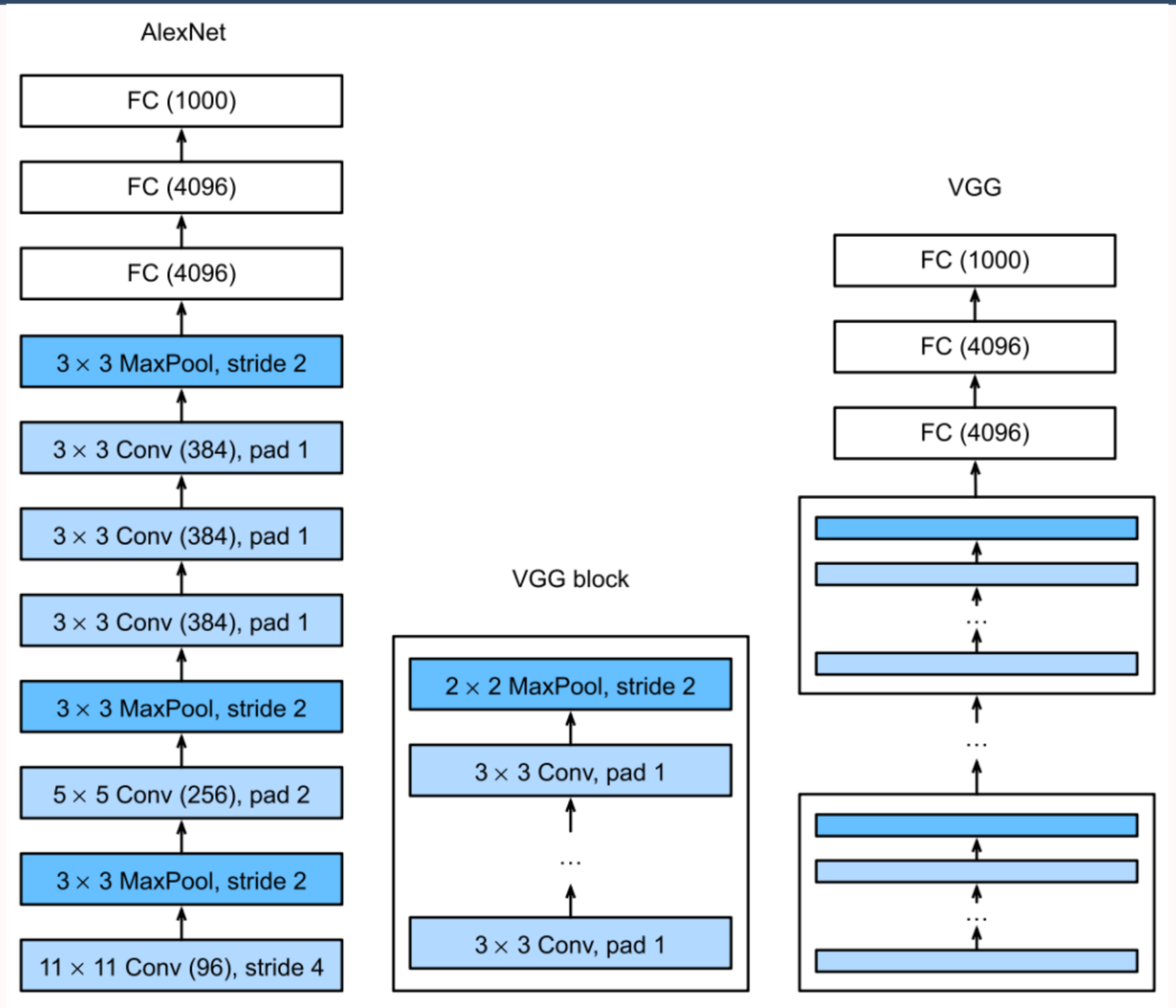
Contents

ImageNet Benchmark



1. VGGNet

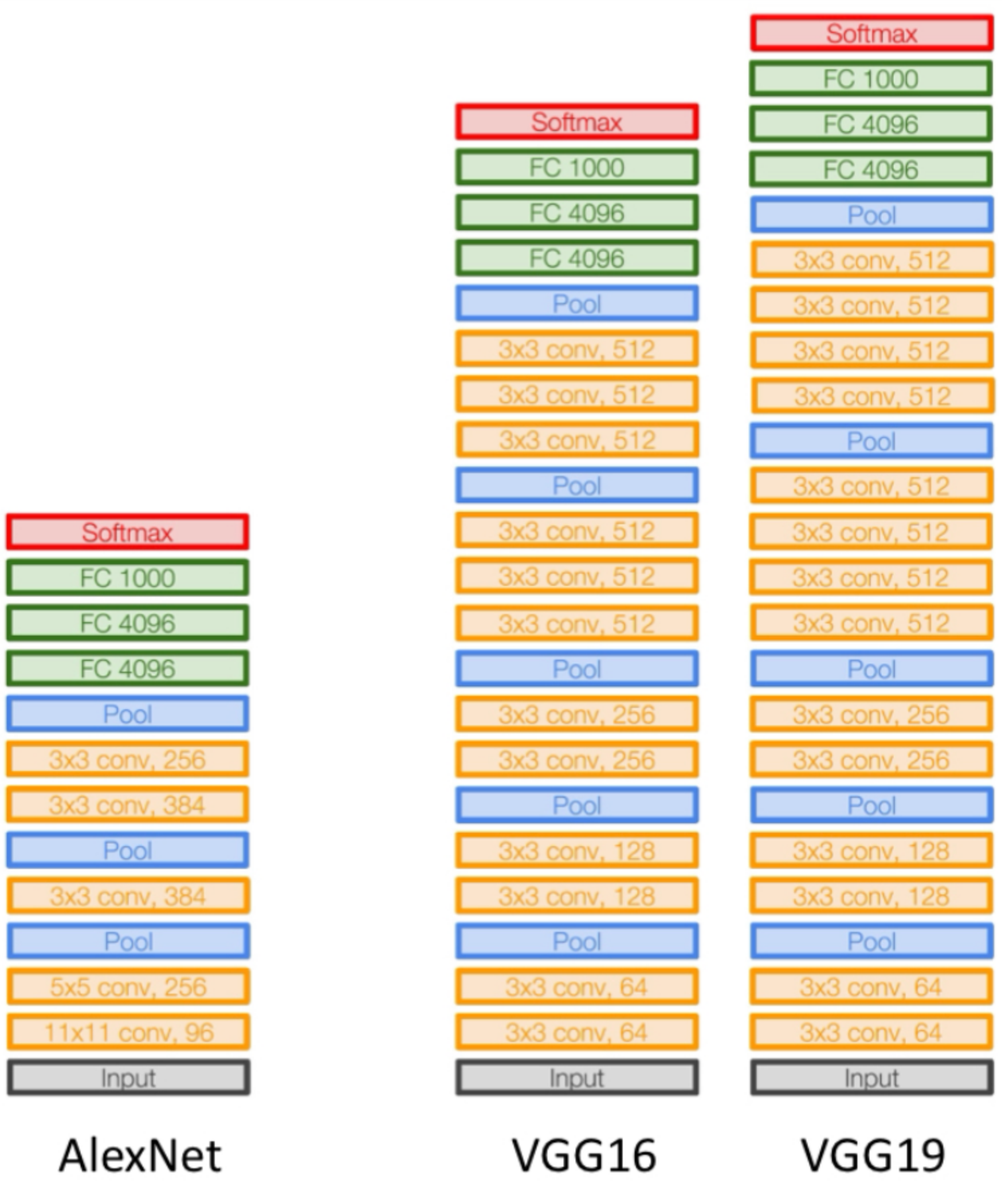
Small Filters, Deeper Networks



