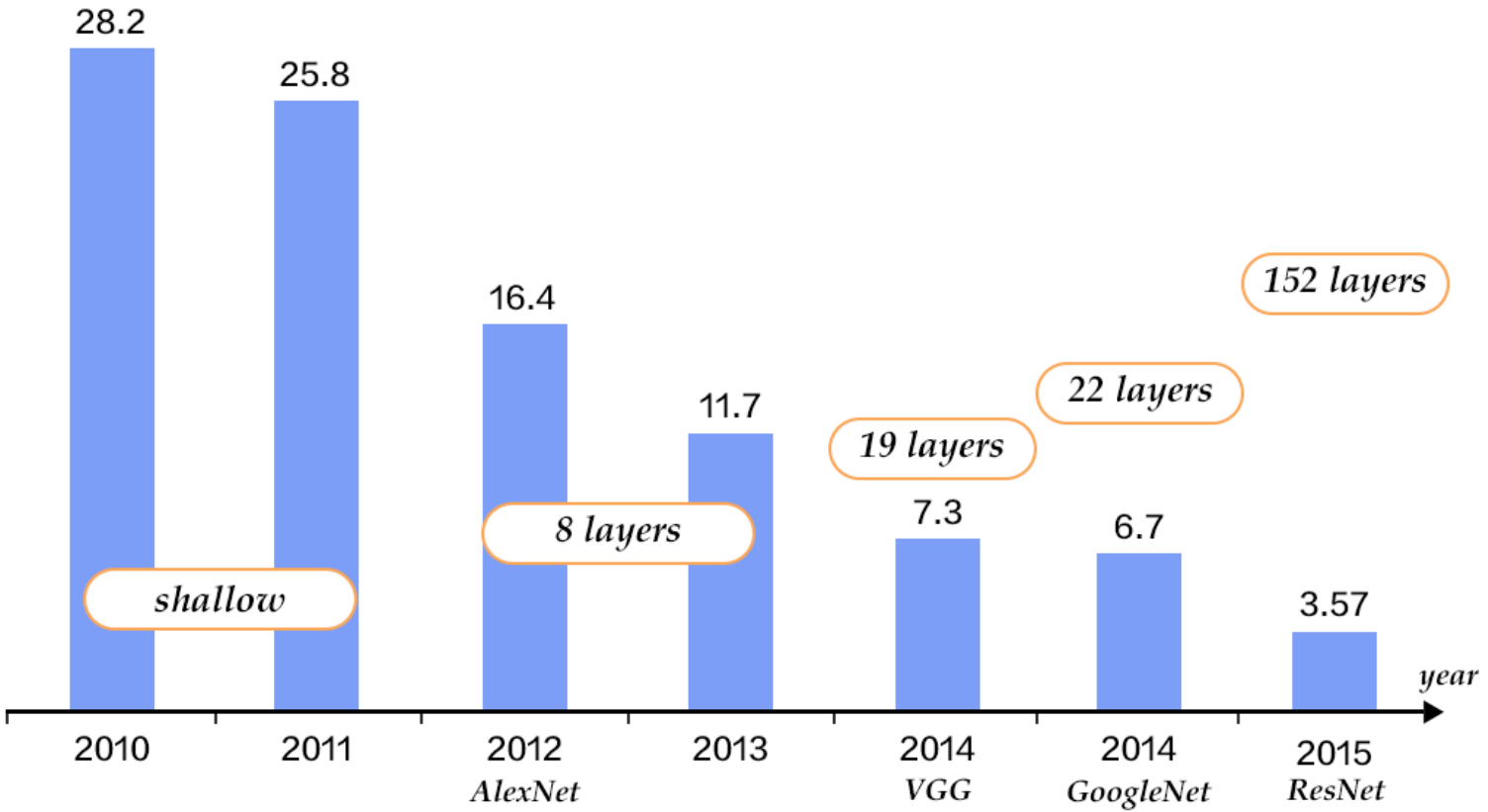
DEEP LEARNING
Layers

ГУУ, 3-й курс 2023, 2-й семестр

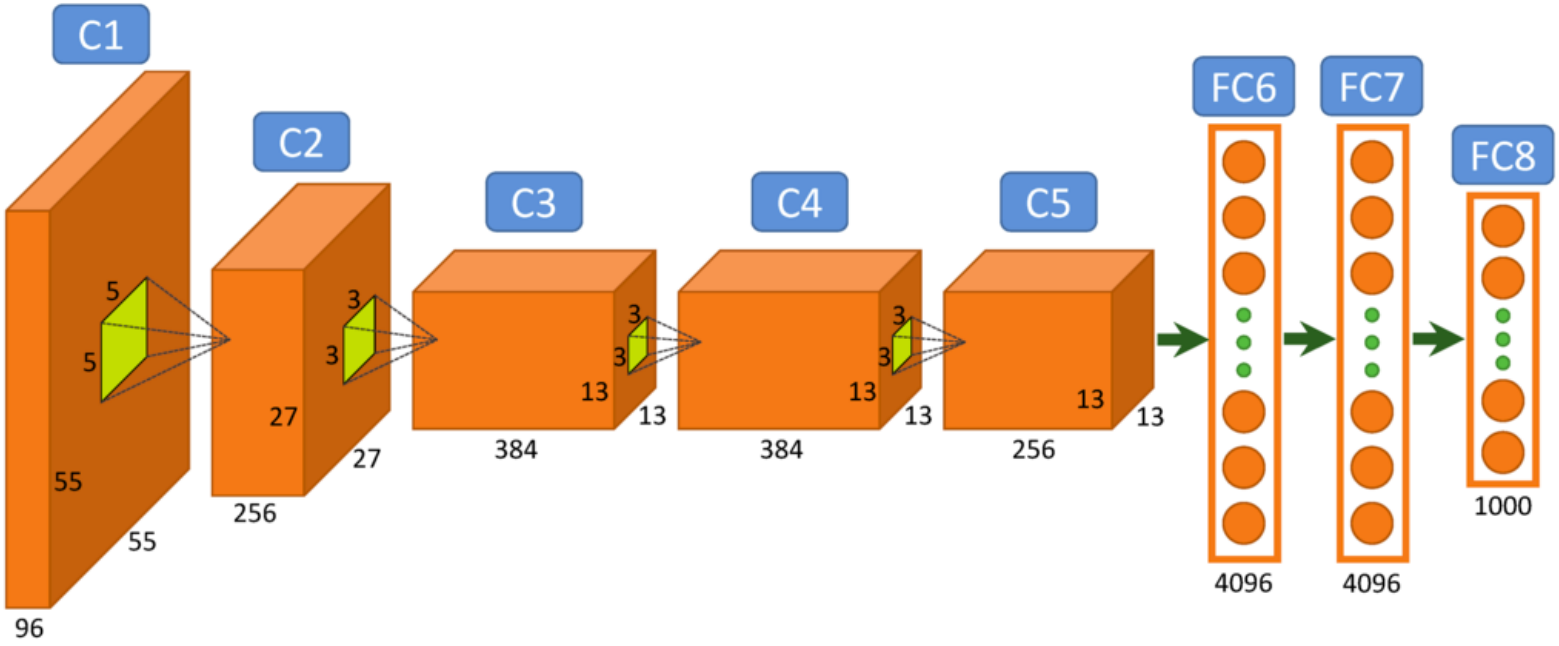
AlexNet

ILSVRC


28.2
25.8
16.4
11.7
7.3
6.7
3.57
shallow
8 layers
19 layers
22 layers
152 layers
year
2010
2011
2012
AlexNet
2013
2014
VGG
2014
GoogleNet
2015
ResNet

