Convolutional Neural Network

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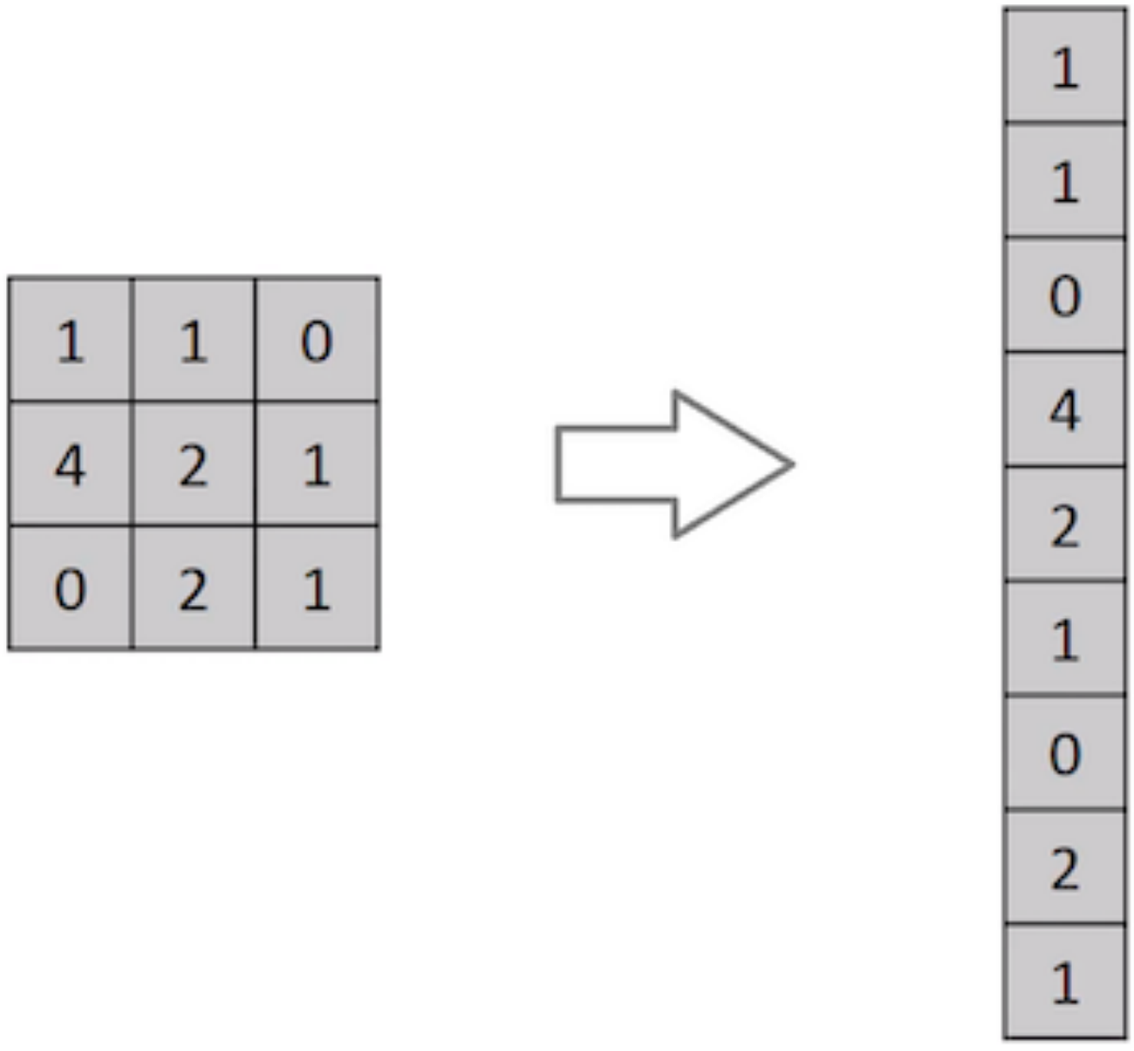
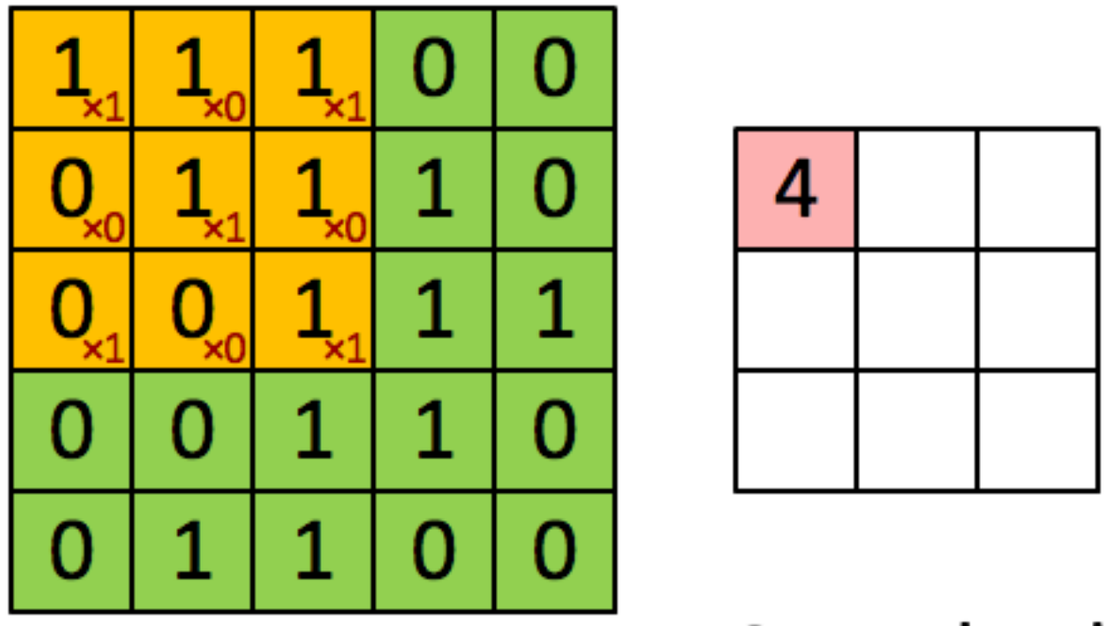
MLP Disadvantages