1. VGGNet

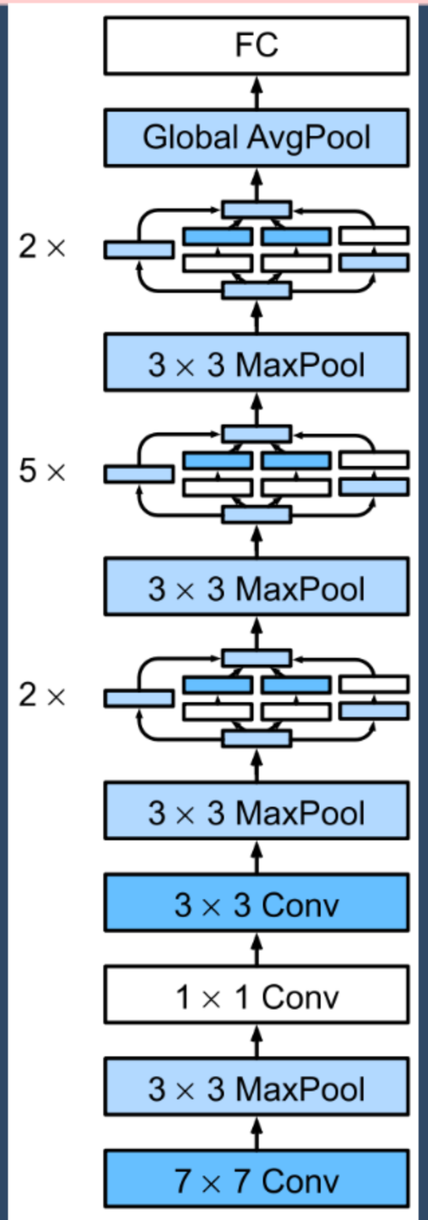
Small Filters

> Effective Receptive Field

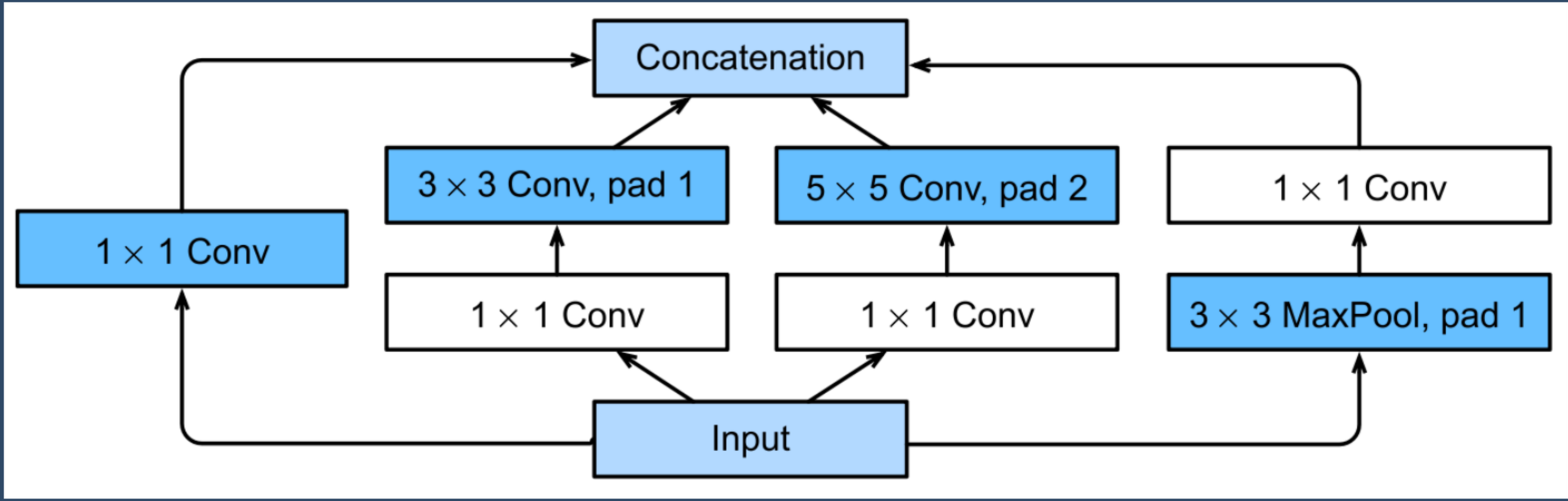


2. GoogLeNet

Deeper Networks,