Архитектура

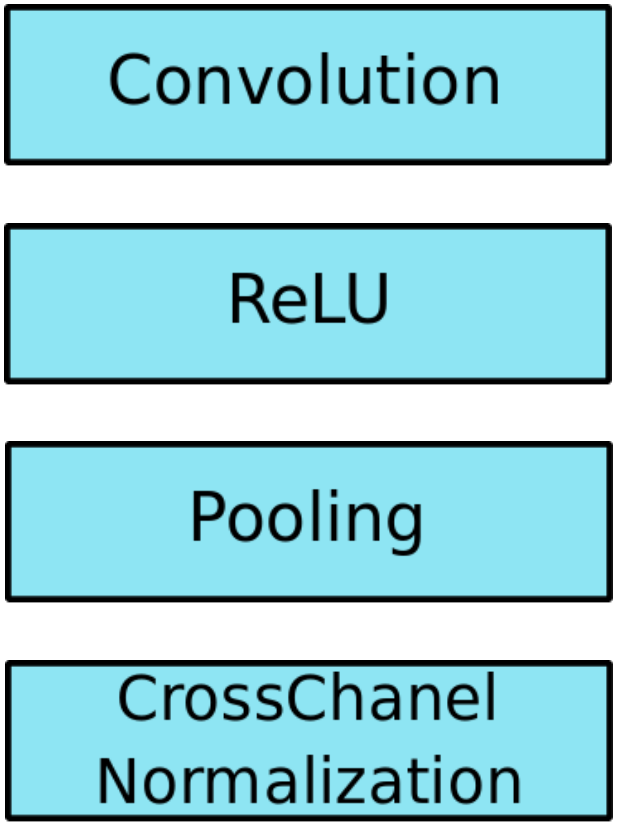
AlexNet


C1
C2
C3
C4
C5
FC6
FC7
FC8
5
5
55
55
96
3
3
27
27
256
3
3
13
13
384
3
3
13
13
384
13
13
256
4096
4096
1000

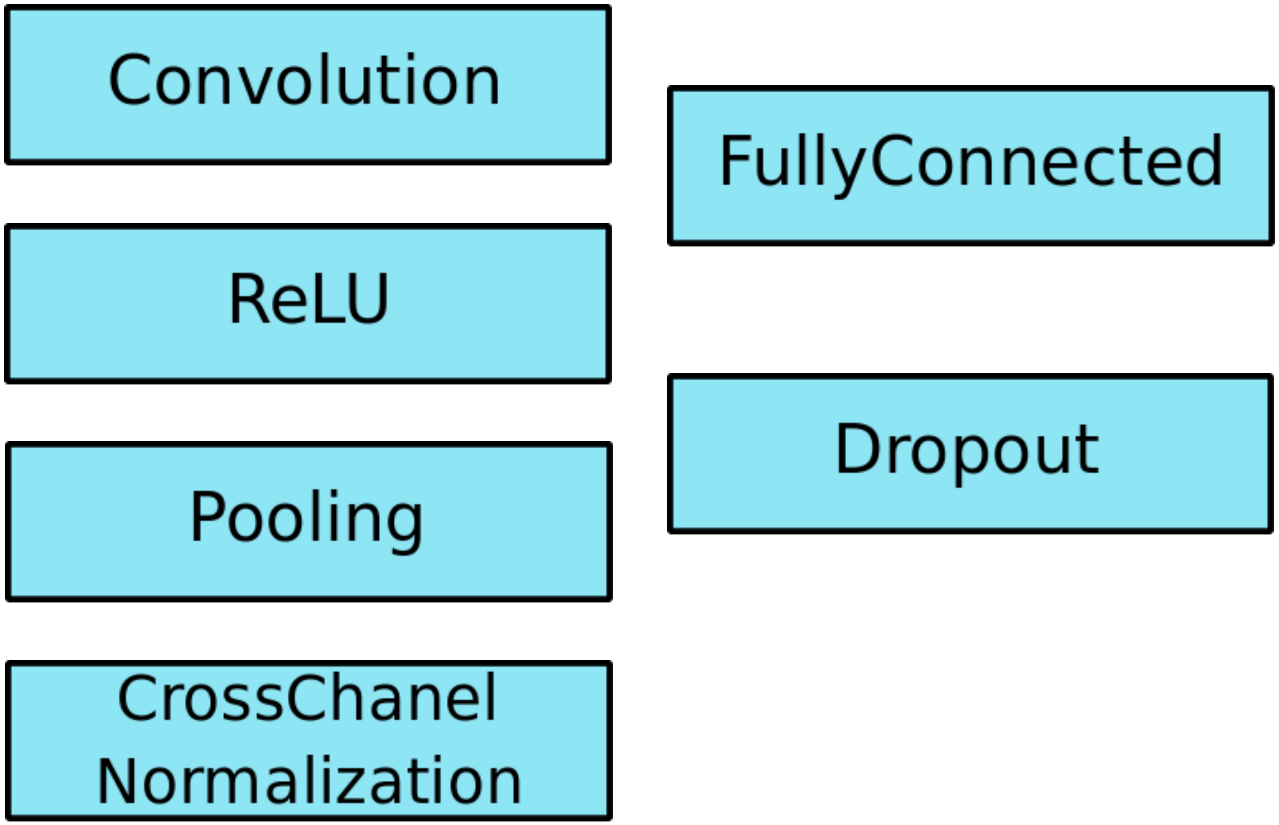
GPU

Строительные блоки

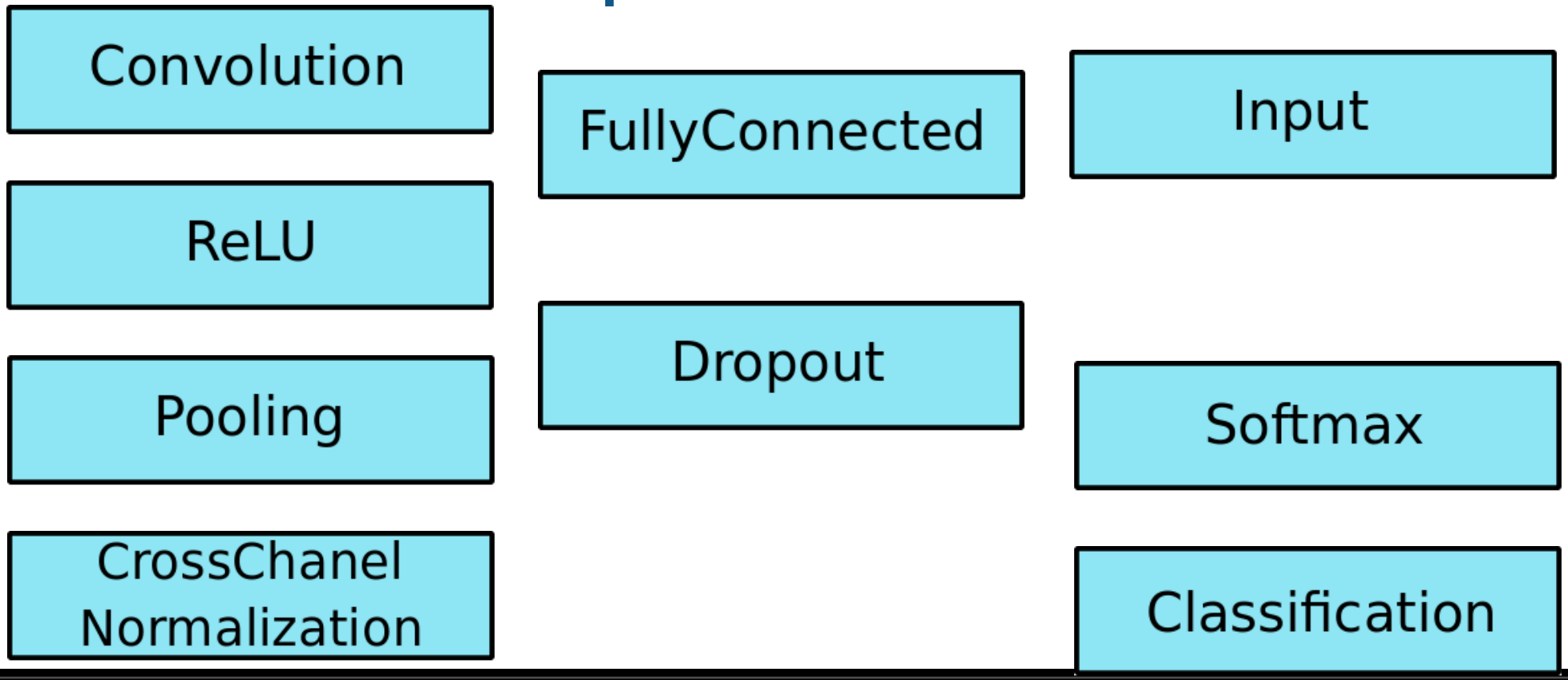
Строительные блоки

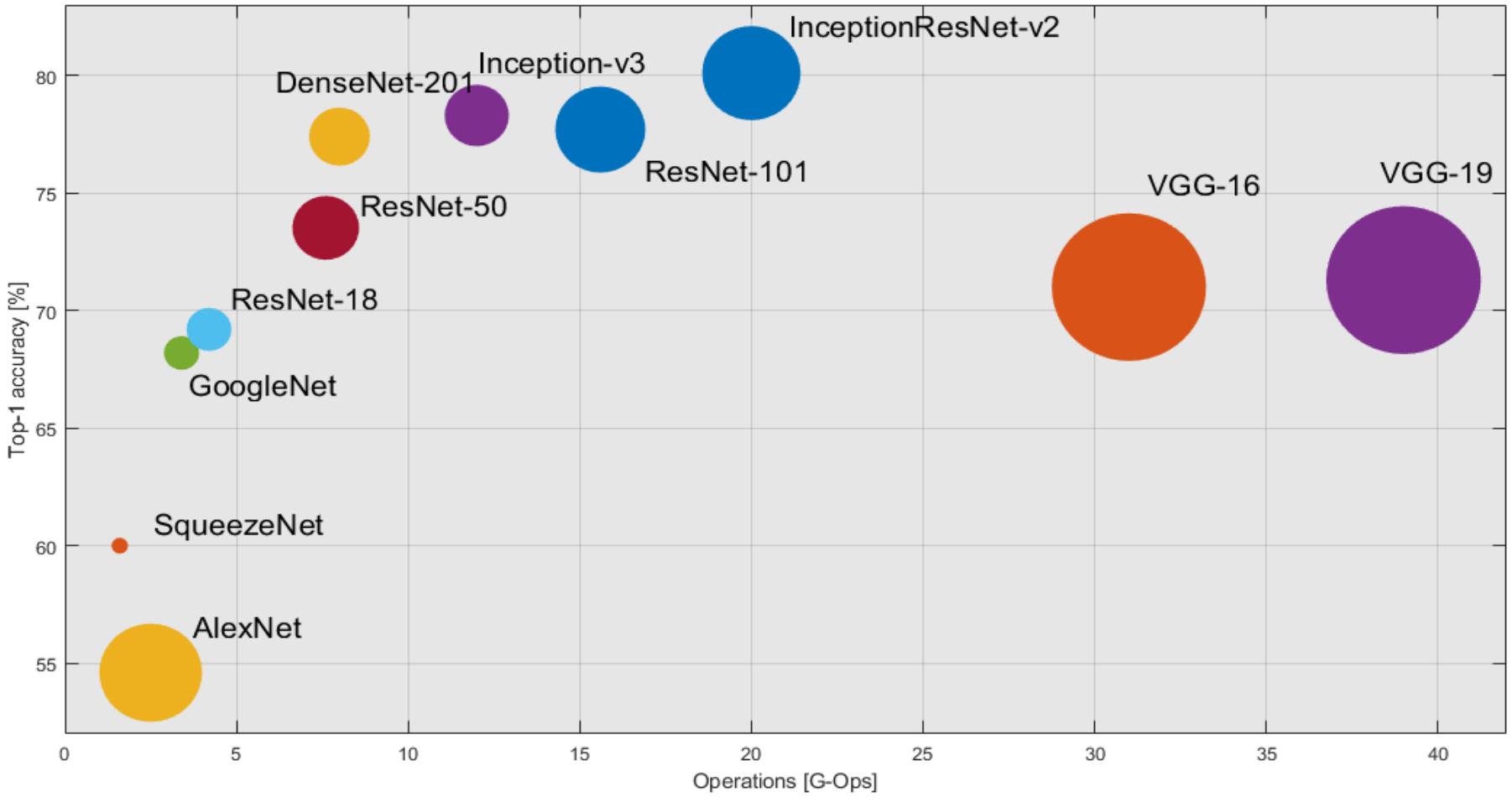


Строительные блоки



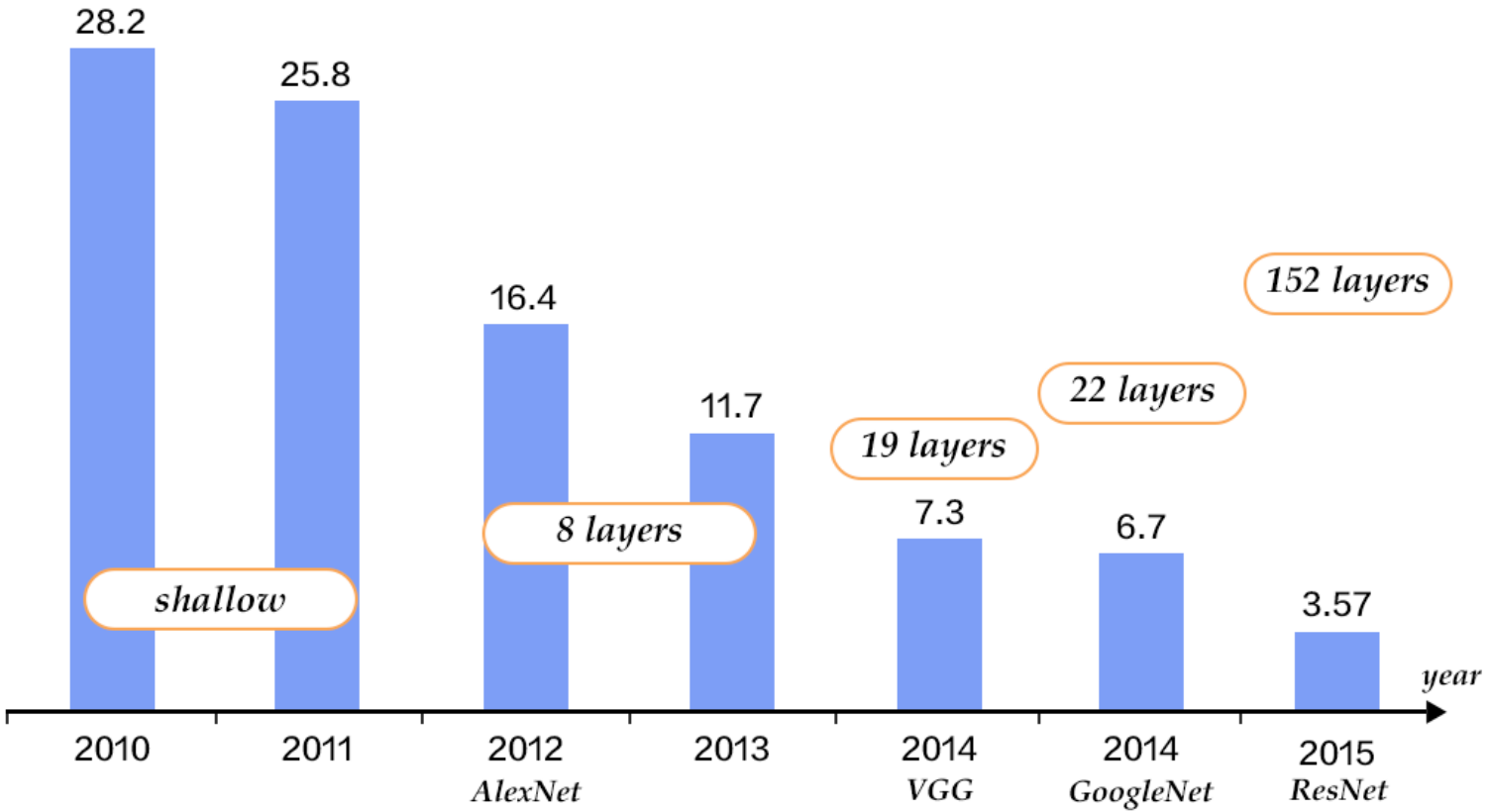
Строительные блоки



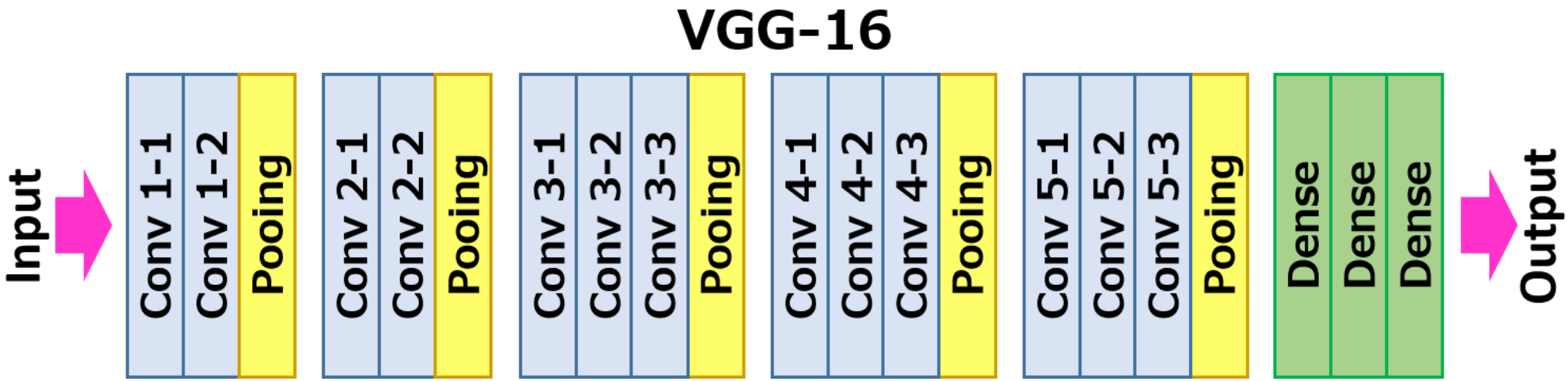

InceptionResNet-v2
Inception-v3
DenseNet-201
ResNet-101
VGG-16
VGG-19
ResNet-50
ResNet-18
GoogleNet
SqueezeNet
AlexNet
Top-1 accuracy [%]
80
75
70
65
60
55
0
5
10
15
20
25
30
35
40
Operations [G-Ops]

VGG - 16 (19)