- A lot of parameters to solve task (neurons)
- Highly overfitting

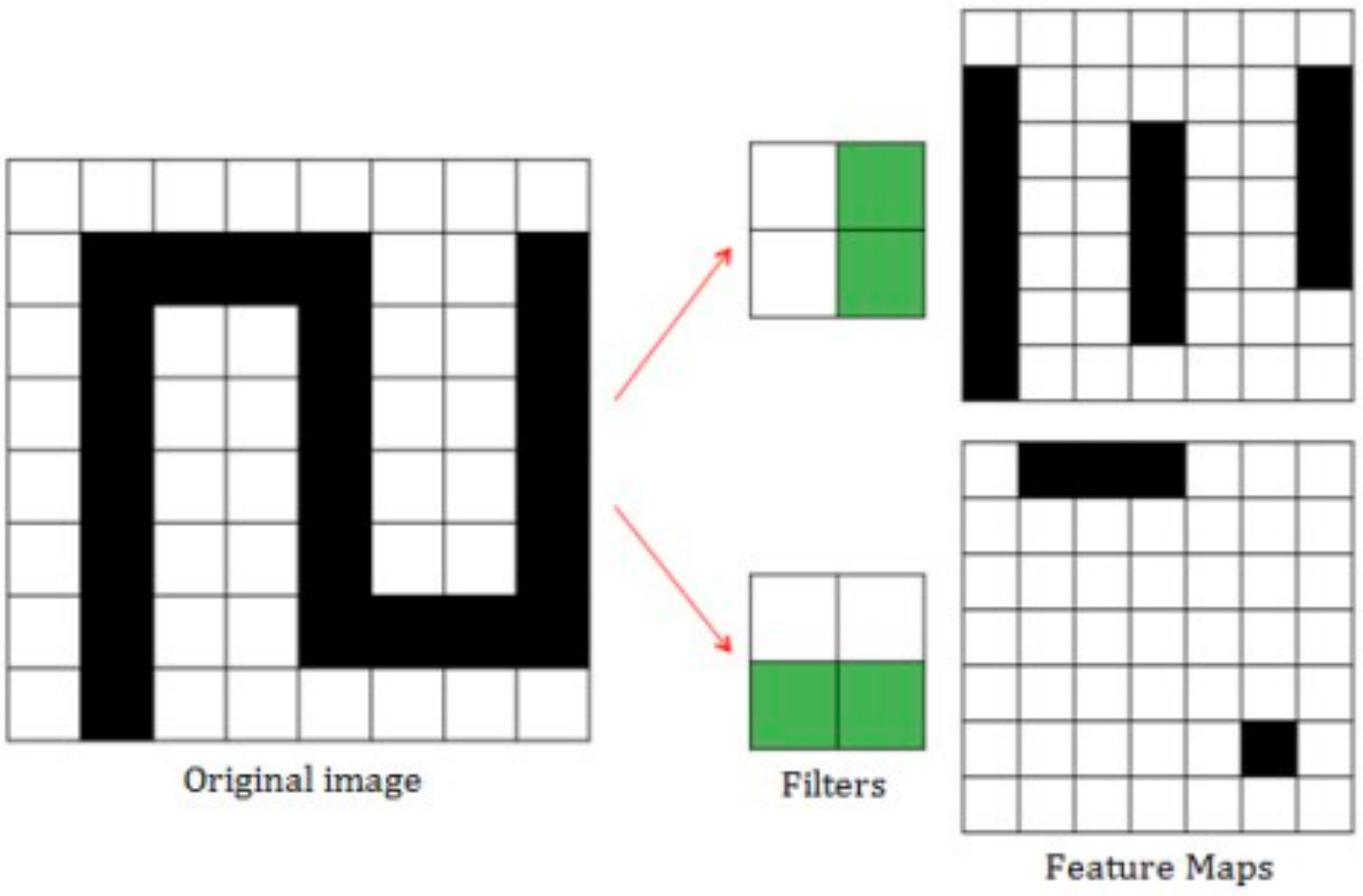
Convolutional Neural Network



Convolutional Neural Network

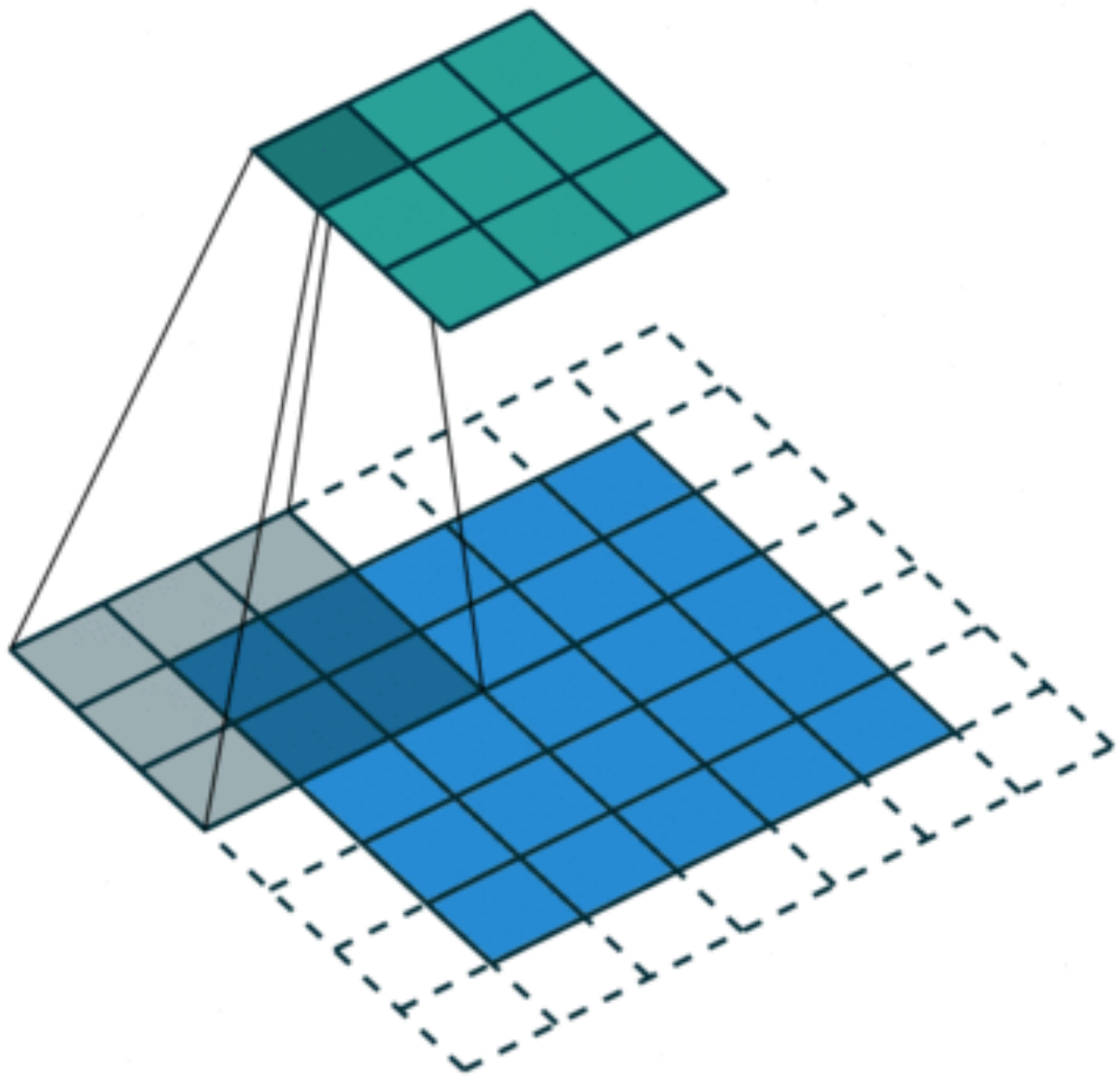


Convolutional Neural Network

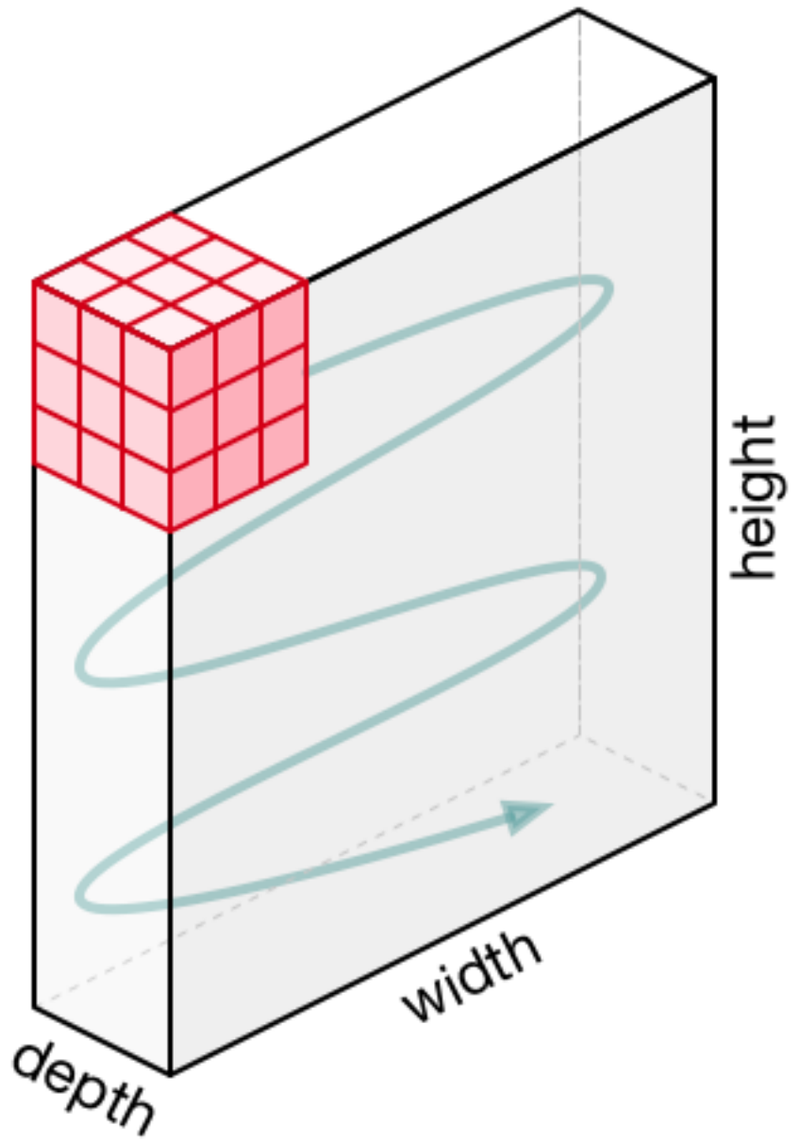


Convolutional Neural Network

Stride



Convolutional Neural Network



Convolutional Neural Network

0	0	0	0	0	0	...
0	156	155	156	158	158	...
0	153	154	157	159	159	...
0	149	151	155	158	159	...
0	146	146	149	153	158	...
0	145	143	143	148	158	...
...	...	...	...	...	...	...