with Computational Efficiency



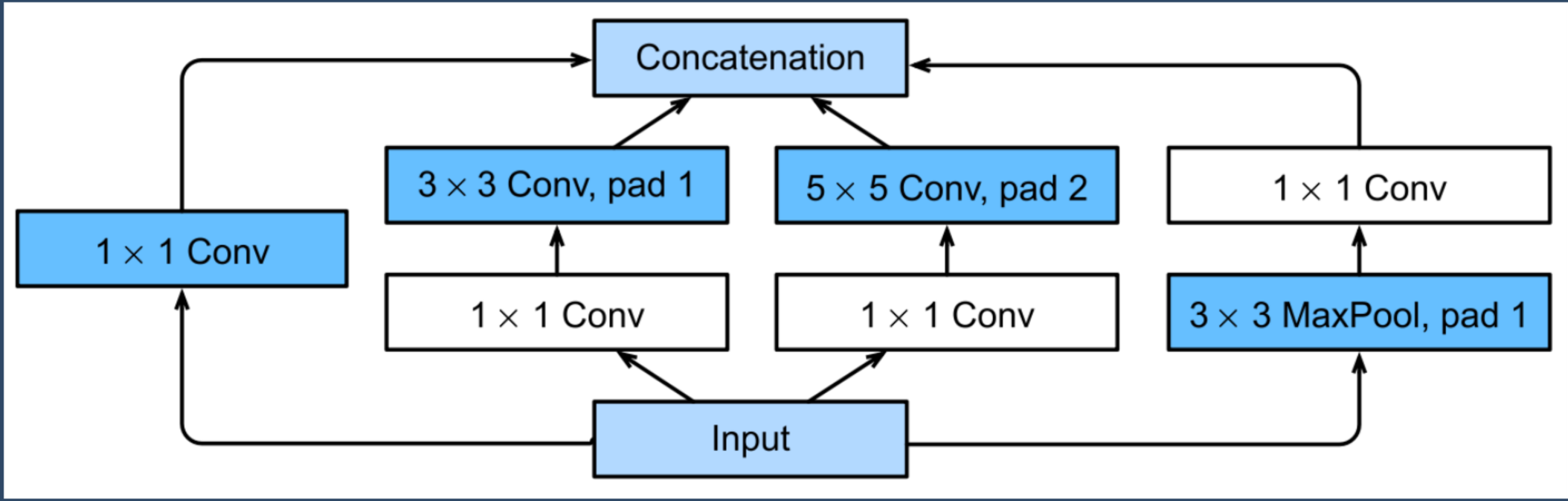
2. GoogLeNet



Efficient Inception Module

복잡한 구조를 통해
적은 수의 파라미터로
좋은 성능을 낼 수 있다.

