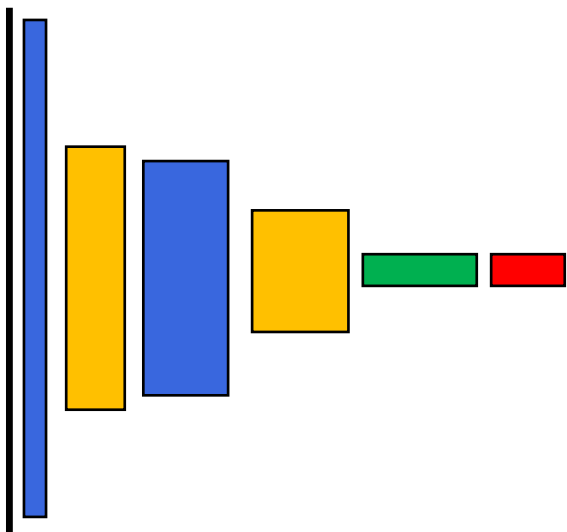


Resnet

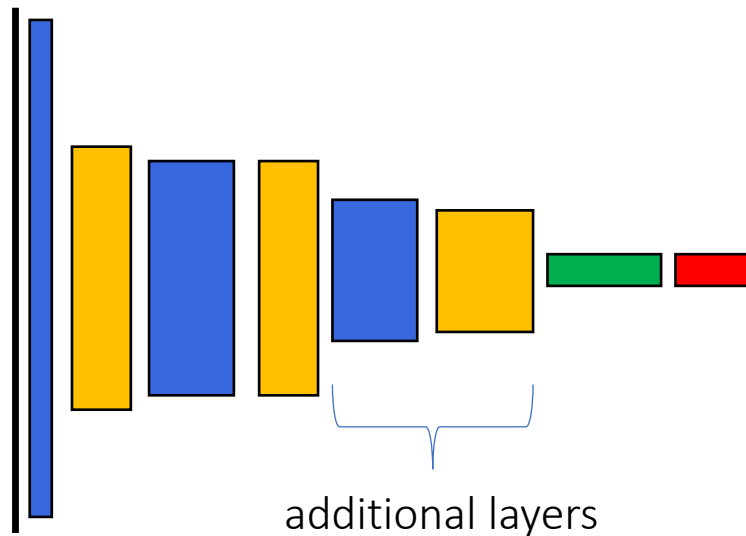
# Resnet

## Problem Description

- Problem: train a computer vision model to solve a more complicated task
- Solution: add more layers



Original Network

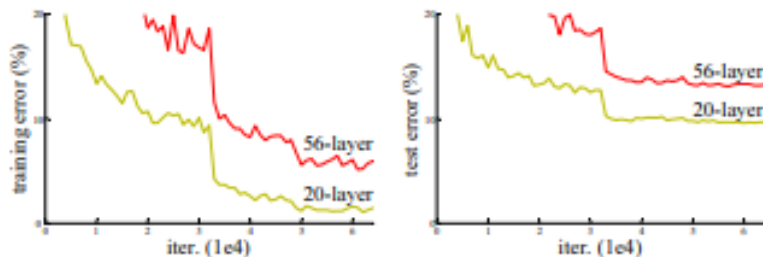


Adapted Network with more layers

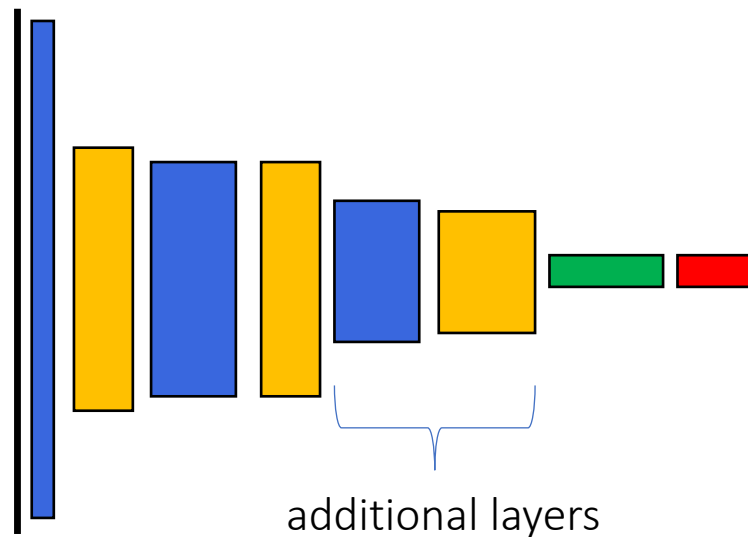
# Resnet

## Impact of Deeper Networks

- Expectation: more layers, more parameters, improved performance
- Reality:
  - deeper networks harder to train
  - reduced performance (degradation problem)