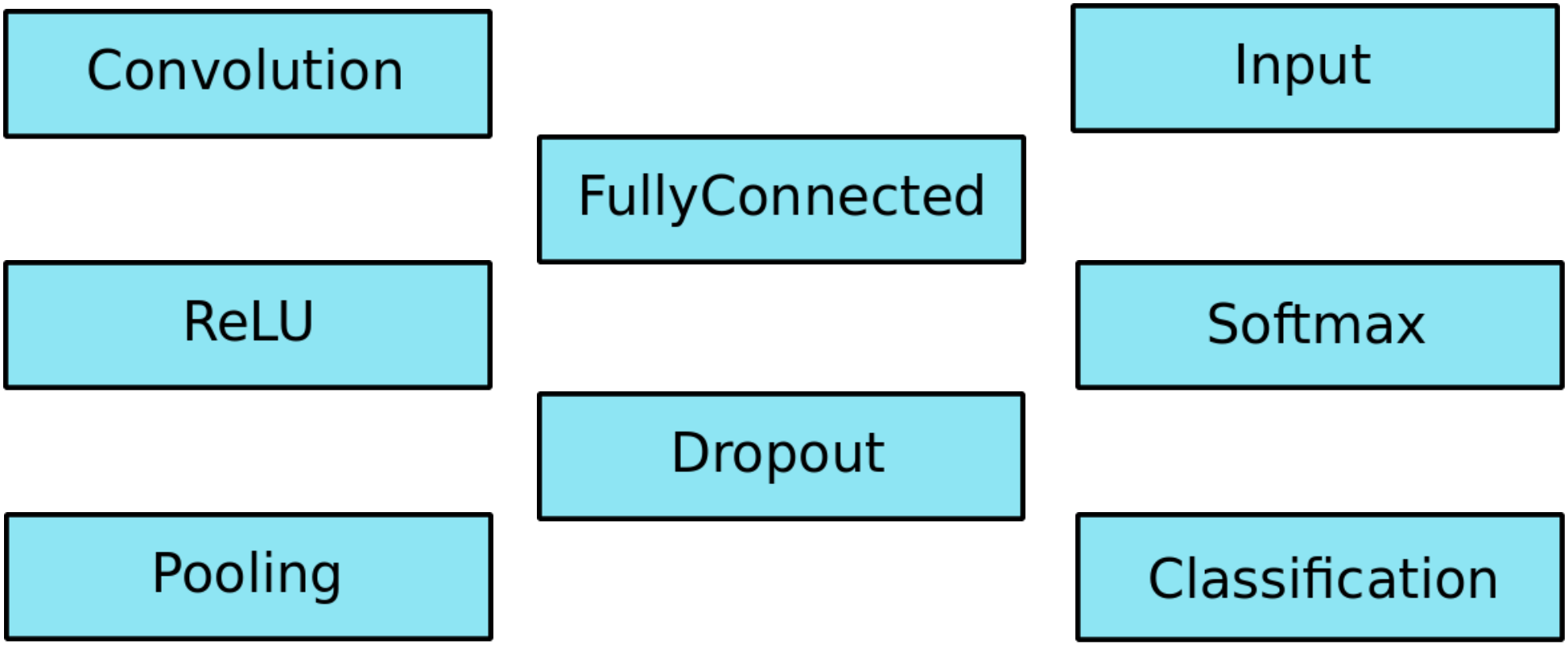
ILSVRC

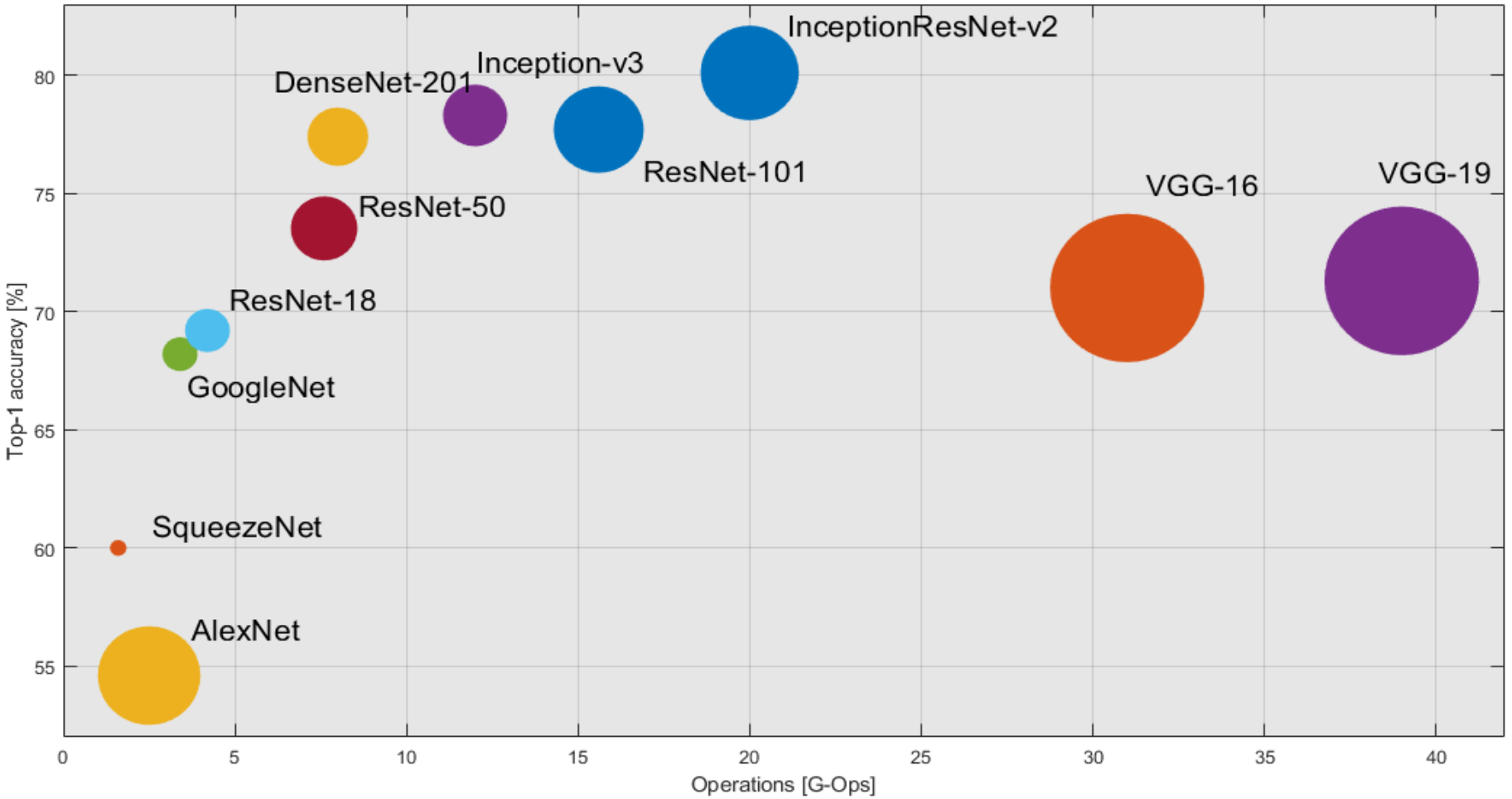

28.2
25.8
16.4
11.7
7.3
6.7
3.57
shallow
8 layers
19 layers
22 layers
152 layers
year
2010
2011
2012
AlexNet
2013
2014
VGG
2014
GoogleNet
2015
ResNet

Архитектура



Строительные блоки

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75
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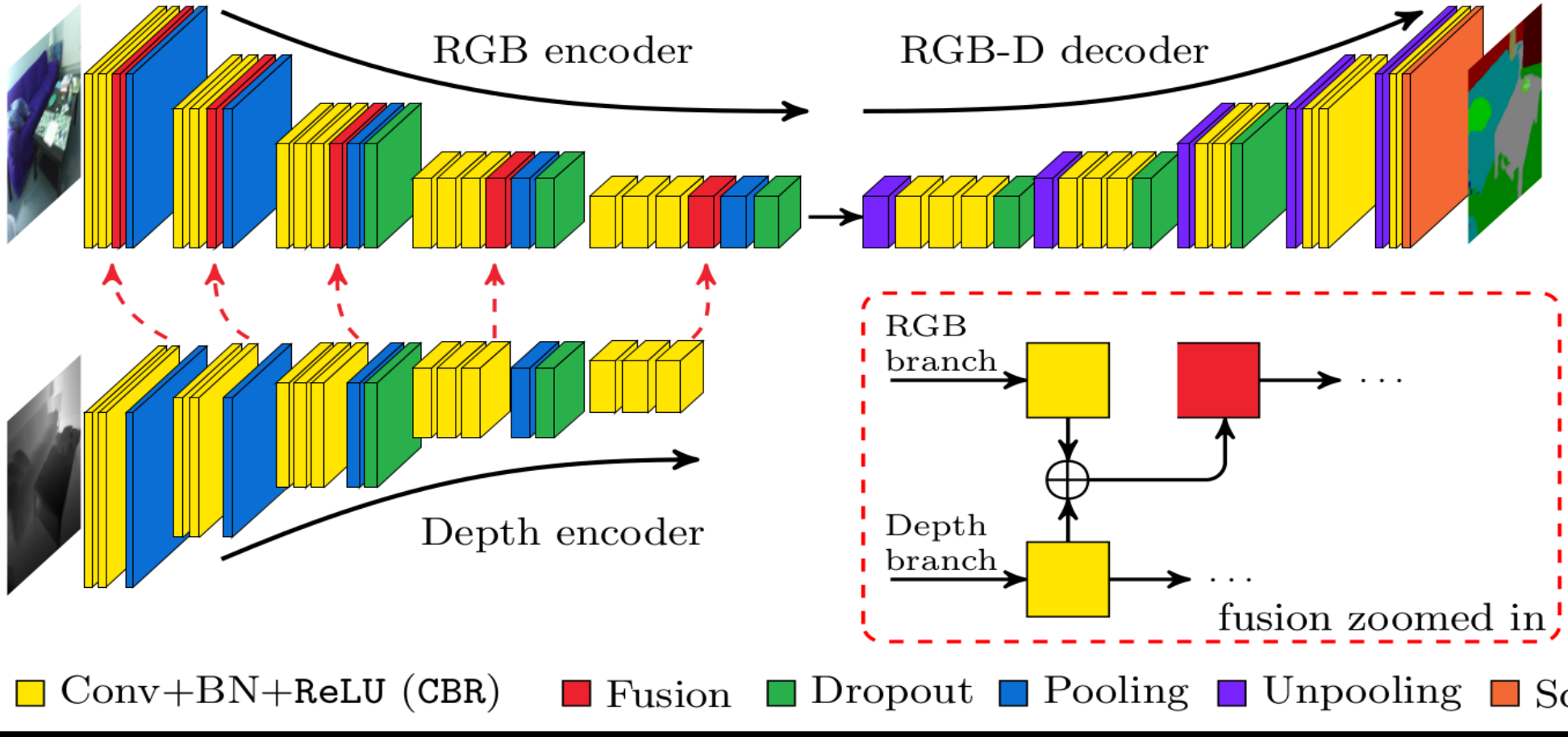
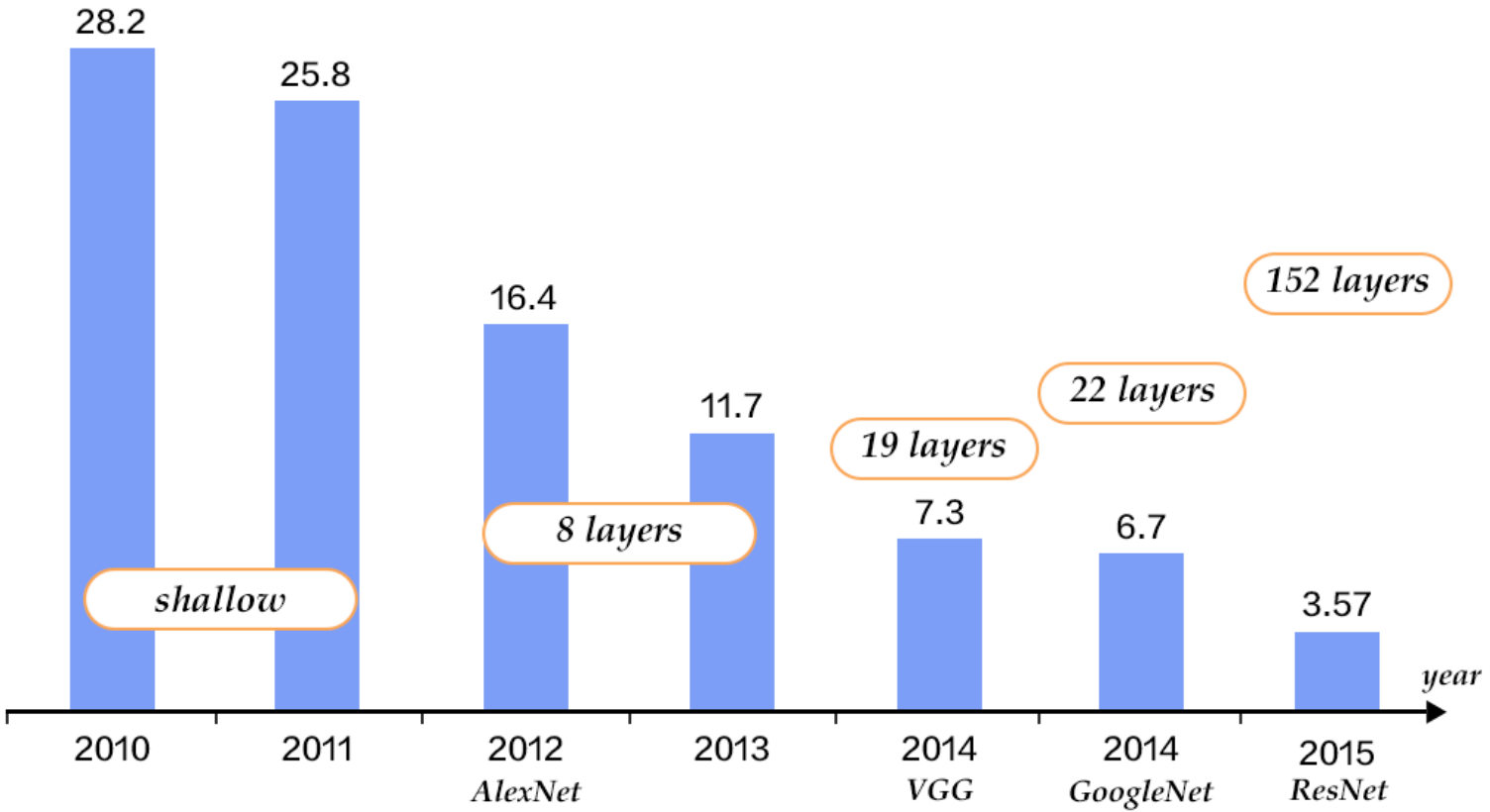
Operations [G-Ops]