Input Channel #1 (Red)

-1	-1	1
0	1	-1
0	1	1

Kernel Channel #1

308

0	0	0	0	0	0	...
0	167	166	167	169	169	...
0	164	165	168	170	170	...
0	160	162	166	169	170	...
0	156	156	159	163	168	...
0	155	153	153	158	168	...
...	...	...	...	...	...	...

Input Channel #2 (Green)

1	0	0
1	-1	-1
1	0	-1

Kernel Channel #2

−498

0	0	0	0	0	0	...
0	163	162	163	165	165	...
0	160	161	164	166	166	...
0	156	158	162	165	166	...
0	155	155	158	162	167	...
0	154	152	152	157	167	...
...	...	...	...	...	...	...

Input Channel #3 (Blue)

0	1	1
0	1	0
1	-1	1

Kernel Channel #3

164

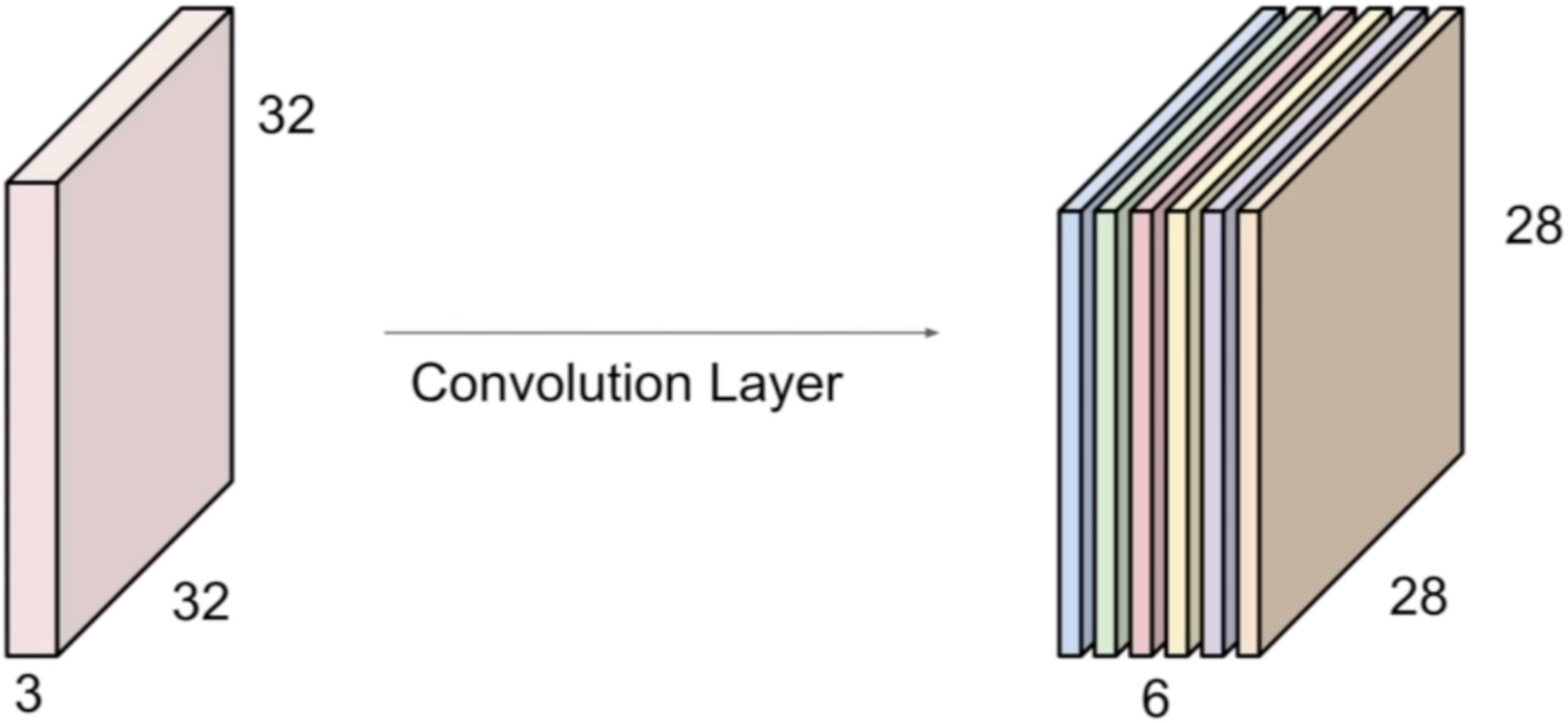
$+ 1 = -25$

Bias = 1

Output

-25				...
				...
				...
				...
...	...	...	...	...