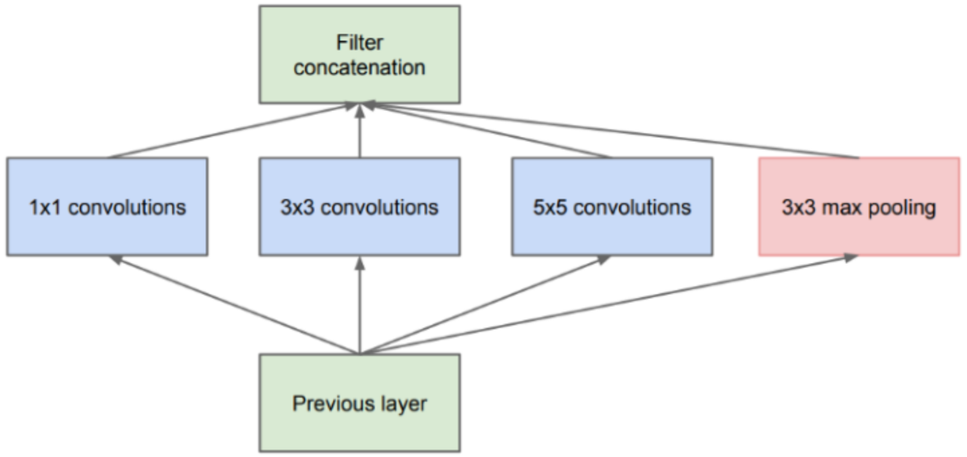
2. GoogLeNet



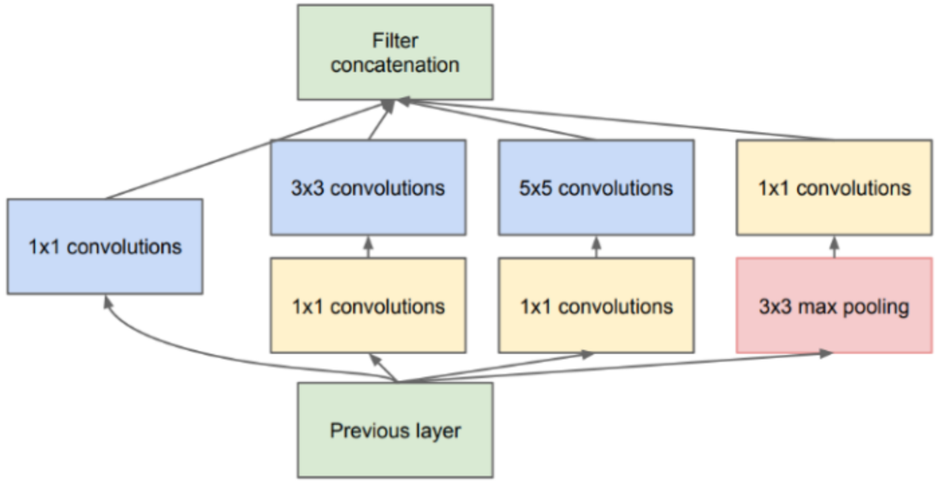
Inception Module

Apply parallel filter operations on the input from previous layer:
- Multiple receptive field sizes for convolution
- Pooling operation
- Concatenate all filter outputs together depth-wise

2. GoogLeNet



(a) Inception module, naïve version



(b) Inception module with dimension reductions

Figure 2: Inception module

Naive Inception Module은 Computational Complexity가 높다는 문제점이 있다.

2. GoogLeNet

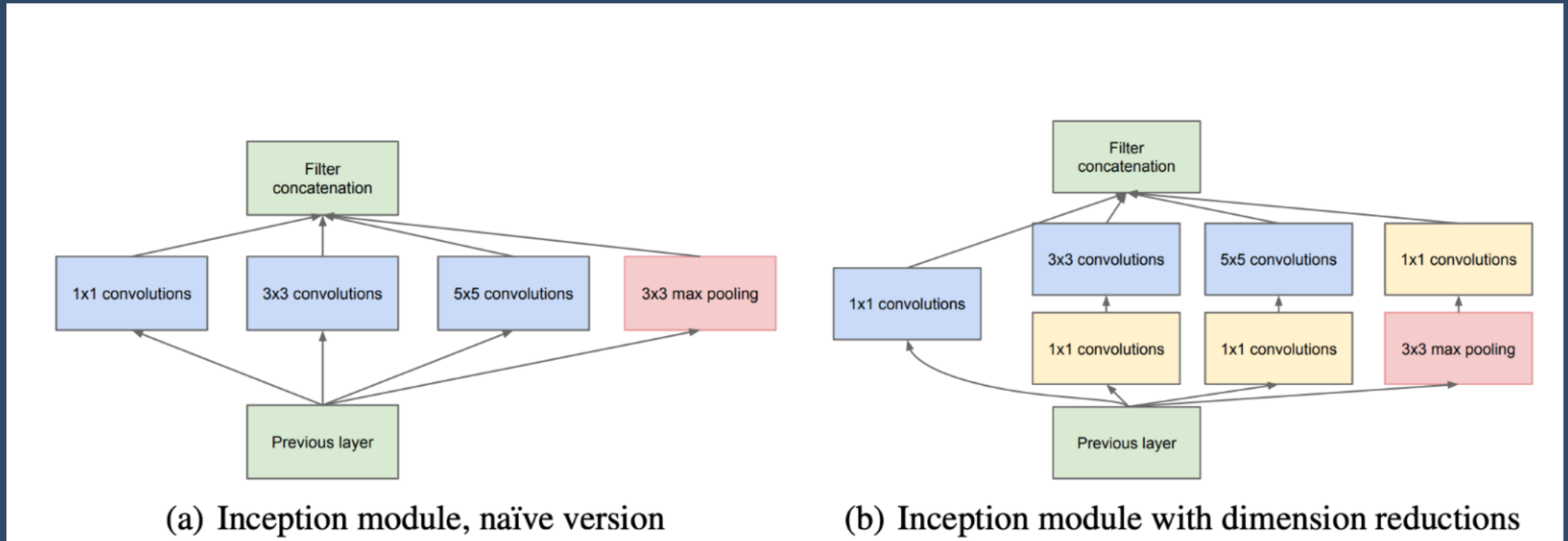
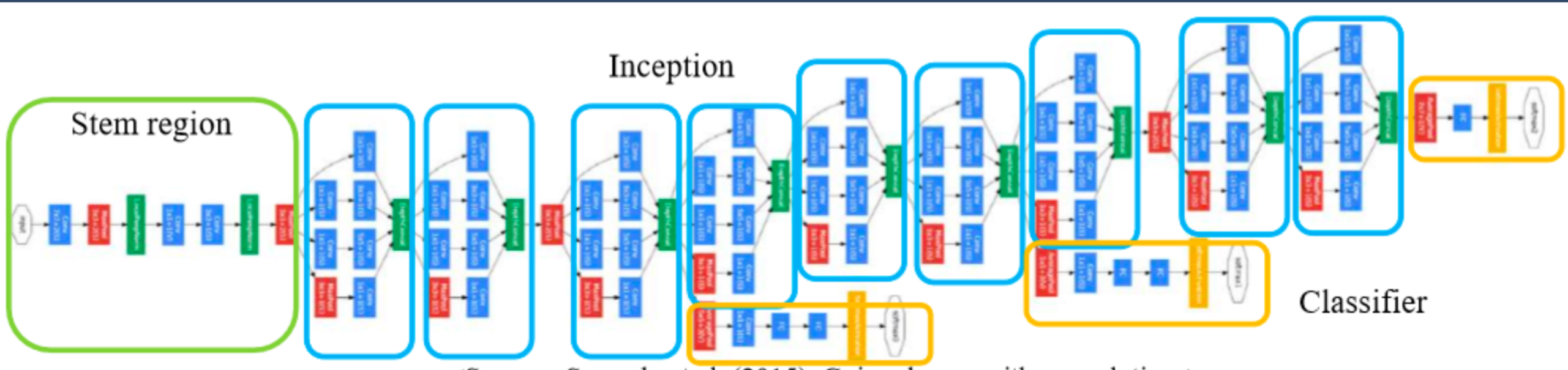