RGB encoder
RGB-D decoder
Depth encoder
RGB branch
Depth branch
fusion zoomed in
Conv+BN+ReLU (CBR)
Fusion
Dropout
Pooling
Unpooling
Score

GoogleNet

ILSVRC


28.2
25.8
16.4
11.7
7.3
6.7
3.57
shallow
8 layers
19 layers
22 layers
152 layers
year
2010
2011
2012
AlexNet
2013
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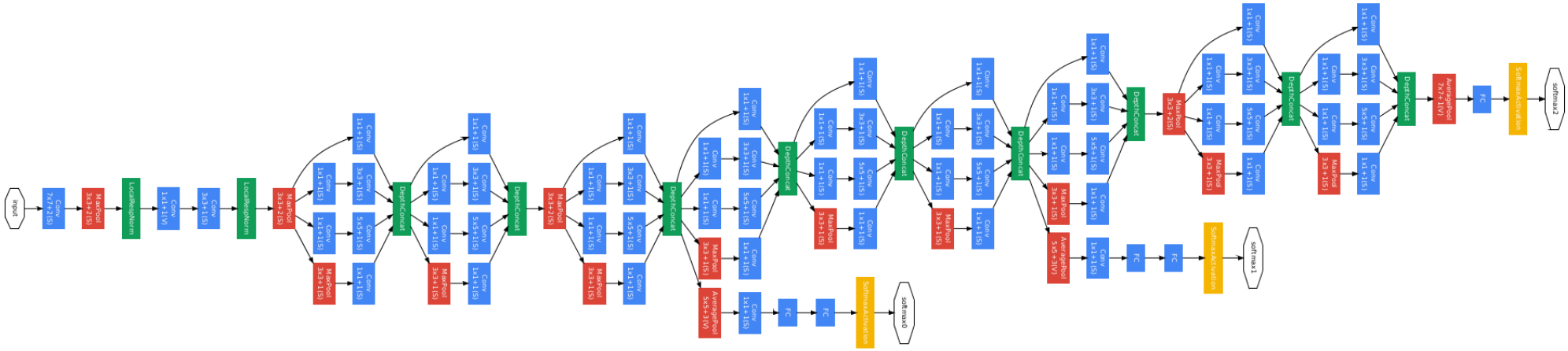
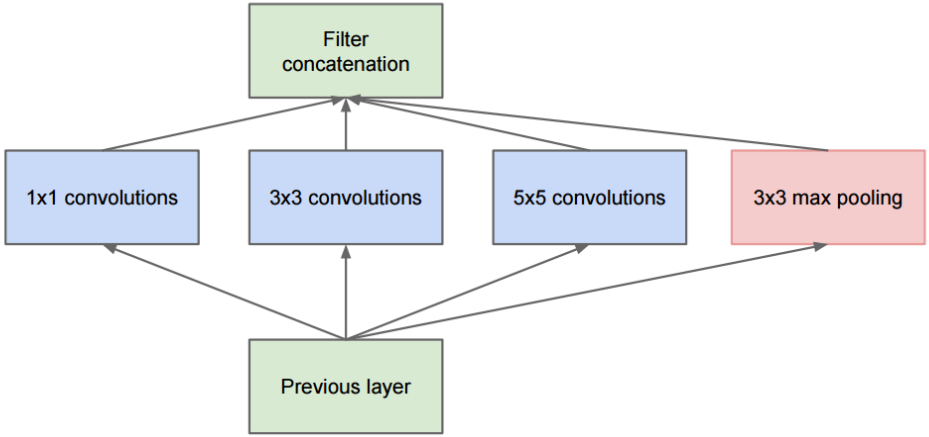
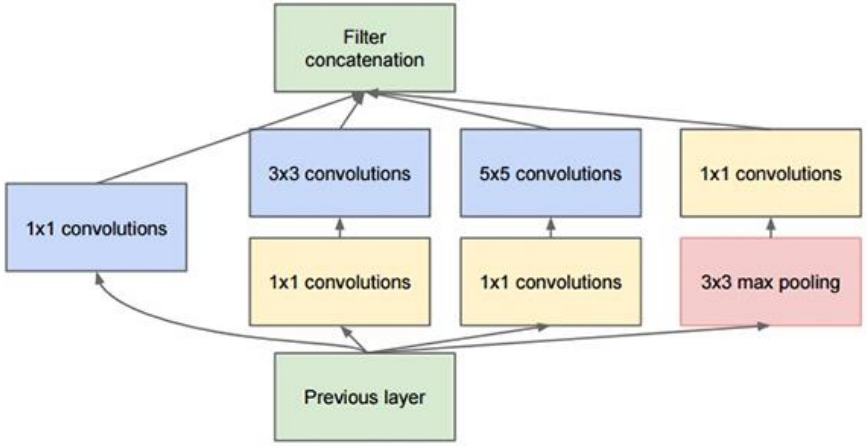
VGG
2014
GoogleNet
2015
ResNet

Архитектура



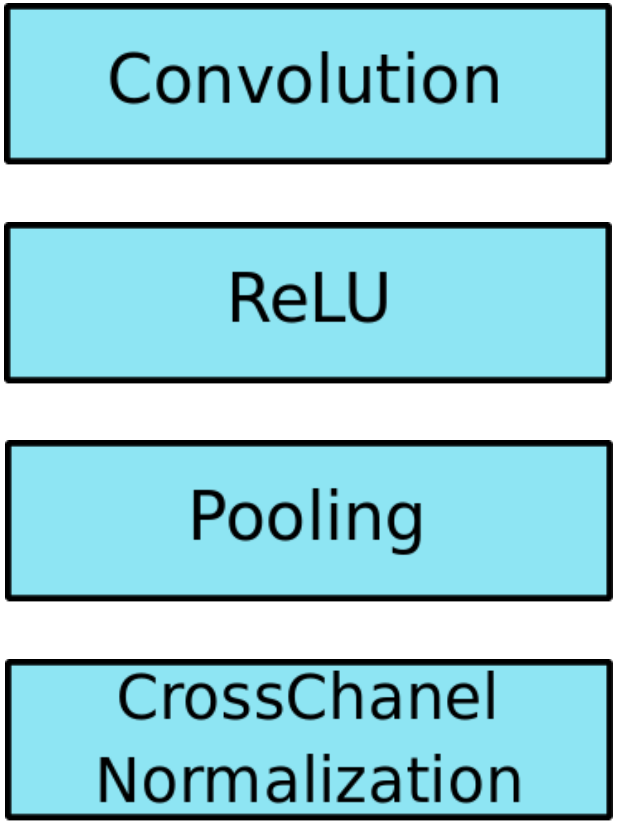
GoogleNet (inception)