Convolutional Neural Network

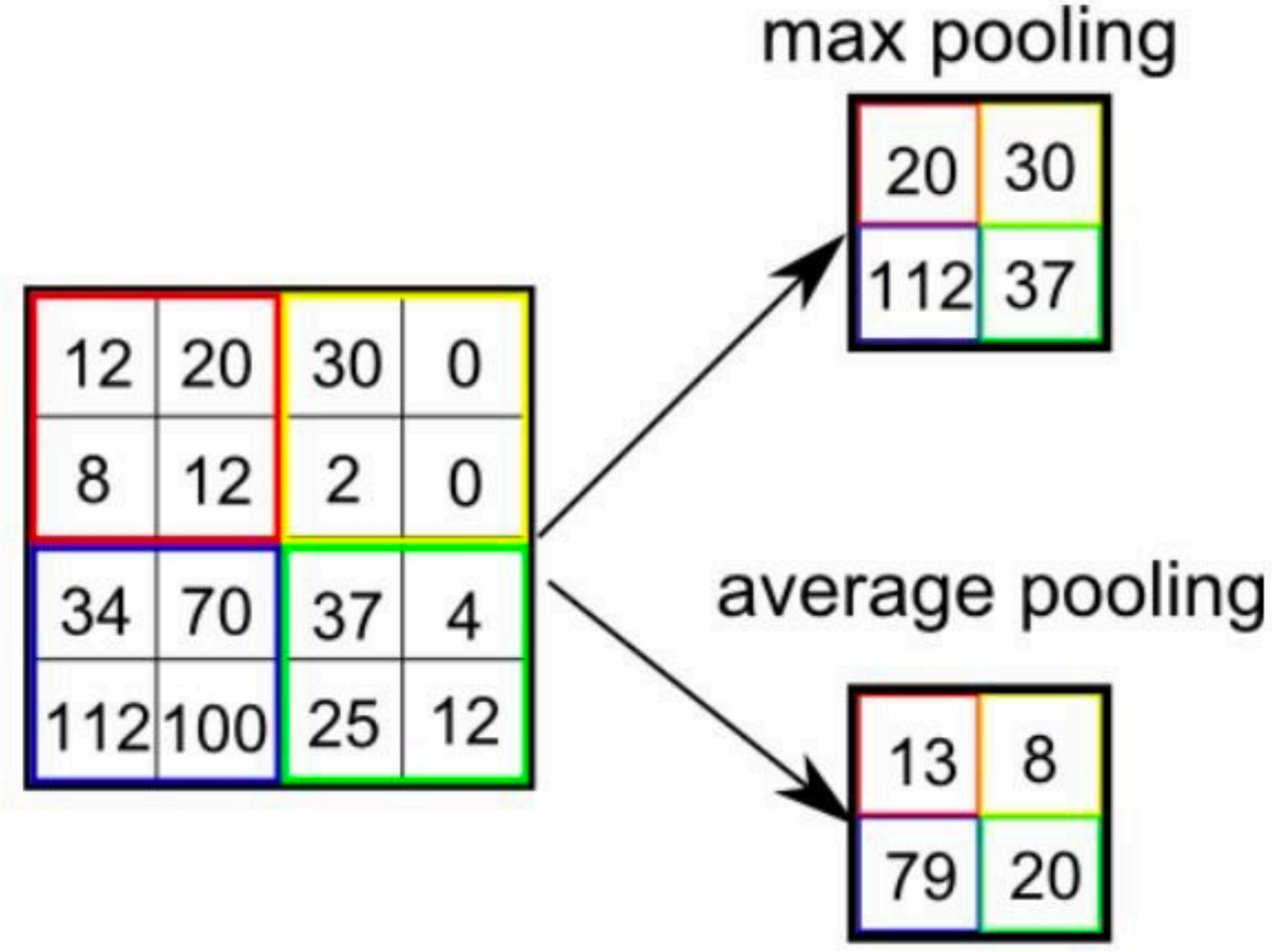


Convolutional Neural Network

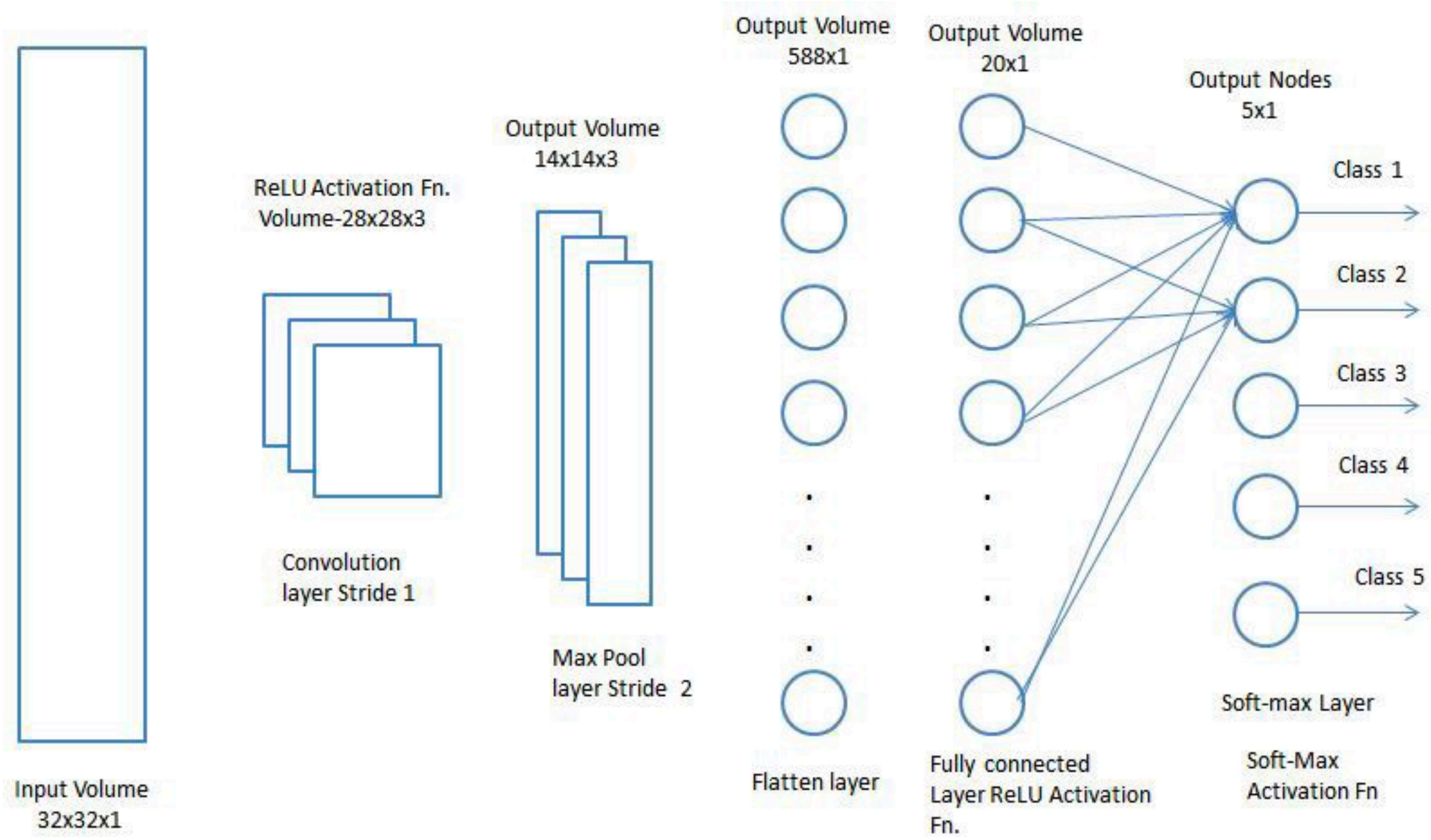
3	3	2	1	0
0	0	1	3	1
3	1	2	2	3
2	0	0	2	2
2	0	0	0	1