Figure 2: Inception module

1 x 1 Convolution Layer을 활용한 Bottleneck layer를 통해 이를 해결할 수 있다.

2. GoogLeNet

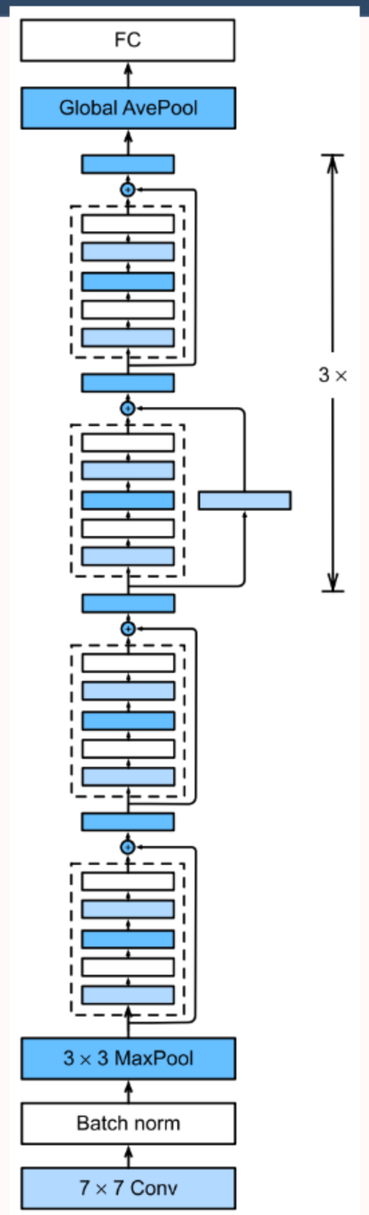


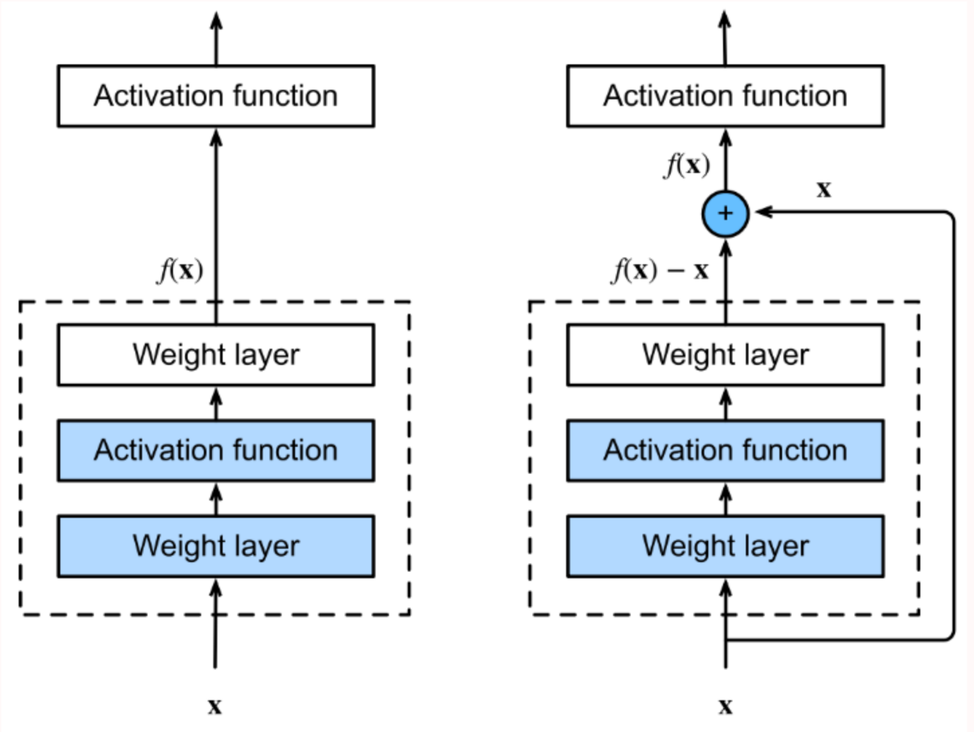
<Source : Szegedy et al. (2015), Going deeper with convolutions>

여러 개의 Classifier를 통해 추가적인 Loss로부터 Gradient를 흘려줄 수 있고
낮은 층에도 학습이 잘 될 수 있게 하는 효과를 가져올 수 있다.