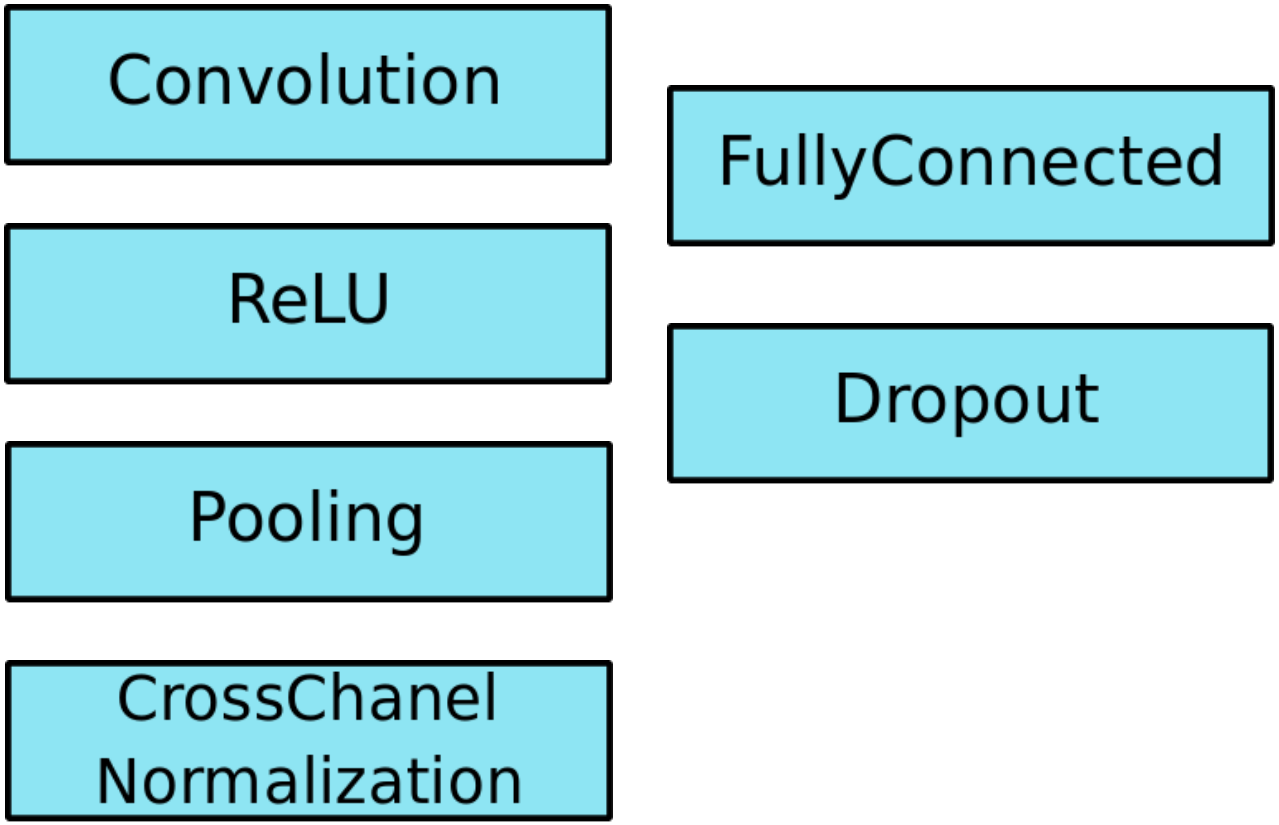


Строительные блоки

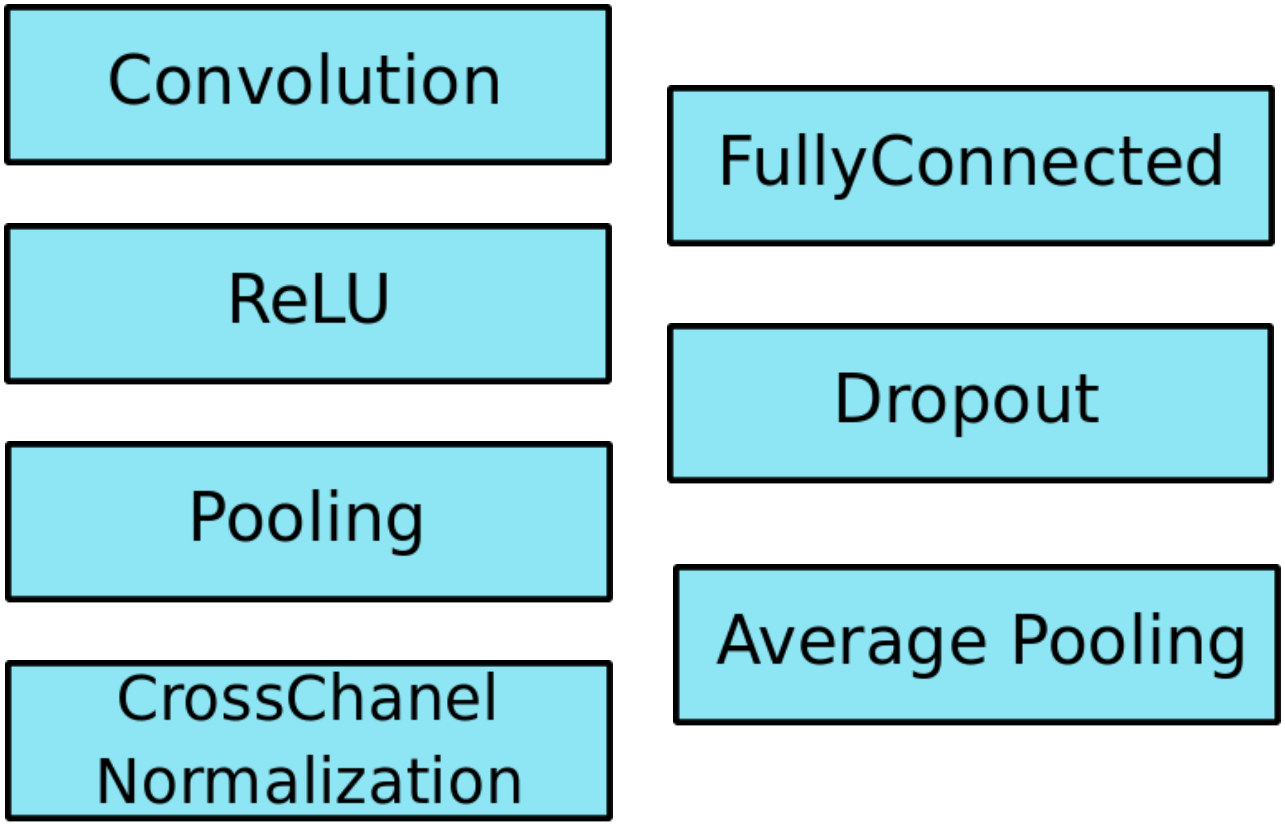
Строительные блоки



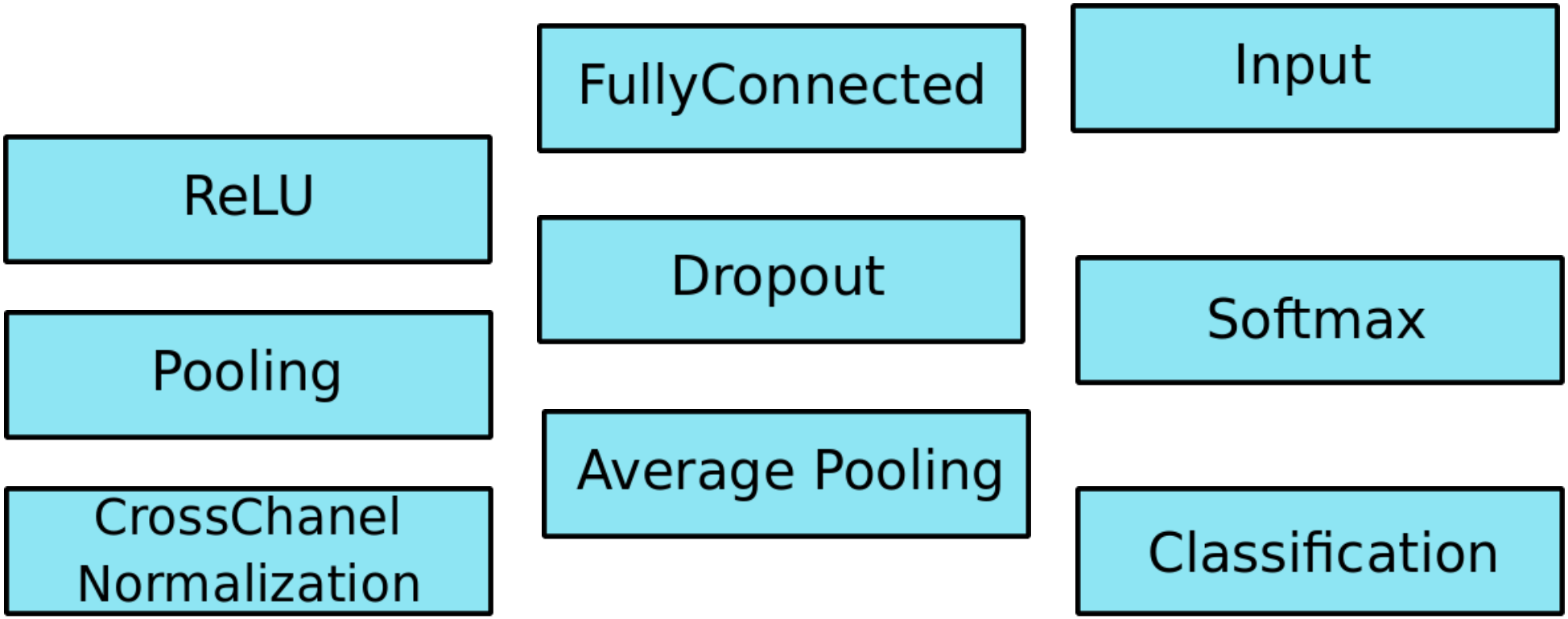
Строительные блоки



Строительные блоки



Строительные блоки



Строительные блоки

Convolution

FullyConnected

Input

ReLU

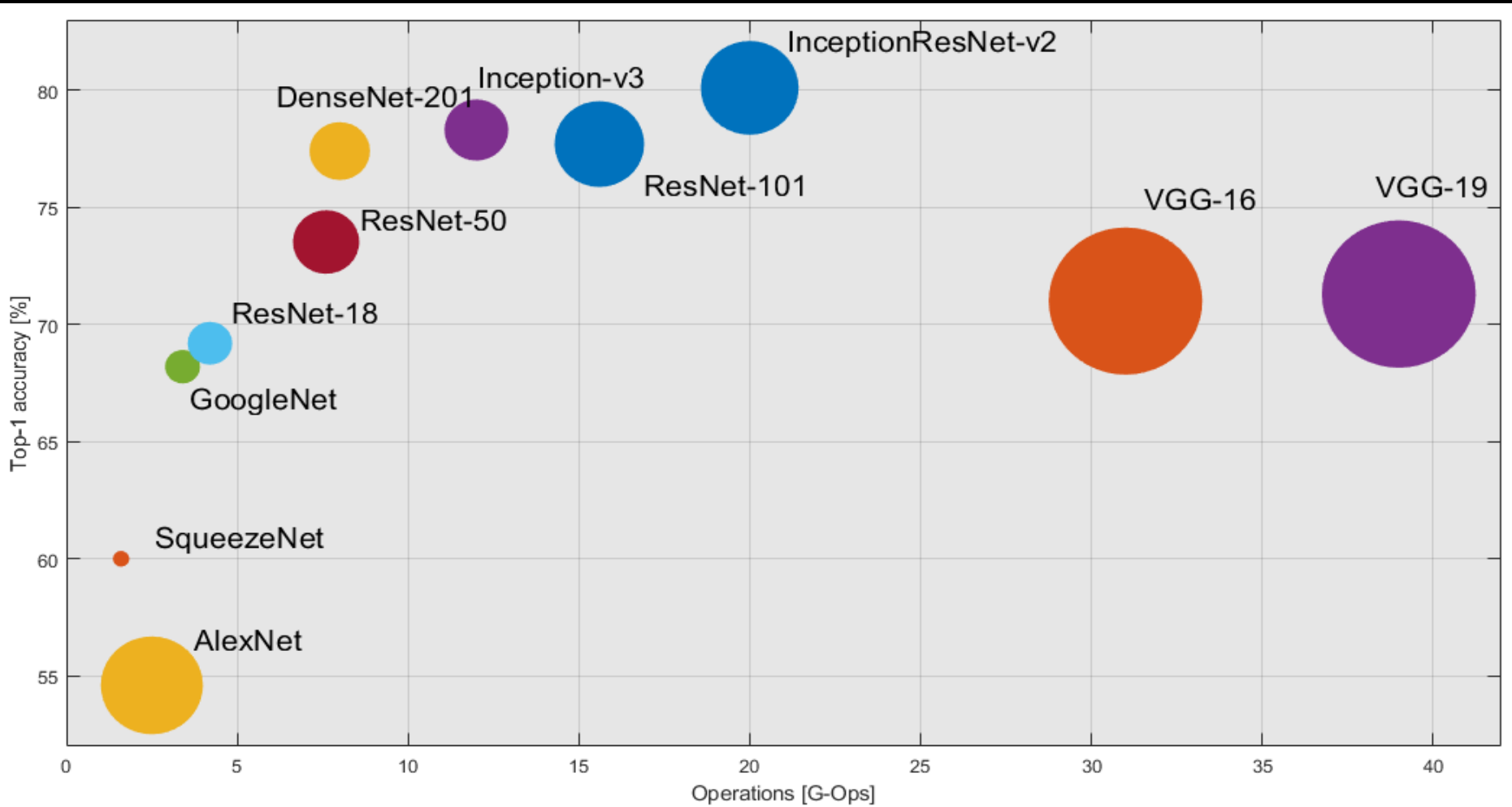
Softmax

Average Pooling

CrossChanel Normalization

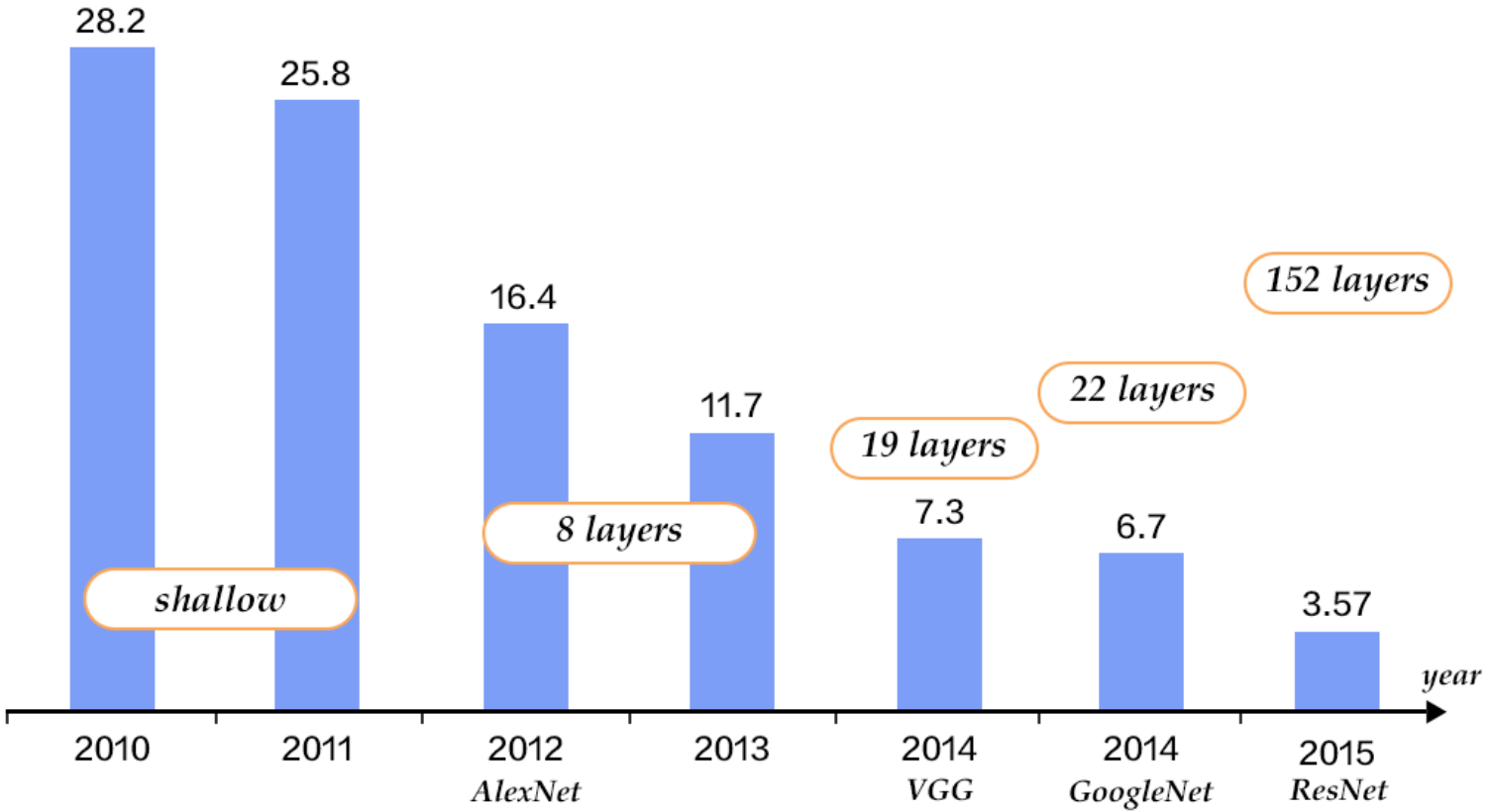
Classification

DepthConcatenation


InceptionResNet-v2
Inception-v3
DenseNet-201
ResNet-101
VGG-16
VGG-19
ResNet-50
ResNet-18
GoogleNet
SqueezeNet
AlexNet
Top-1 accuracy [%]
Operations [G-Ops]
80
75
70
65
60
55
0
5
10
15
20
25
30
35
40