Source: Kaiming He, Xiangyu Zhang, Shaoqing Ren, Jian Sun  
„Deep Residual Learning for Image Recognition“  
<https://arxiv.org/pdf/1512.03385.pdf>

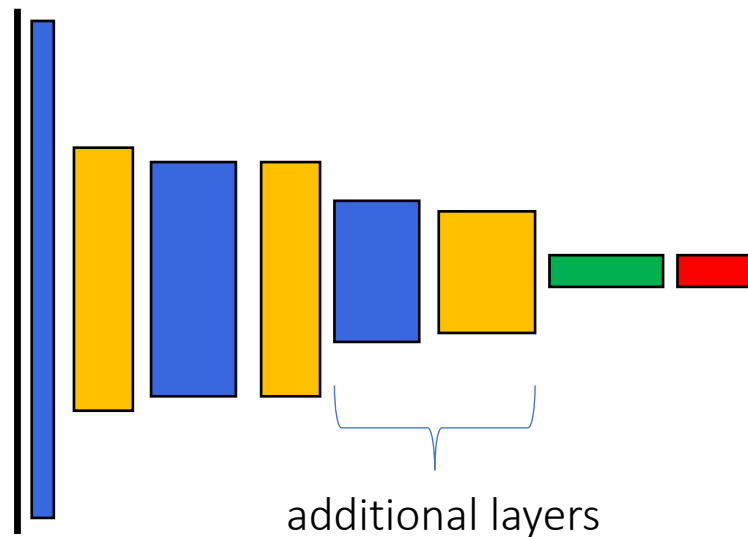


Adapted Network with more layers

# Resnet

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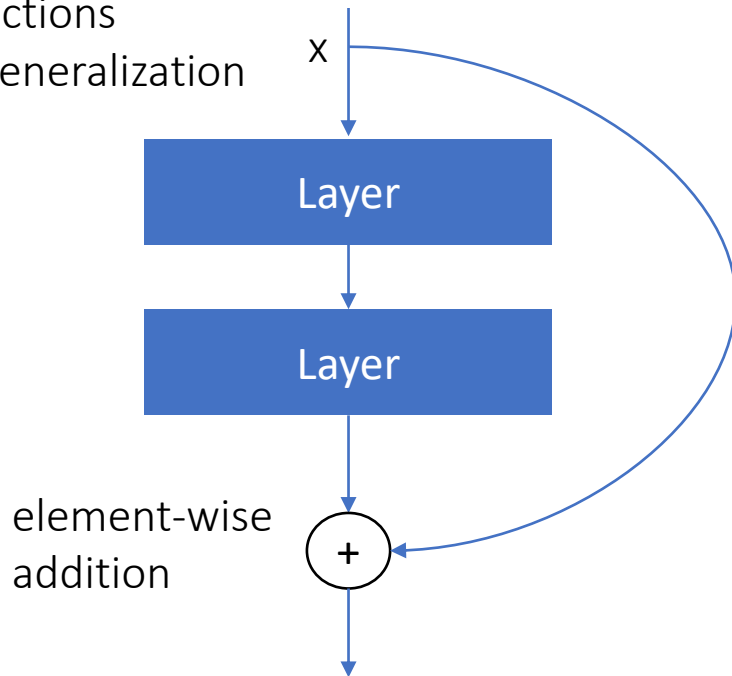