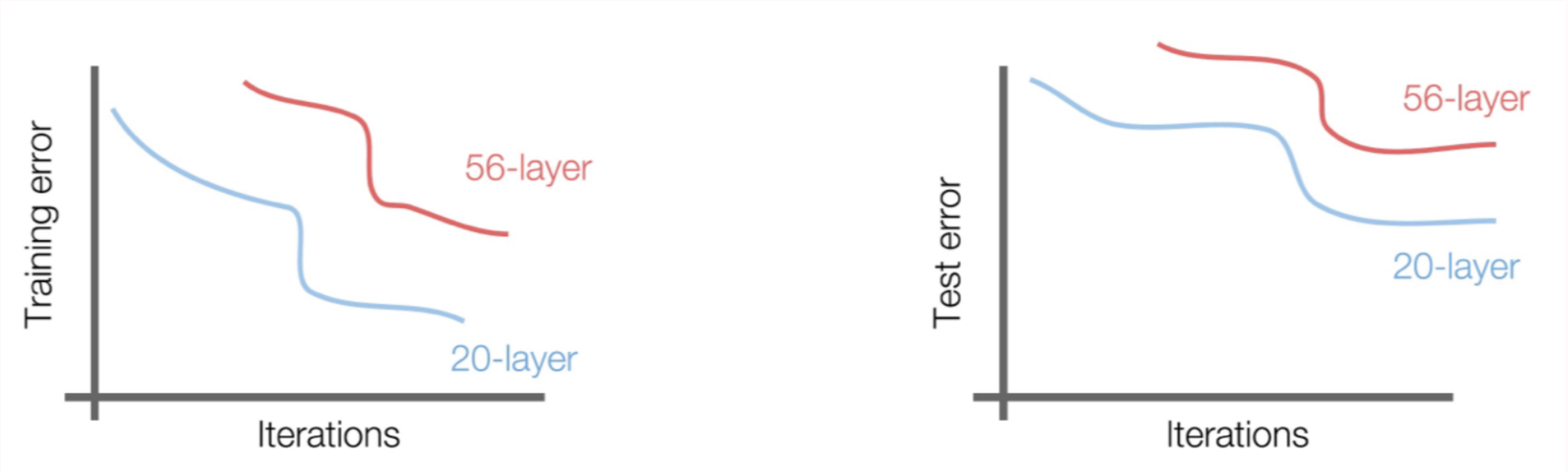
3. ResNet

Very deep networks
using residual connections





3. ResNet



56-layer model performs worse on both training and test error

> The deeper model performs worse, but it's not caused by overfitting!

3. ResNet

Fact :

Deep models have
more representation power
(more parameters)
than shallower models.

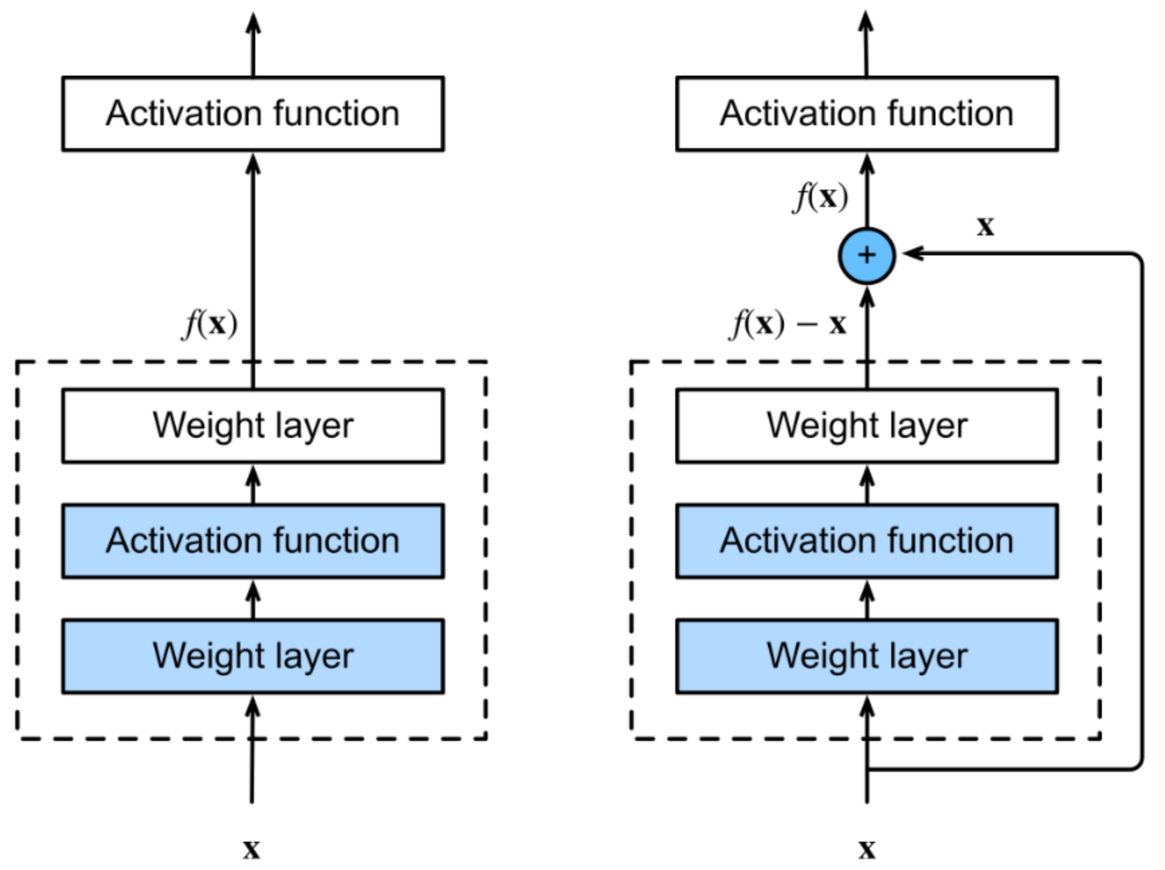
Hypothesis :

The problem is an optimization,
not the model itself.