ResNet

ILSVRC


28.2
25.8
16.4
11.7
7.3
6.7
3.57
shallow
8 layers
19 layers
22 layers
152 layers
year
2010
2011
2012
AlexNet
2013
2014
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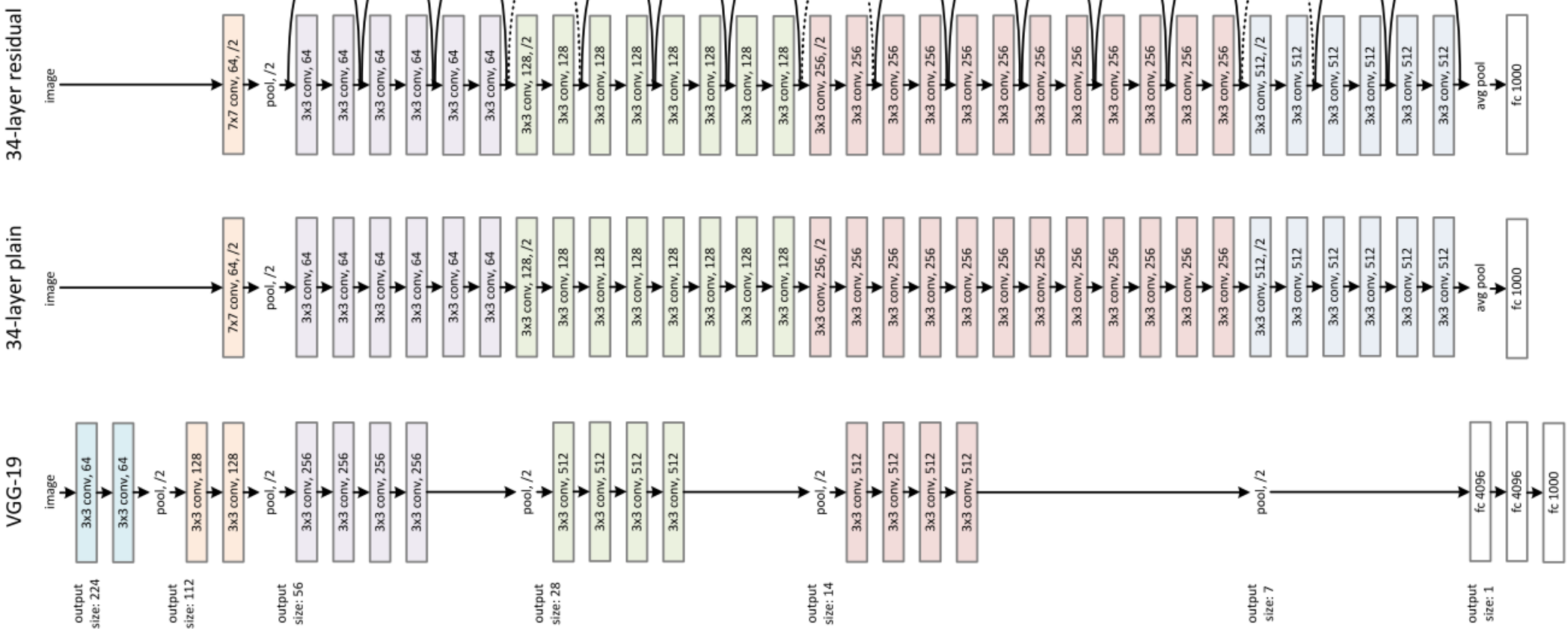
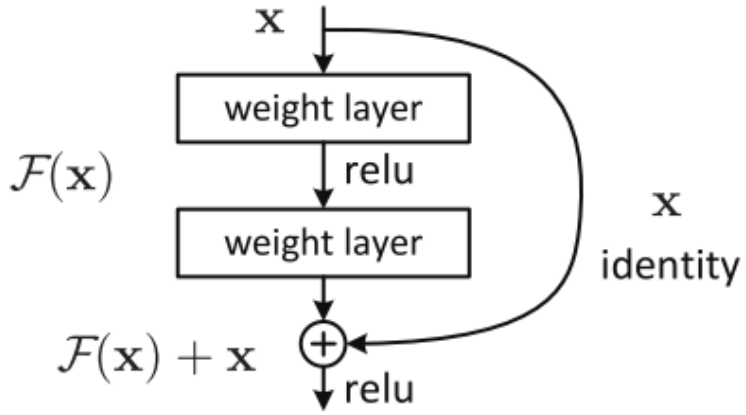
2014
GoogleNet
2015
ResNet

Архитектура

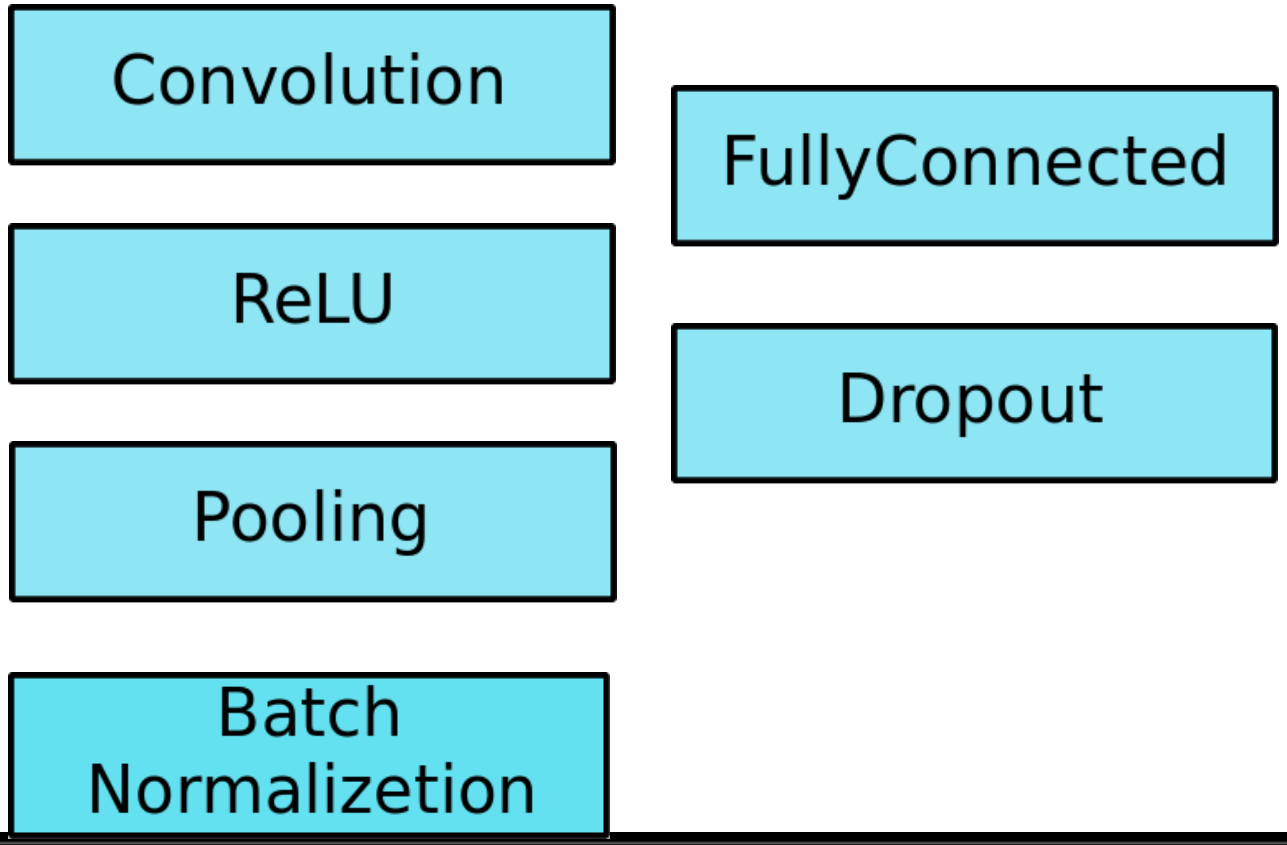



x
weight layer
$\mathcal{F}(\mathbf{x})$
relu
weight layer
x
identity
$\mathcal{F}(\mathbf{x}) + \mathbf{x}$
relu