3.0	3.0	3.0
3.0	3.0	3.0
3.0	2.0	3.0

Convolutional Neural Network

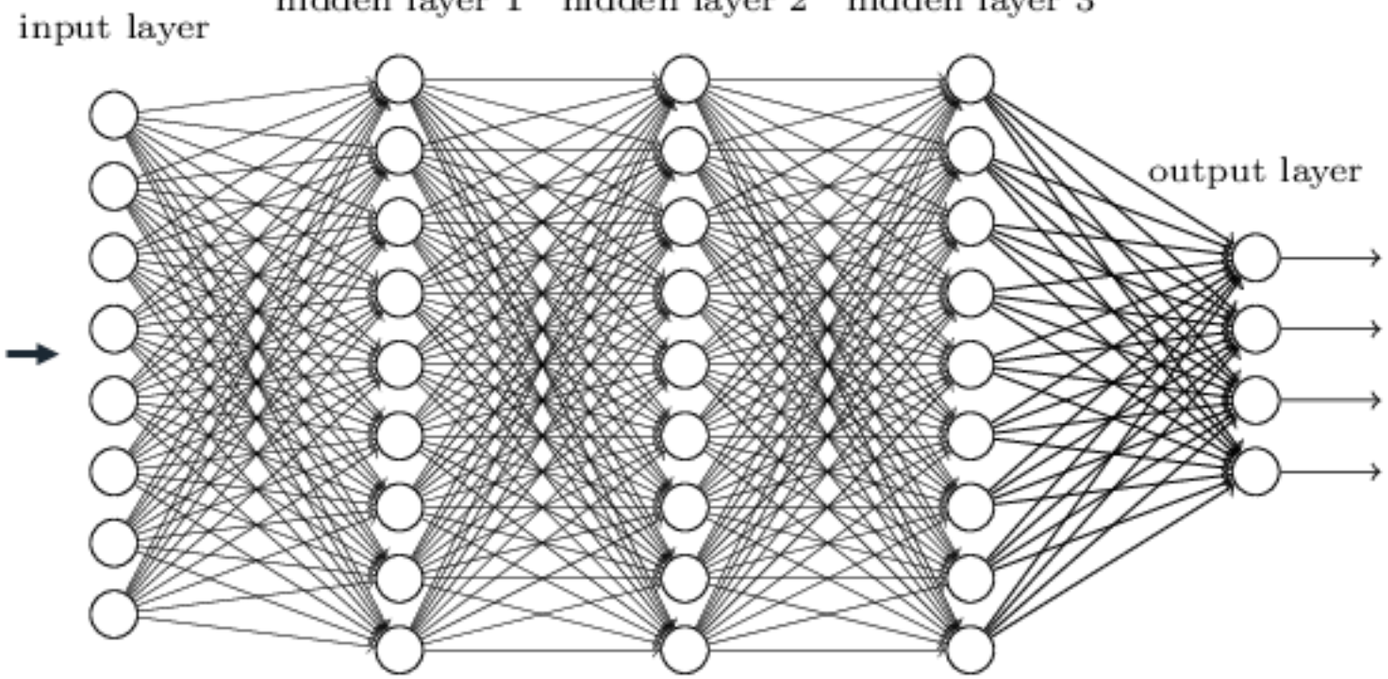


Convolutional Neural Network



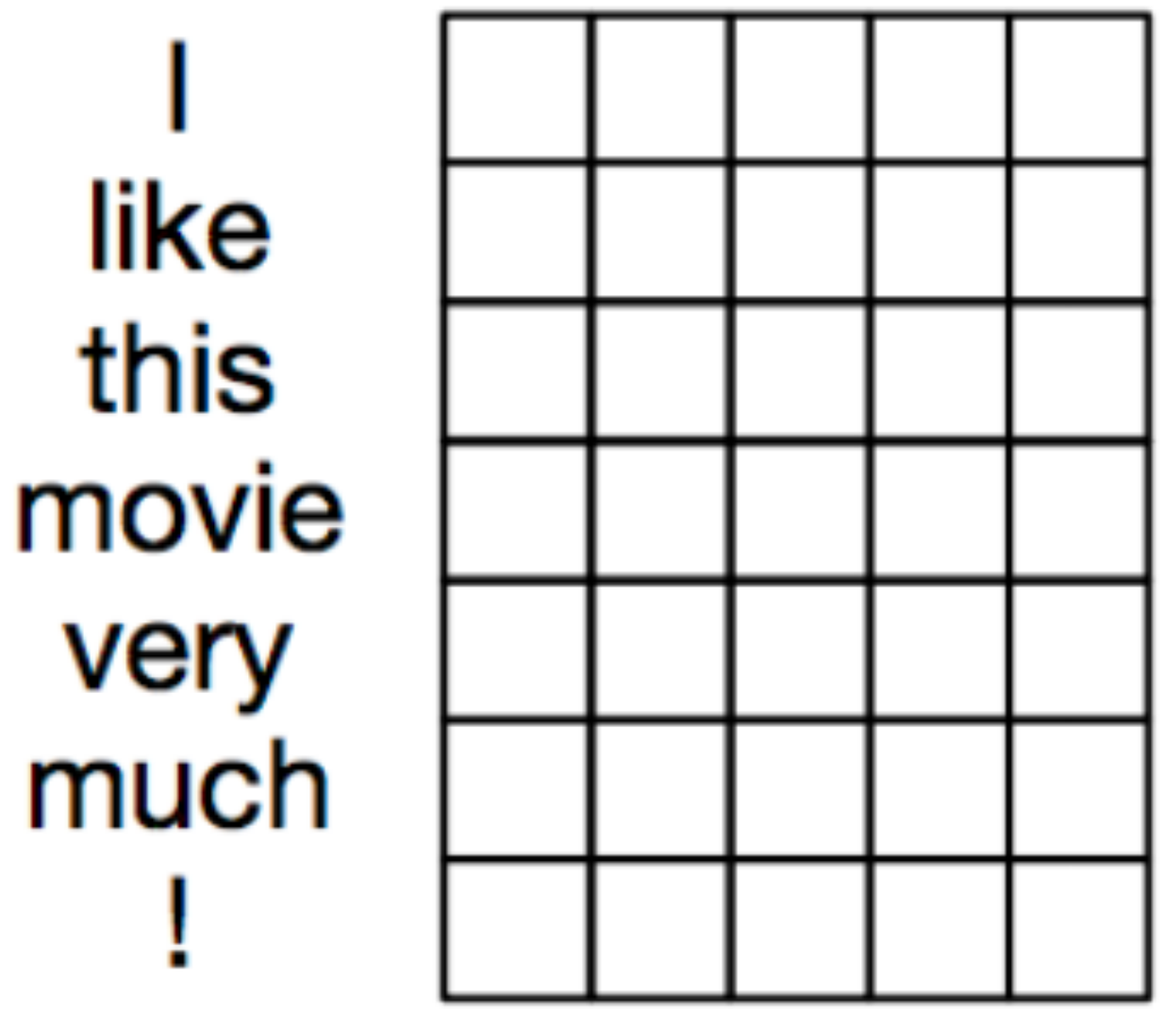
Convolutional Neural Network

Deep neural networks learn hierarchical feature representations

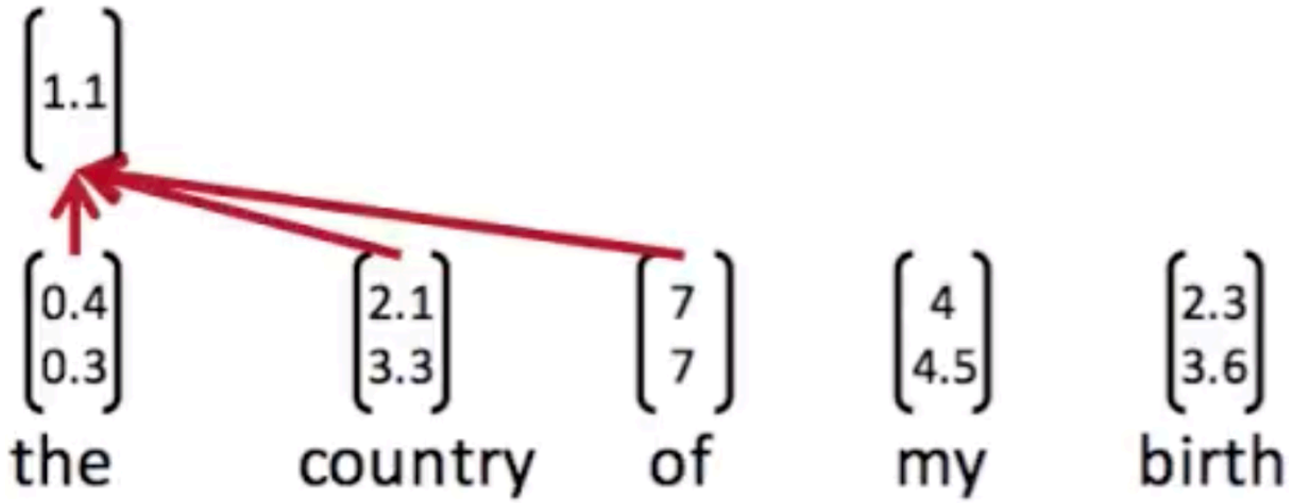


Convolutional Neural Network

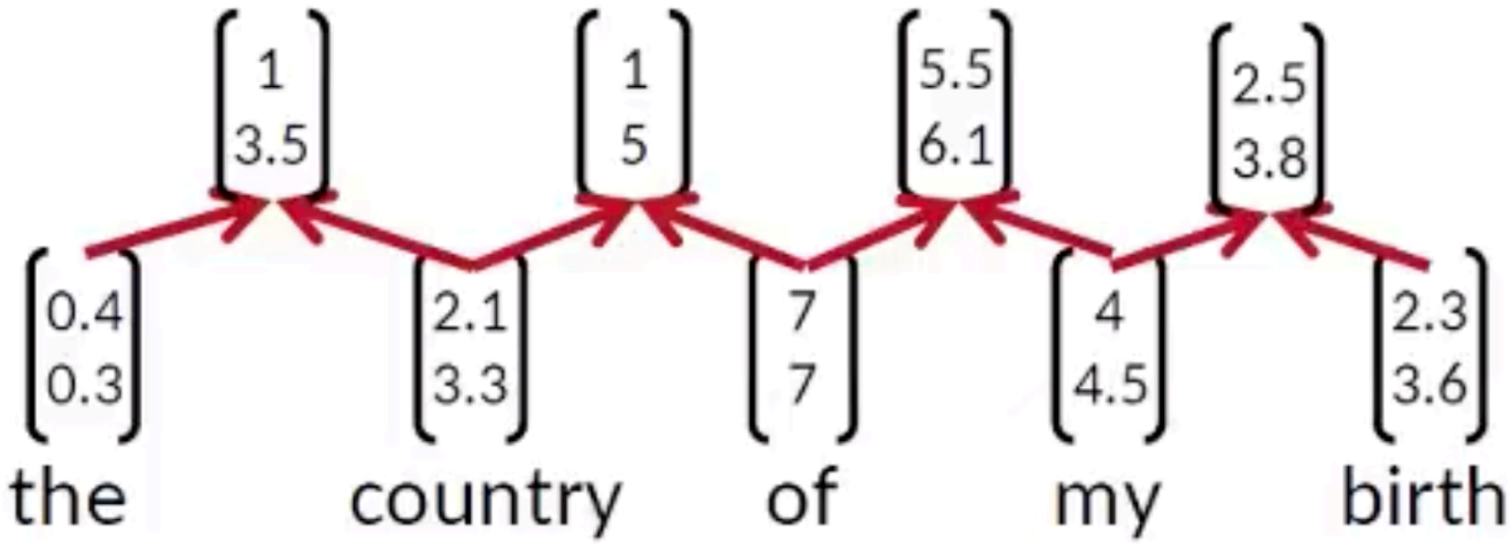