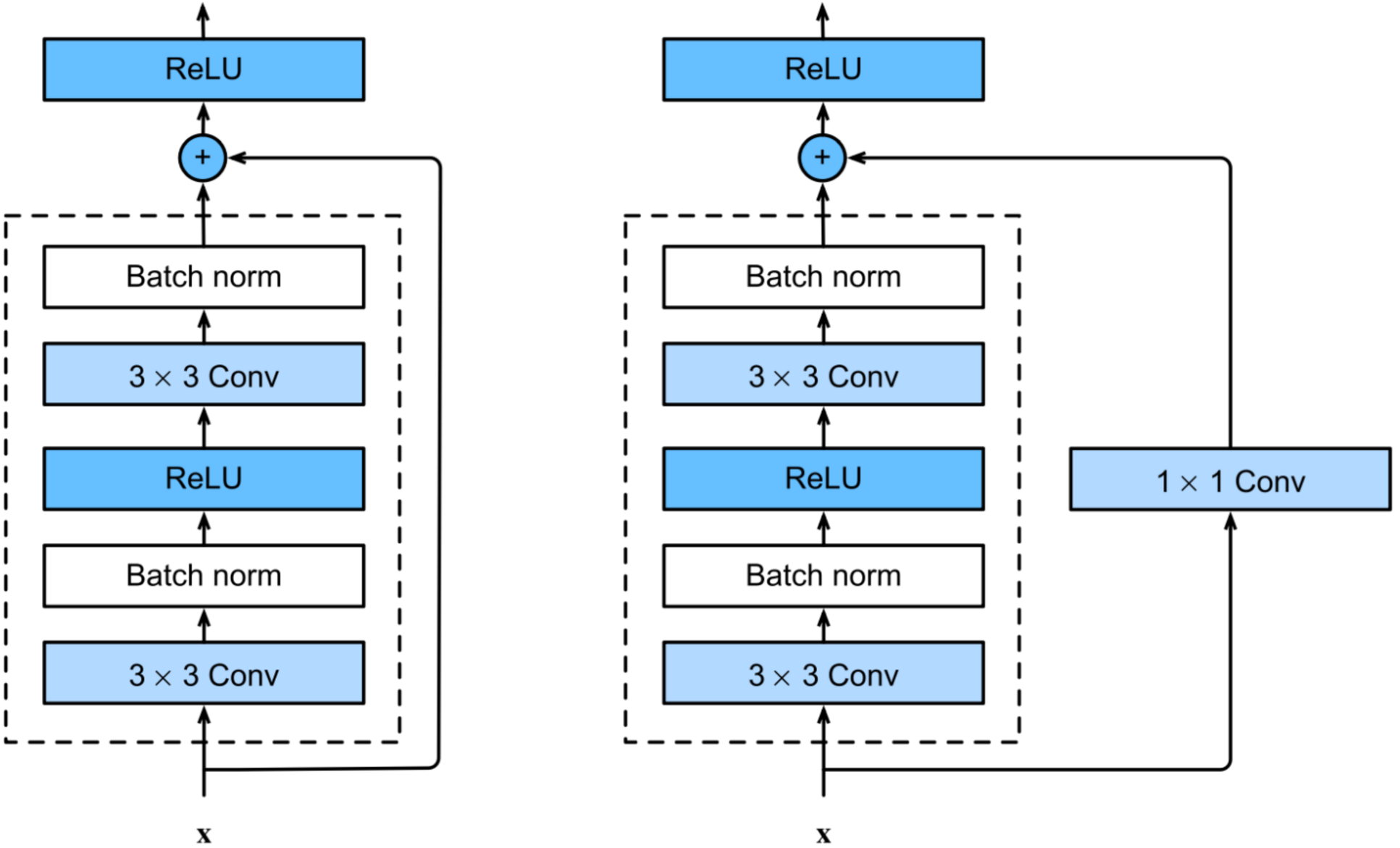
> Deeper models are harder to optimizer.

Solution :

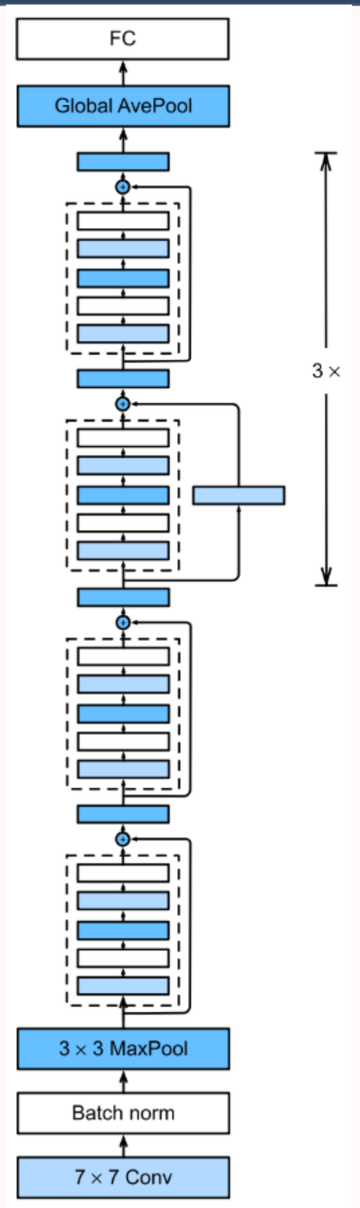
Use network layers
to fit a residual mapping
instead of directly trying
to fit a desired underlying mapping.