Строительные блоки

Строительные блоки

Строительные блоки



Строительные блоки

Convolution

ReLU

Pooling

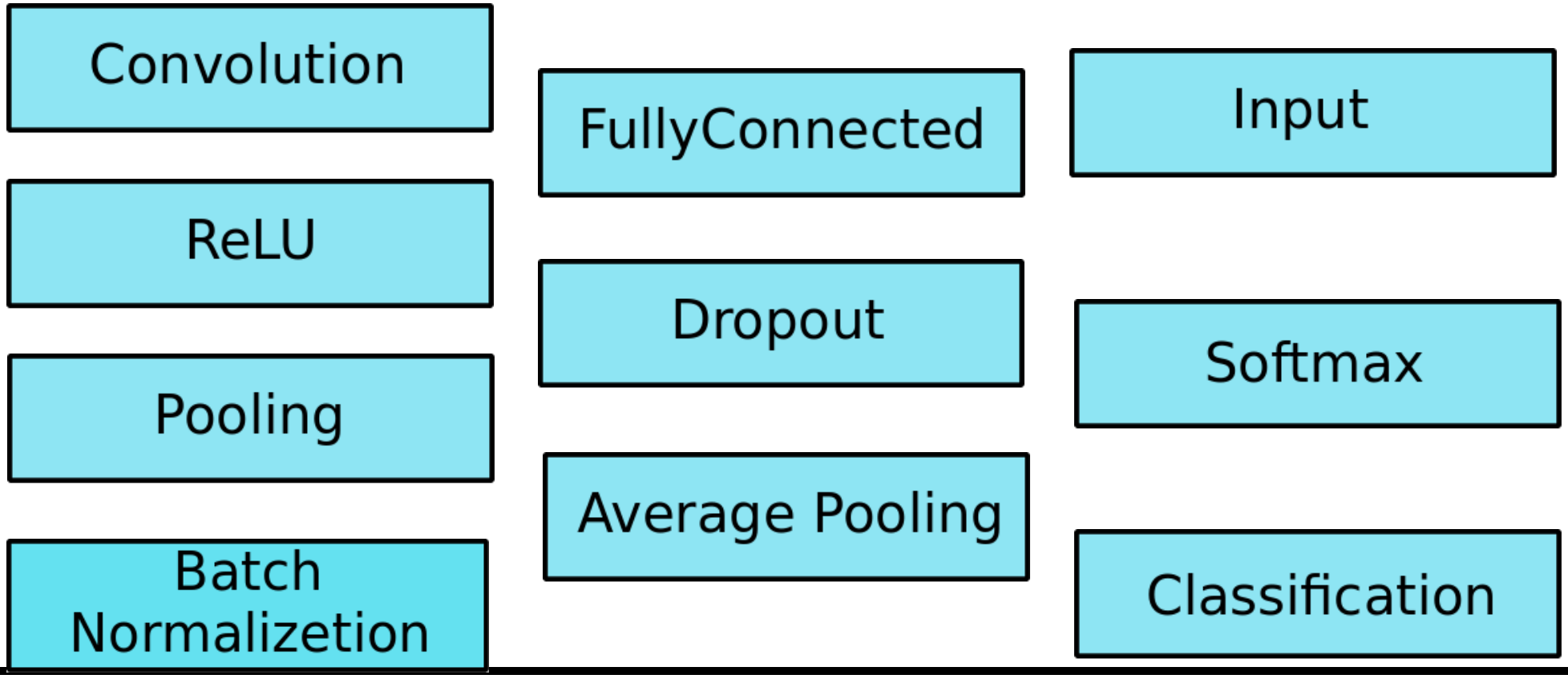
Batch Normalizetion

FullyConnected

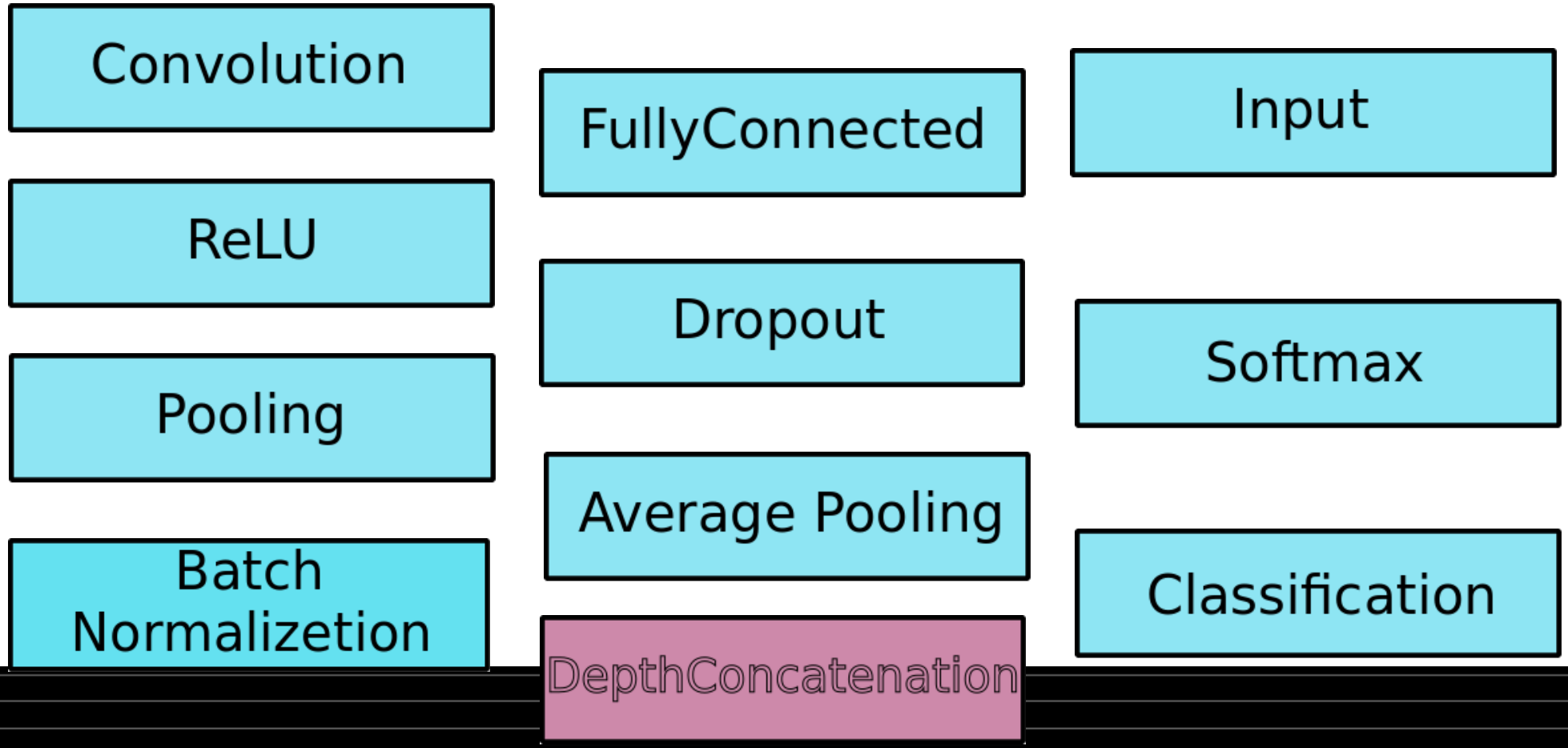
Dropout

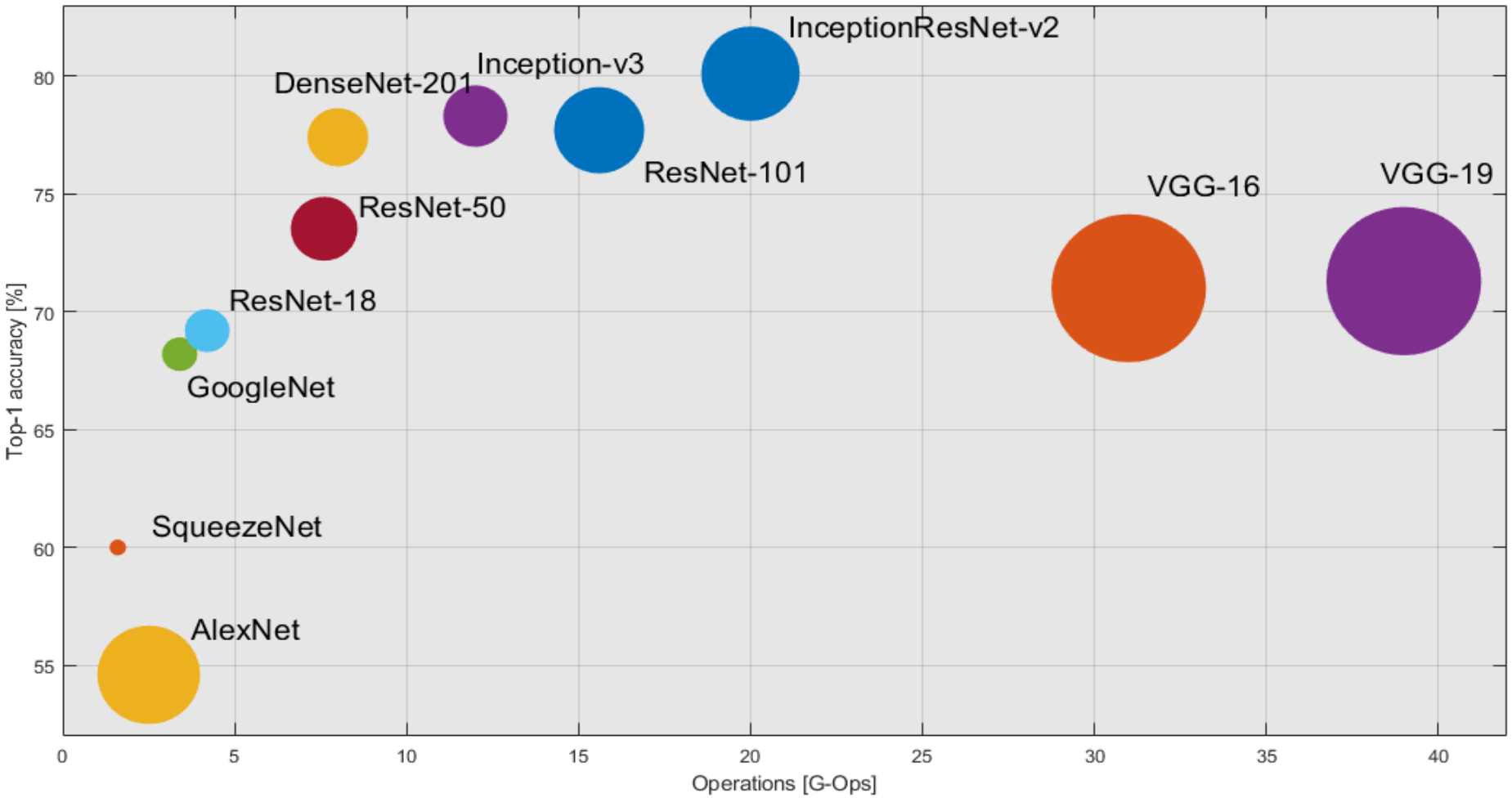
Average Pooling

Строительные блоки

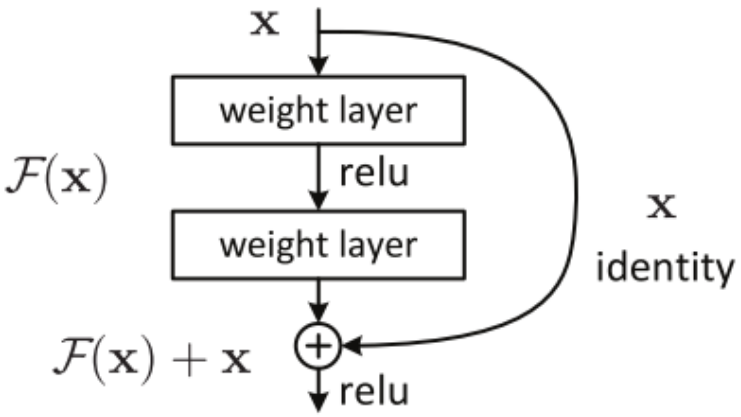


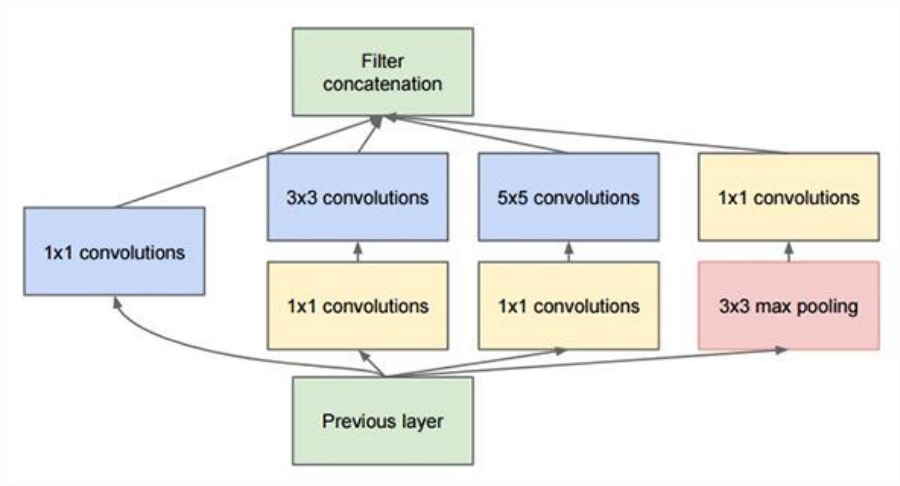
Строительные блоки

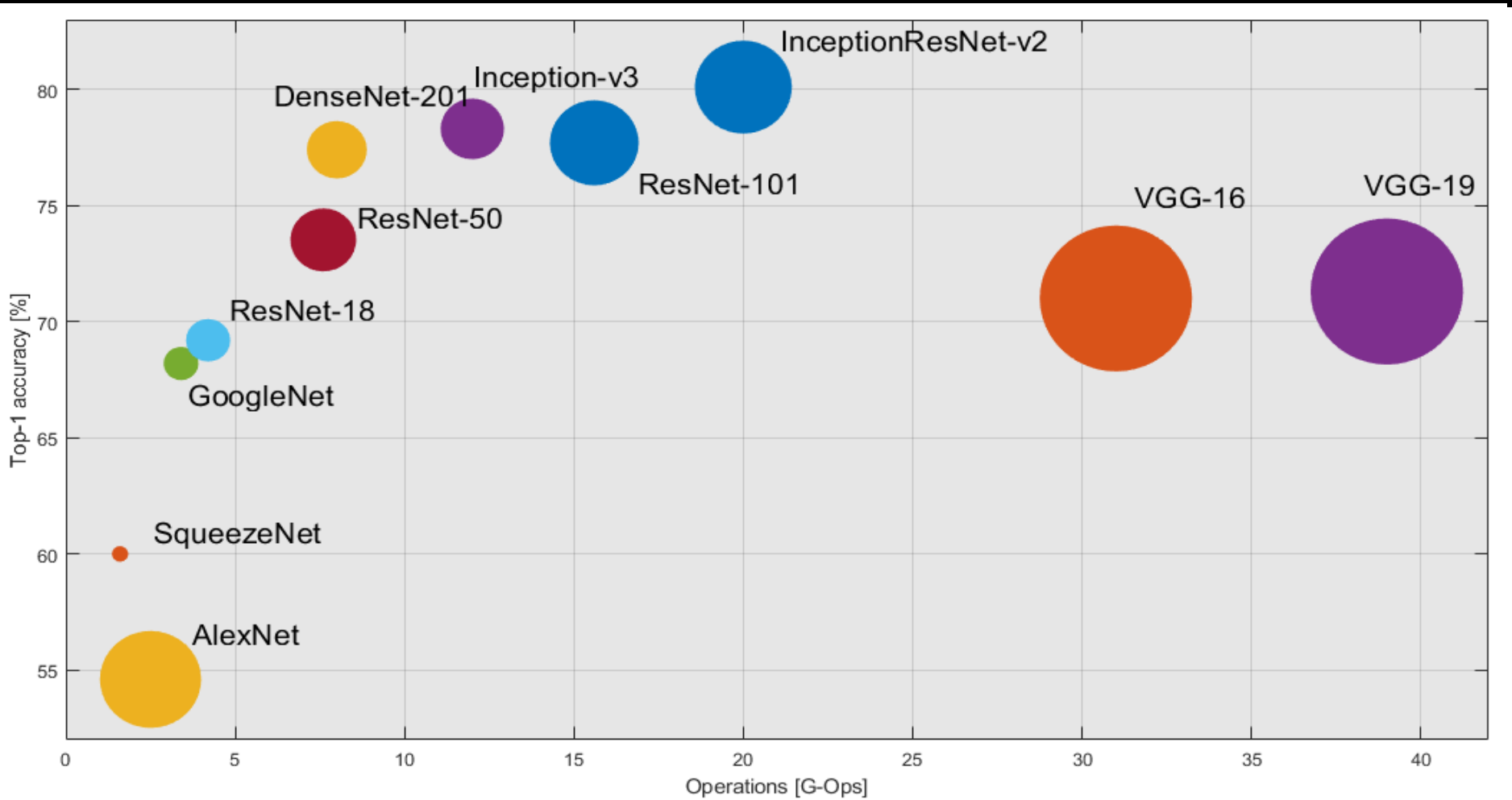



InceptionResNet-v2
Inception-v3
DenseNet-201
ResNet-101
VGG-16
VGG-19
ResNet-50
ResNet-18
GoogleNet
SqueezeNet
AlexNet
Top-1 accuracy [%]
80
75
70
65
60
55
0
5
10
15
20
25
30
35
40
Operations [G-Ops]