embedding_dim = 5



Convolutional Neural Network

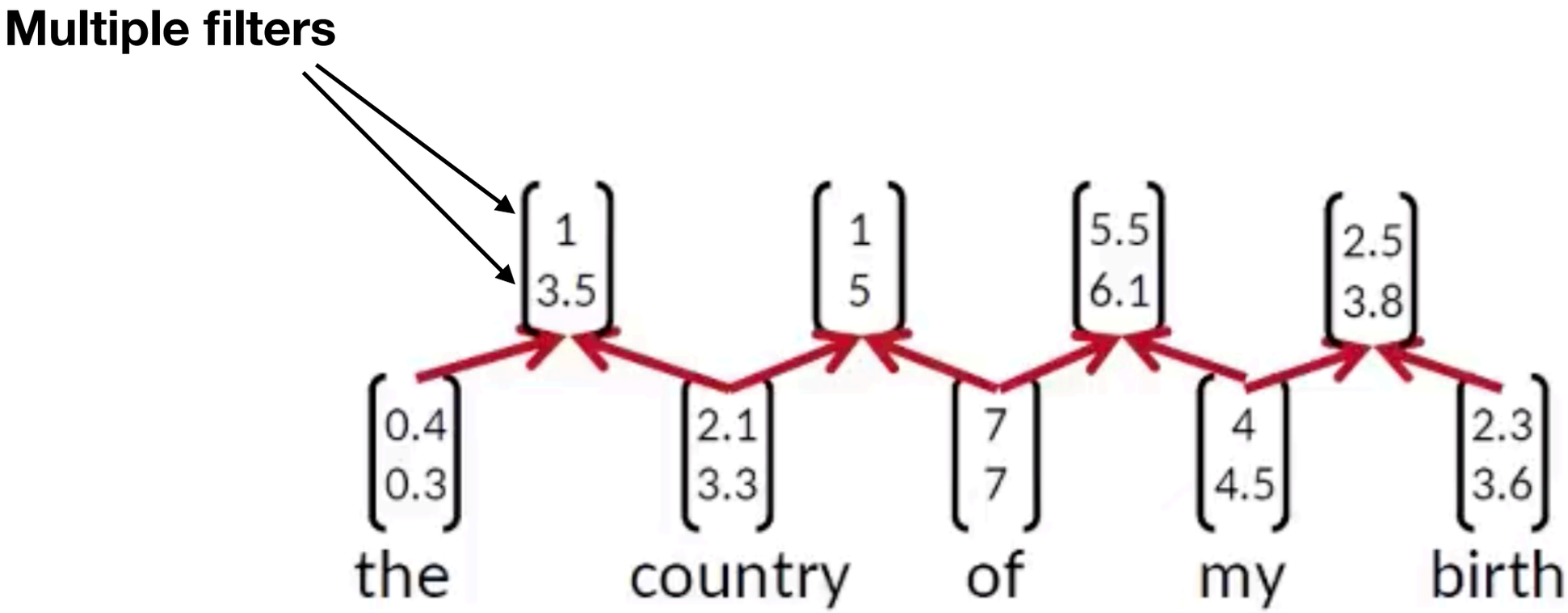


Convolutional Neural Network



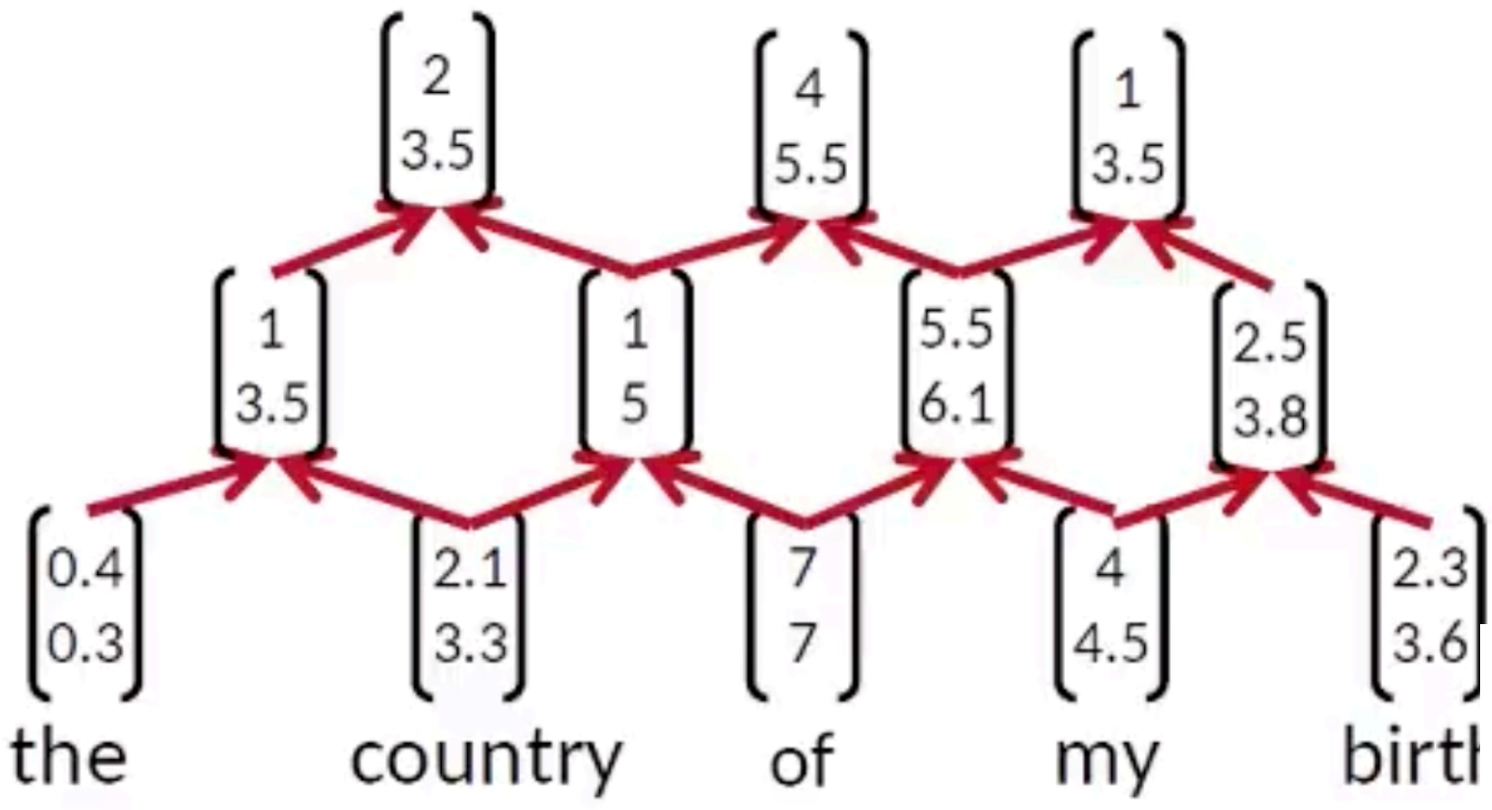
$$p = \tanh\left(W \begin{bmatrix} c_1 \\ c_2 \end{bmatrix} + b\right)$$

Convolutional Neural Network



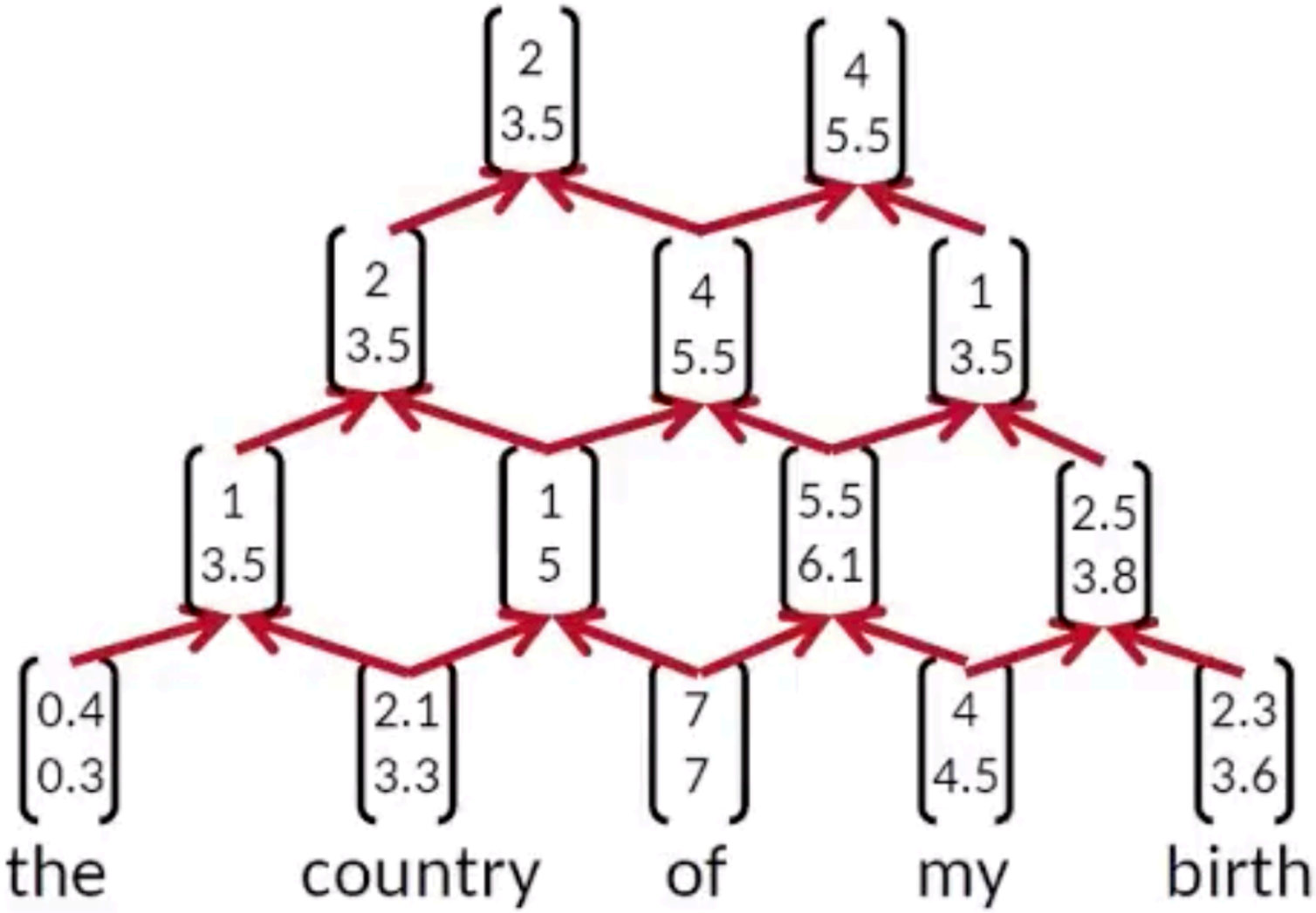
$$p = \tanh\left(W \begin{bmatrix} c_1 \\ c_2 \end{bmatrix} + b\right)$$