Adapted Network with more layers

# Resnet

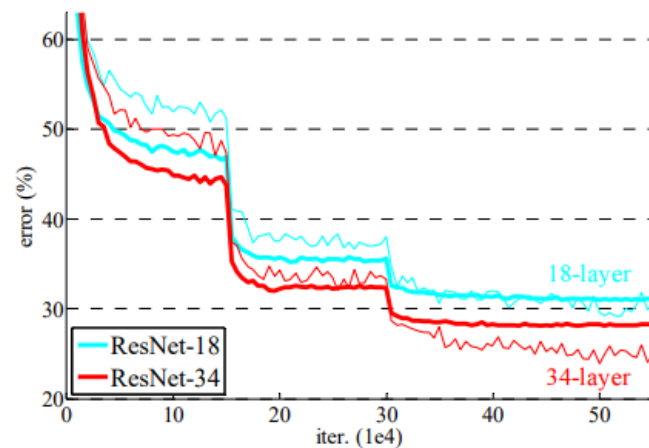
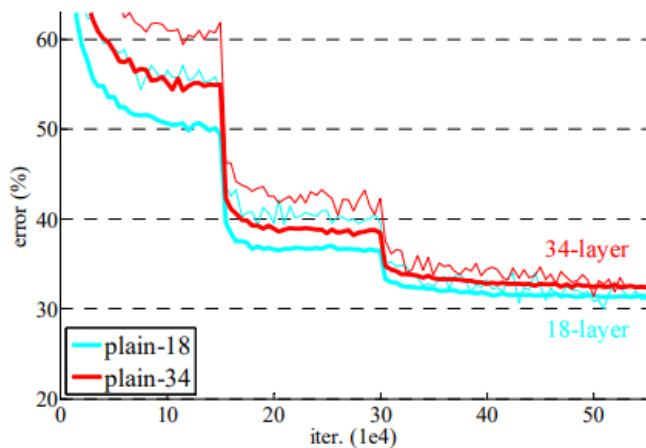
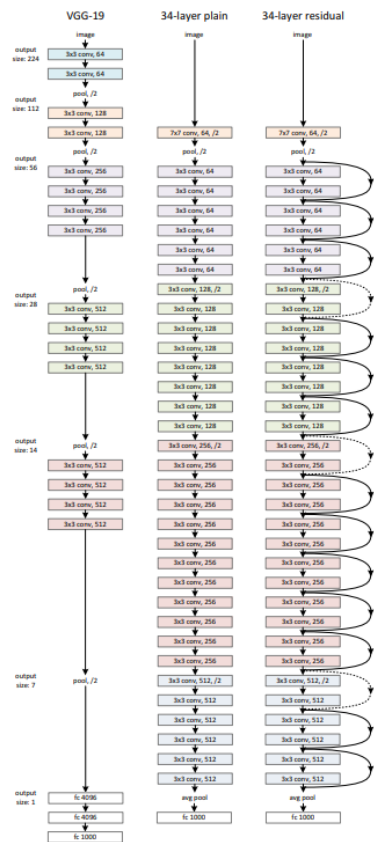
## Skip Connections

- also called Shortcut Connections or residual connections
- useful technique for improving performance and generalization
- allow gradient signal to bypass one or more layers
- often used in networks with deep architectures
- purpose:
  - overcome vanishing gradient problem
  - overcome overfitting
  - help network learn more easily
  - improve performance
- useful in different applications
  - image classification
  - language translation
  - speech recognition



# Resnet

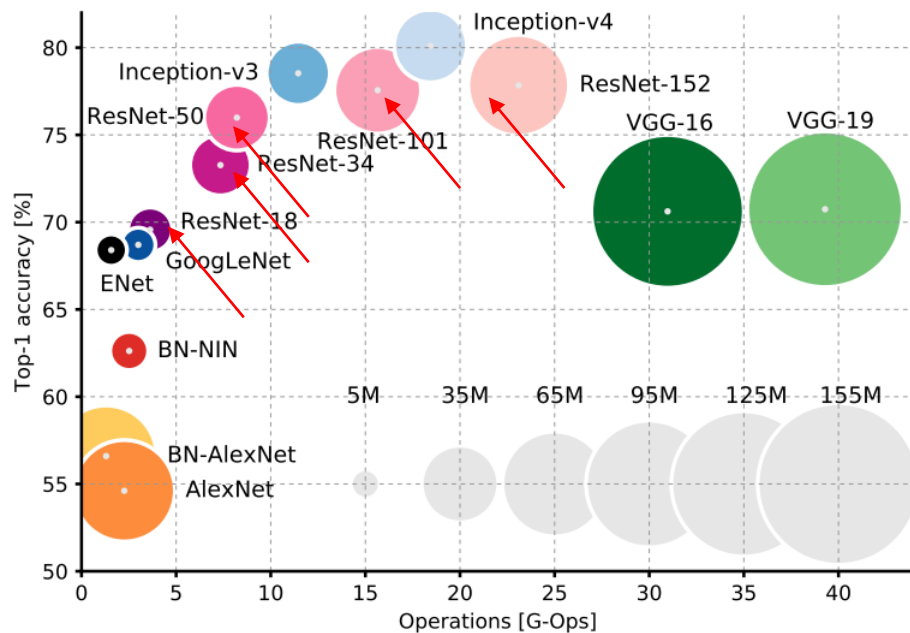
## Impact on Performance



Source: Kaiming He, Xiangyu Zhang, Shaoqing Ren, Jian Sun  
„Deep Residual Learning for Image Recognition“  
<https://arxiv.org/pdf/1512.03385.pdf>

# Resnet

Resnet in comparison to other models



diameter ~ number  
of parameters

Source: Canziani, Culurciello, Paszke: „An Analysis of Deep Neural Network Models For Practical Applications“  
<https://arxiv.org/pdf/1605.07678.pdf>