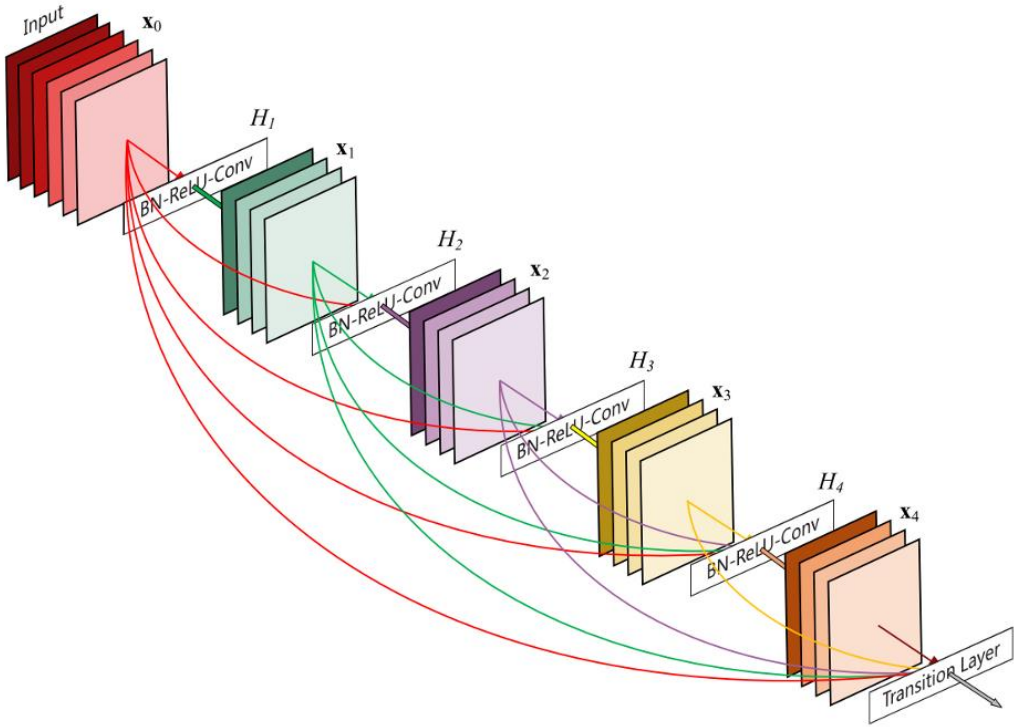
InceptionResNet

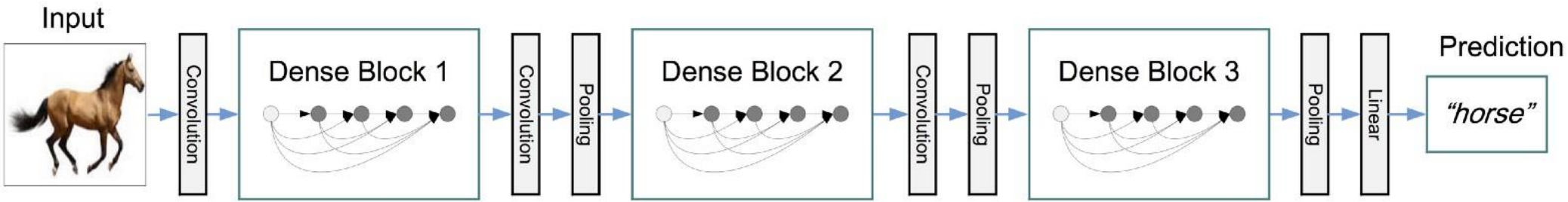


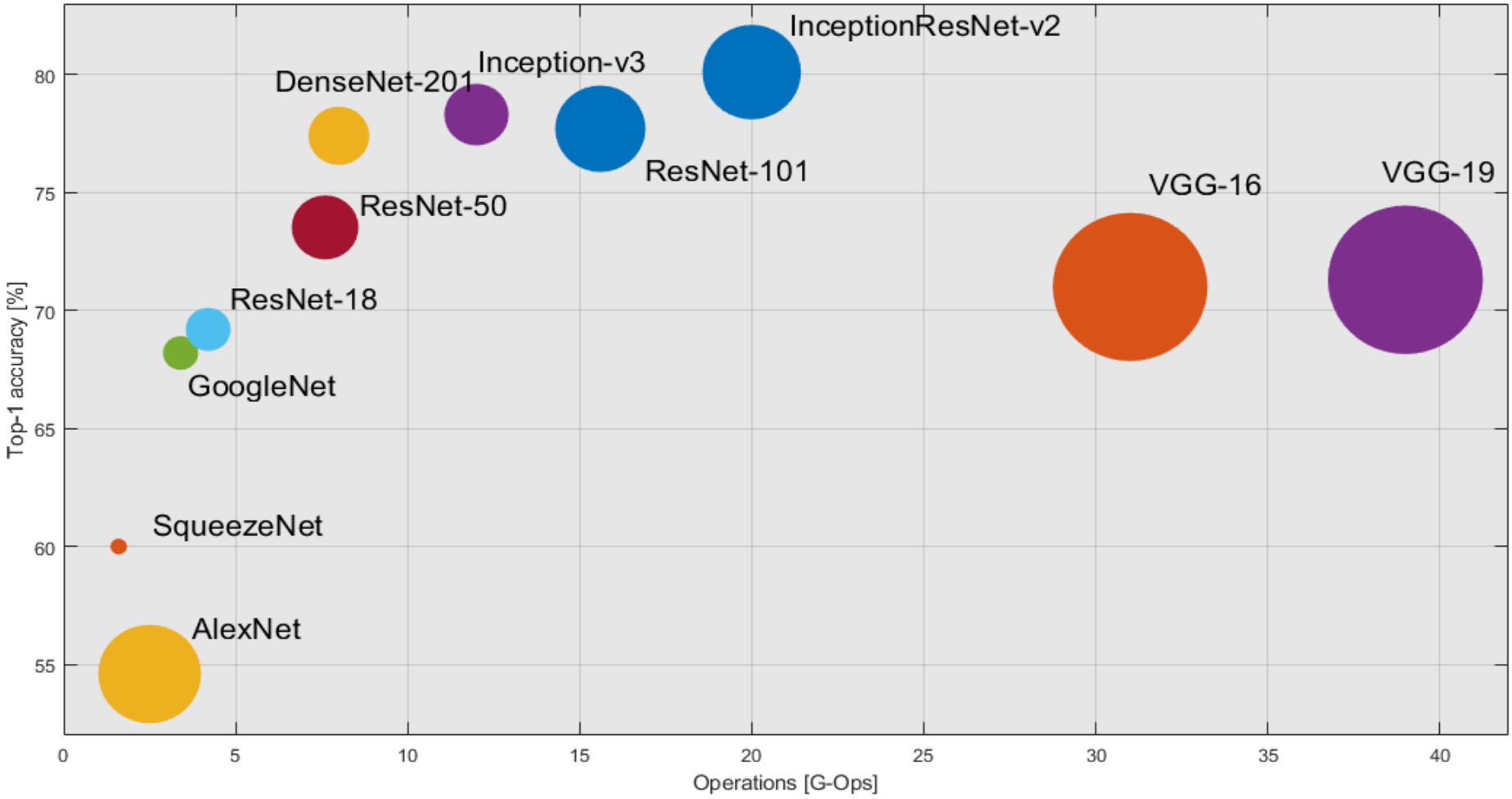



InceptionResNet-v2
Inception-v3
DenseNet-201
ResNet-101
VGG-16
VGG-19
ResNet-50
ResNet-18
GoogleNet
SqueezeNet
AlexNet
Top-1 accuracy [%]
Operations [G-Ops]
80
75
70
65
60
55
0
5
10
15
20
25
30
35
40

DenseNet


Input
$\mathbf{x}_0$
H_1
$\mathbf{x}_1$
BN-ReLU-Conv
H_2
$\mathbf{x}_2$
BN-ReLU-Conv
H_3
$\mathbf{x}_3$
BN-ReLU-Conv
H_4
$\mathbf{x}_4$
BN-ReLU-Conv
Transition Layer


Input
Convolution
Dense Block 1
Convolution
Pooling
Dense Block 2
Convolution
Pooling
Dense Block 3
Pooling
Linear
Prediction
"horse"


InceptionResNet-v2
Inception-v3
DenseNet-201
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VGG-19
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AlexNet
Top-1 accuracy [%]
Operations [G-Ops]
80
75
70
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60
55
0
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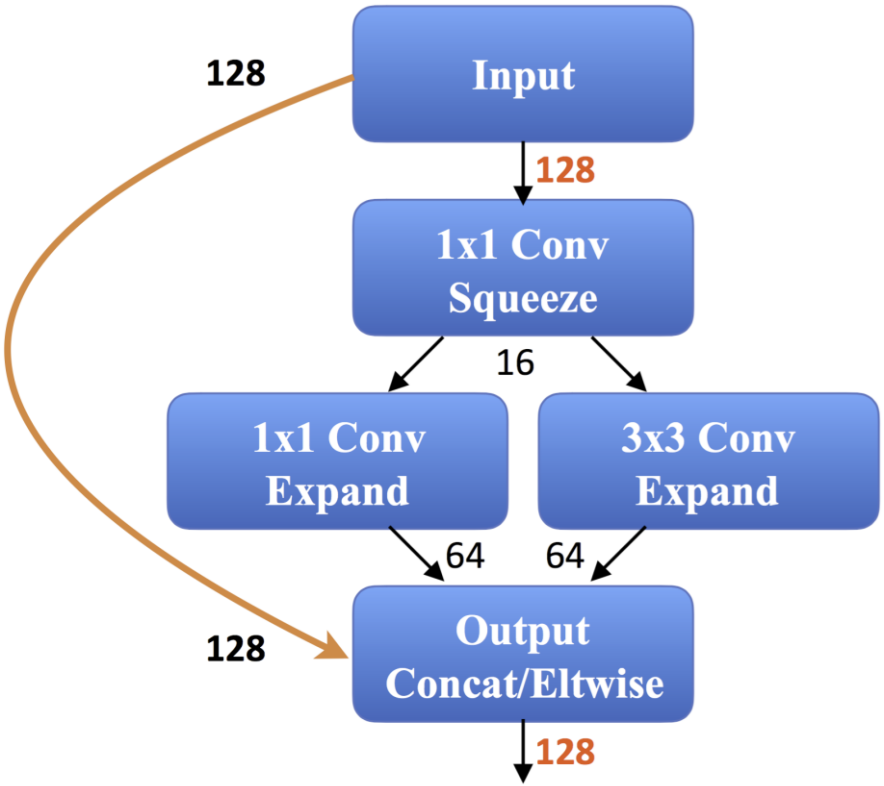
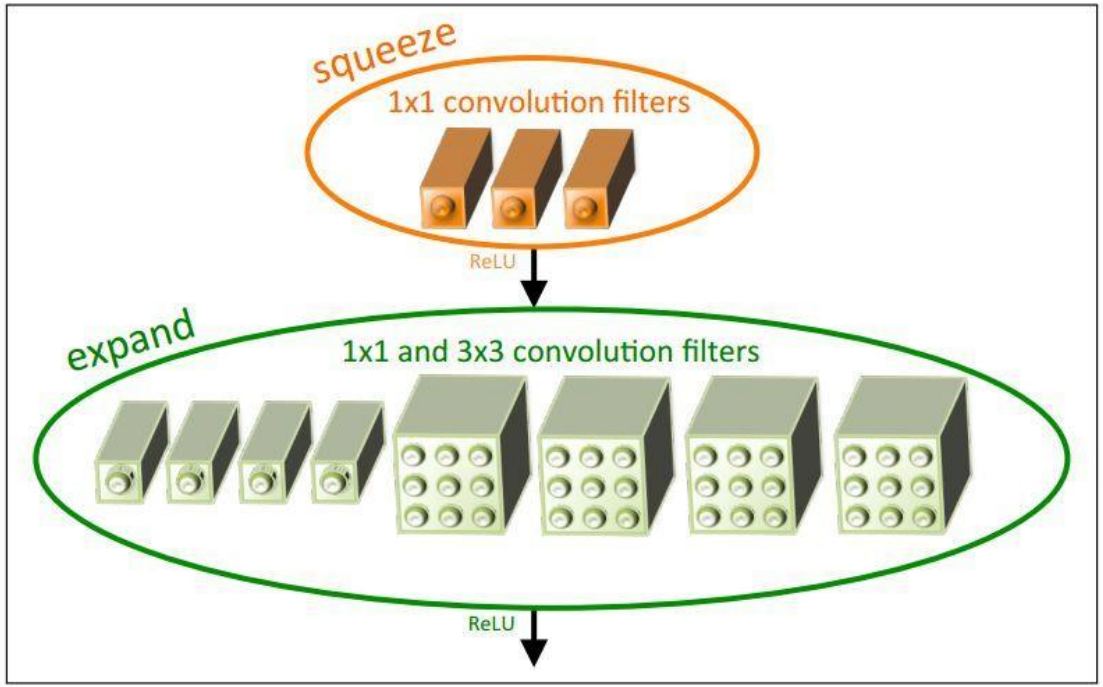
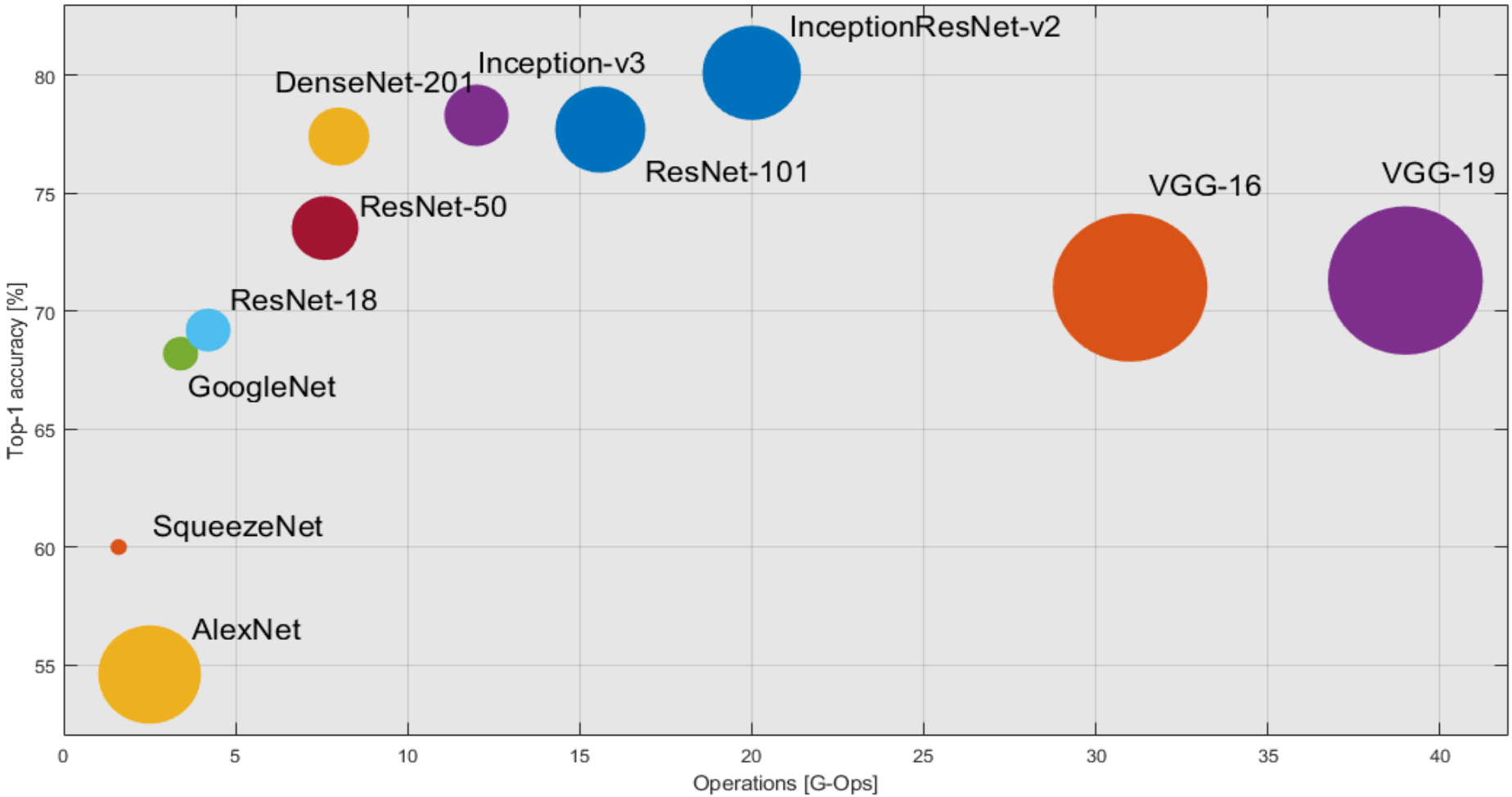
35
40

SqueezeNet


128
Input
128
1x1 Conv
Squeeze
16
1x1 Conv
Expand
3x3 Conv
Expand
64
64
128
Output
Concat/Eltwise
128


squeeze
1x1 convolution filters
ReLU
expand
1x1 and 3x3 convolution filters
ReLU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