Convolutional Neural Network

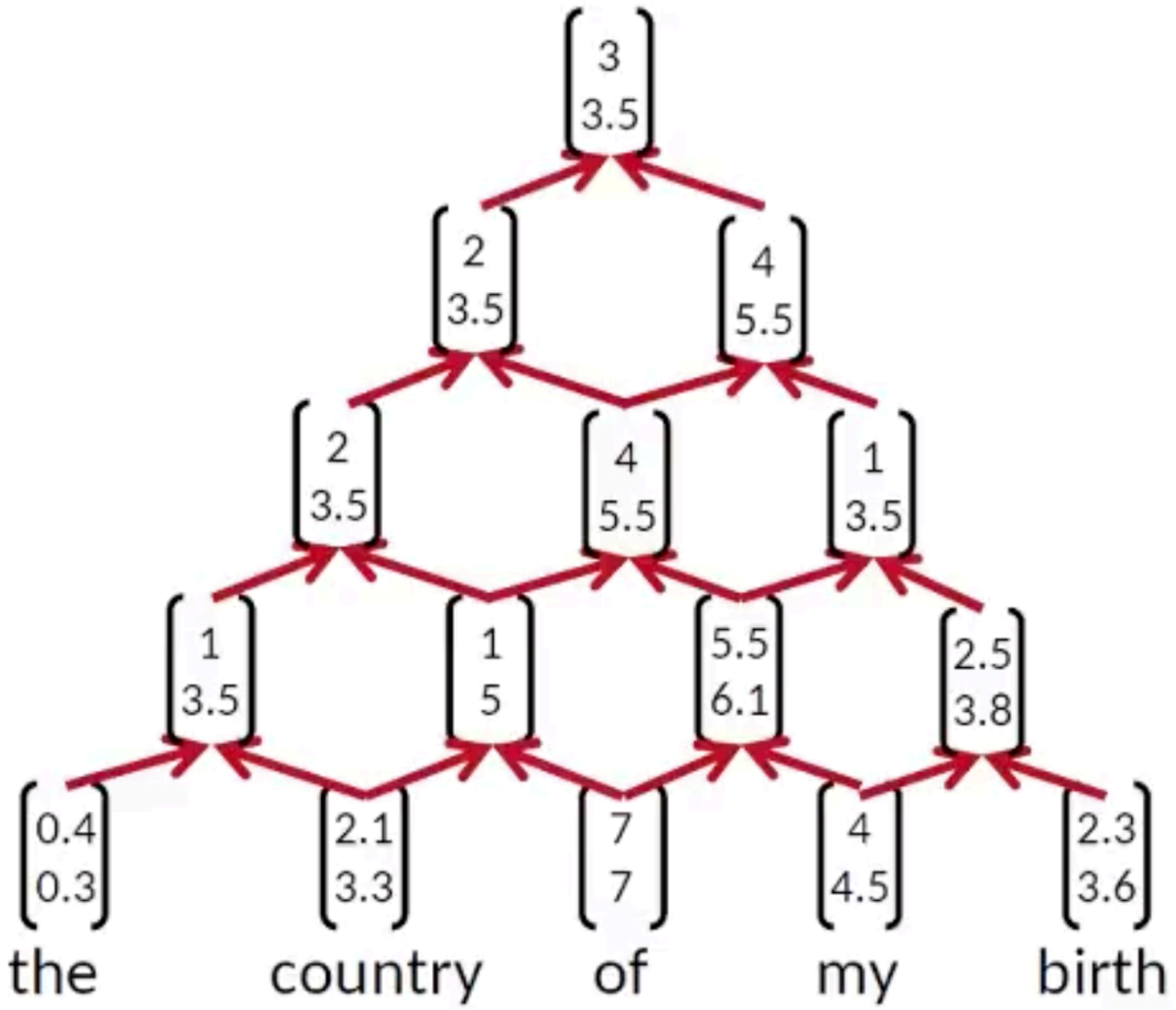


$$p = \tanh\left(W^{(2)}\begin{bmatrix} c_1 \\ c_2 \end{bmatrix} + b\right)$$

Convolutional Neural Network

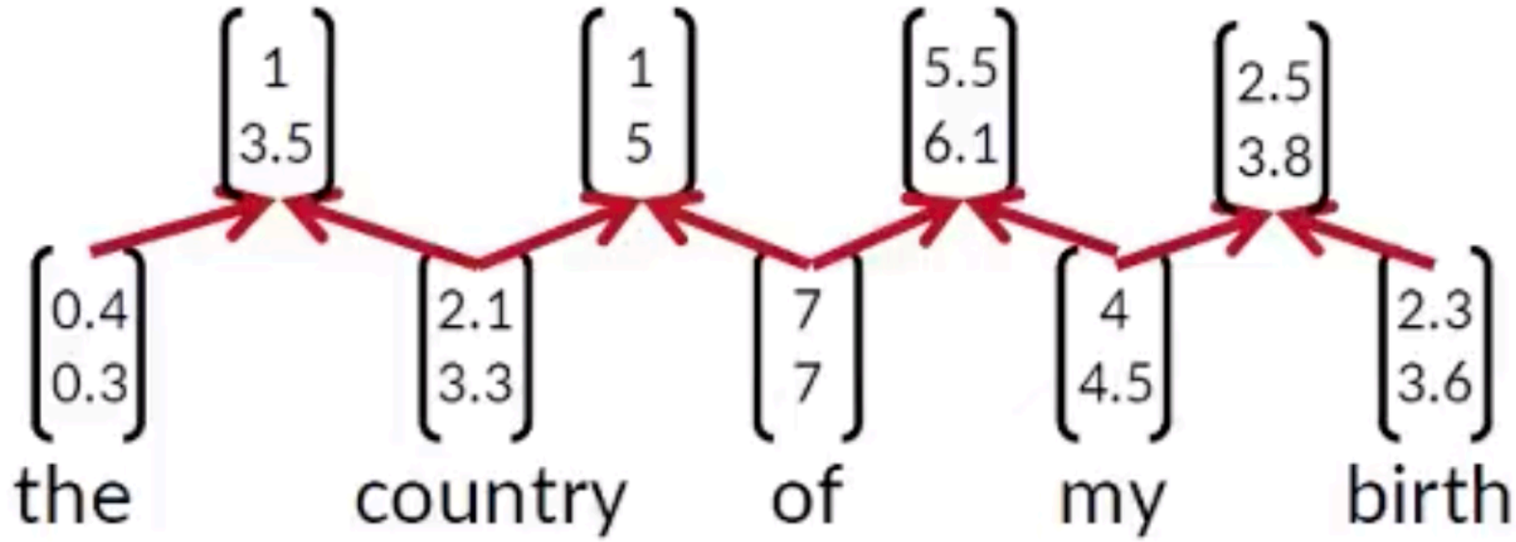


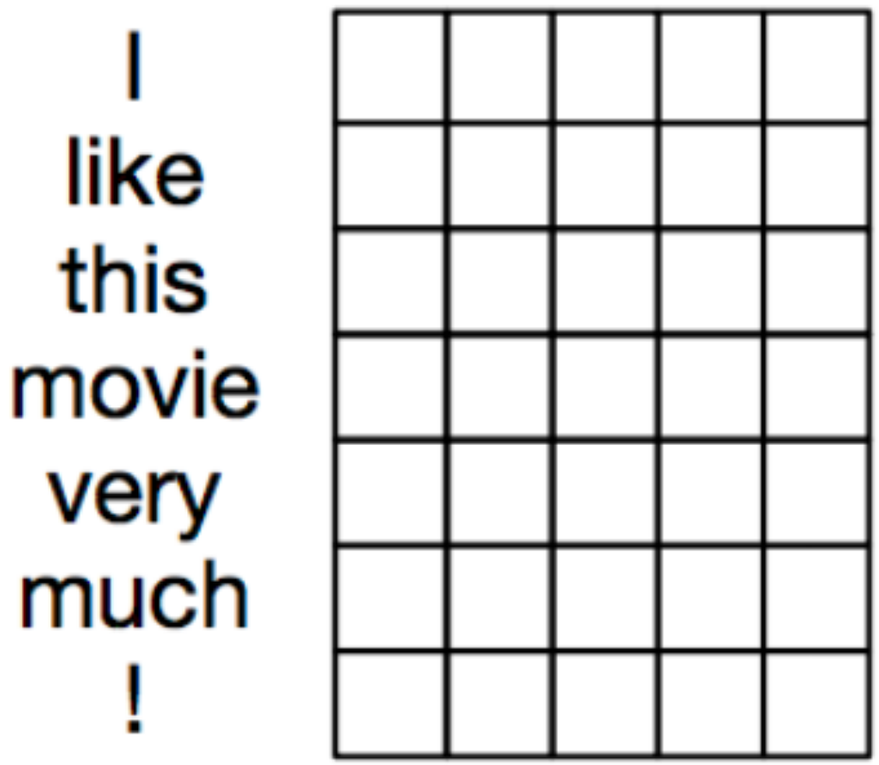
Convolutional Neural Network