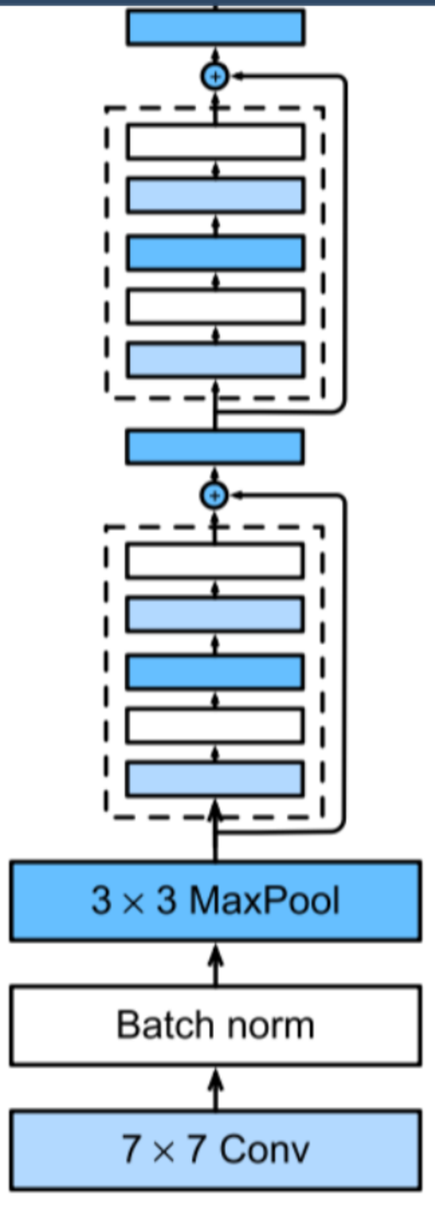


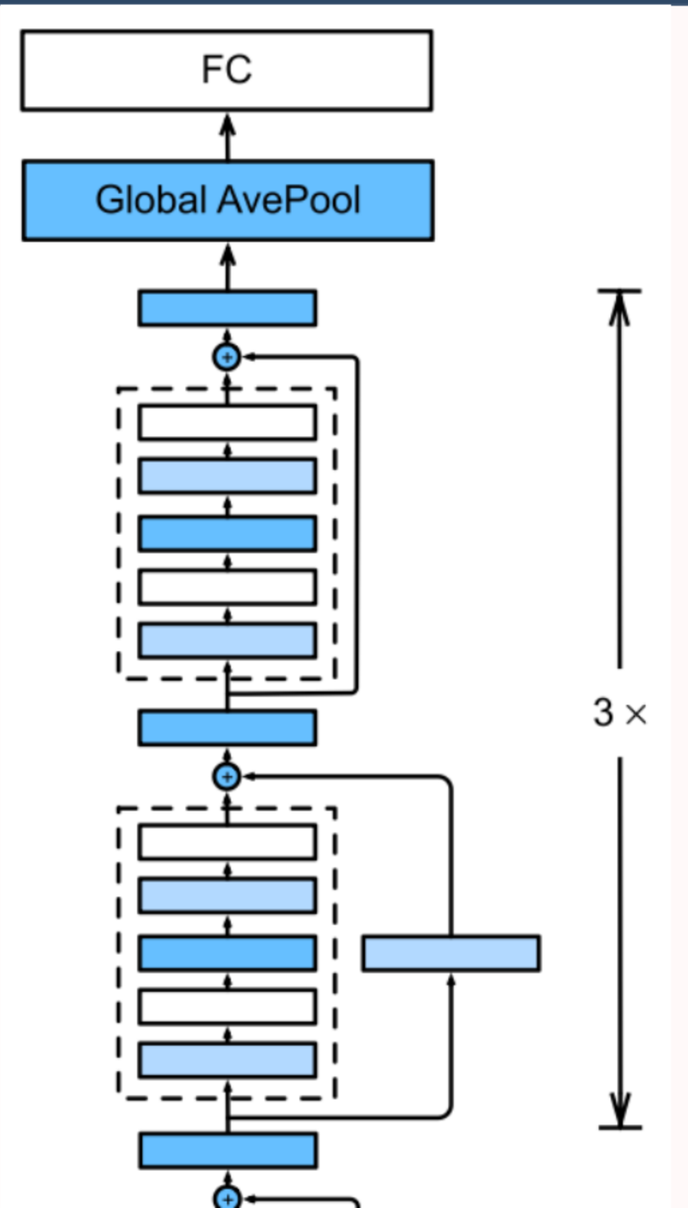
3. ResNet


ReLU
+
Batch norm
3 × 3 Conv
ReLU
Batch norm
3 × 3 Conv
x
ReLU
+
Batch norm
3 × 3 Conv
ReLU
Batch norm
3 × 3 Conv
1 × 1 Conv
x

3. ResNet


FC
Global AvePool
3 ×
3 × 3 MaxPool
Batch norm
7 × 7 Conv


3 × 3 MaxPool
Batch norm
7 × 7 Conv


FC
Global AvePool
3 ×

Thank you for listening

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