Convolutional Neural Network

Max over time pooling





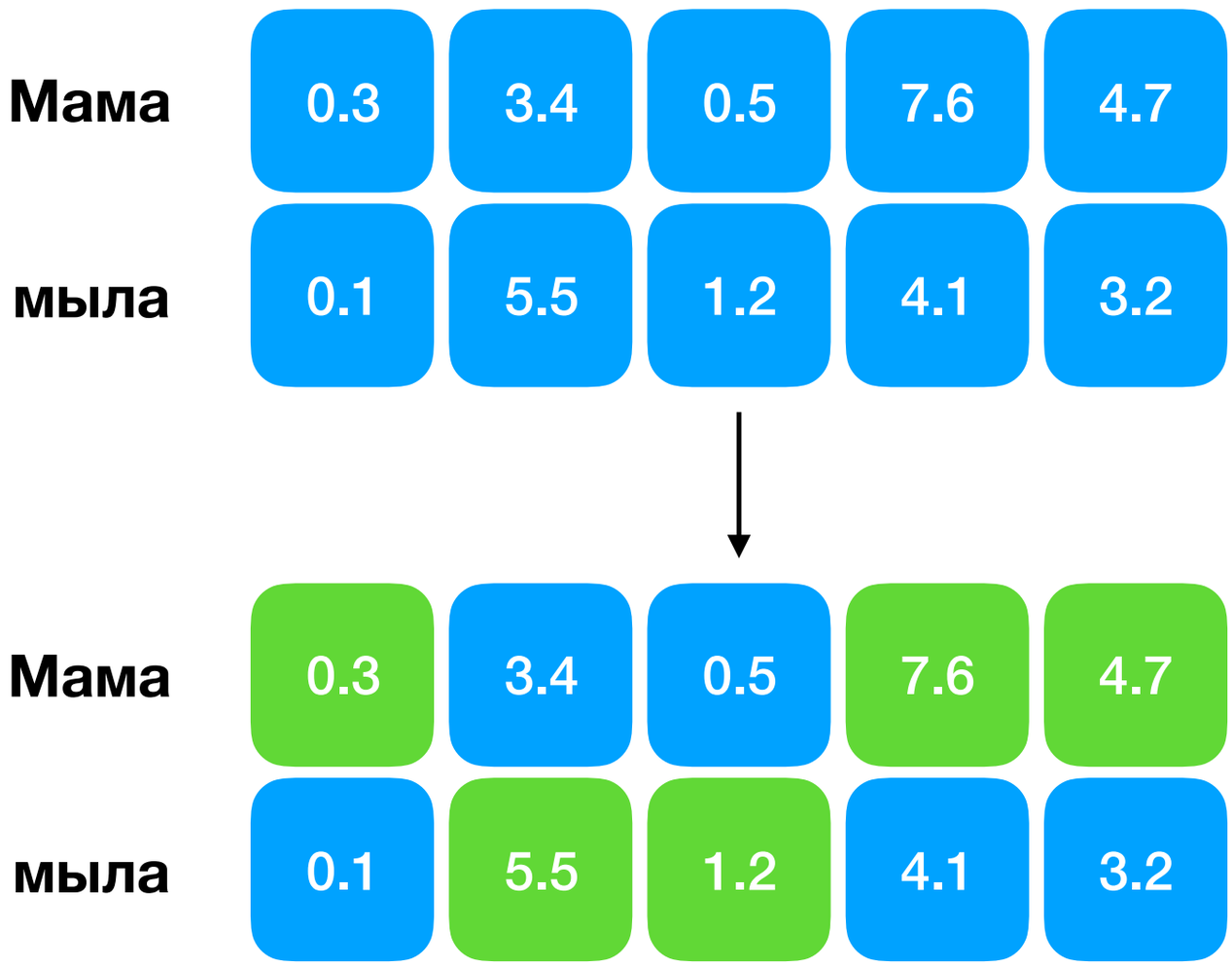
Convolutional Neural Network

Max over time pooling

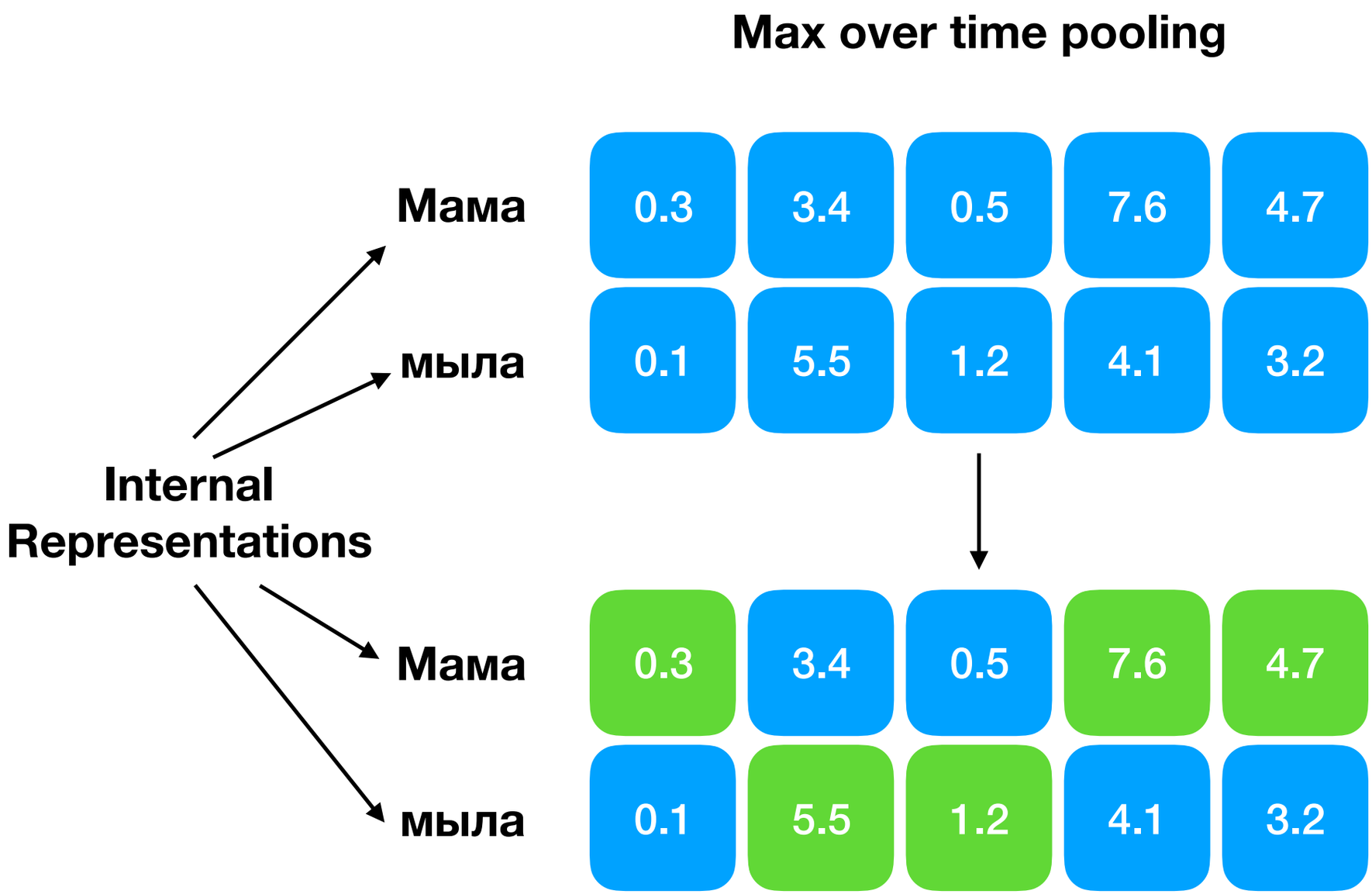
Мама	0.3	3.4	0.5	7.6	4.7
мыла	0.1	5.5	1.2	4.1	3.2

Convolutional Neural Network

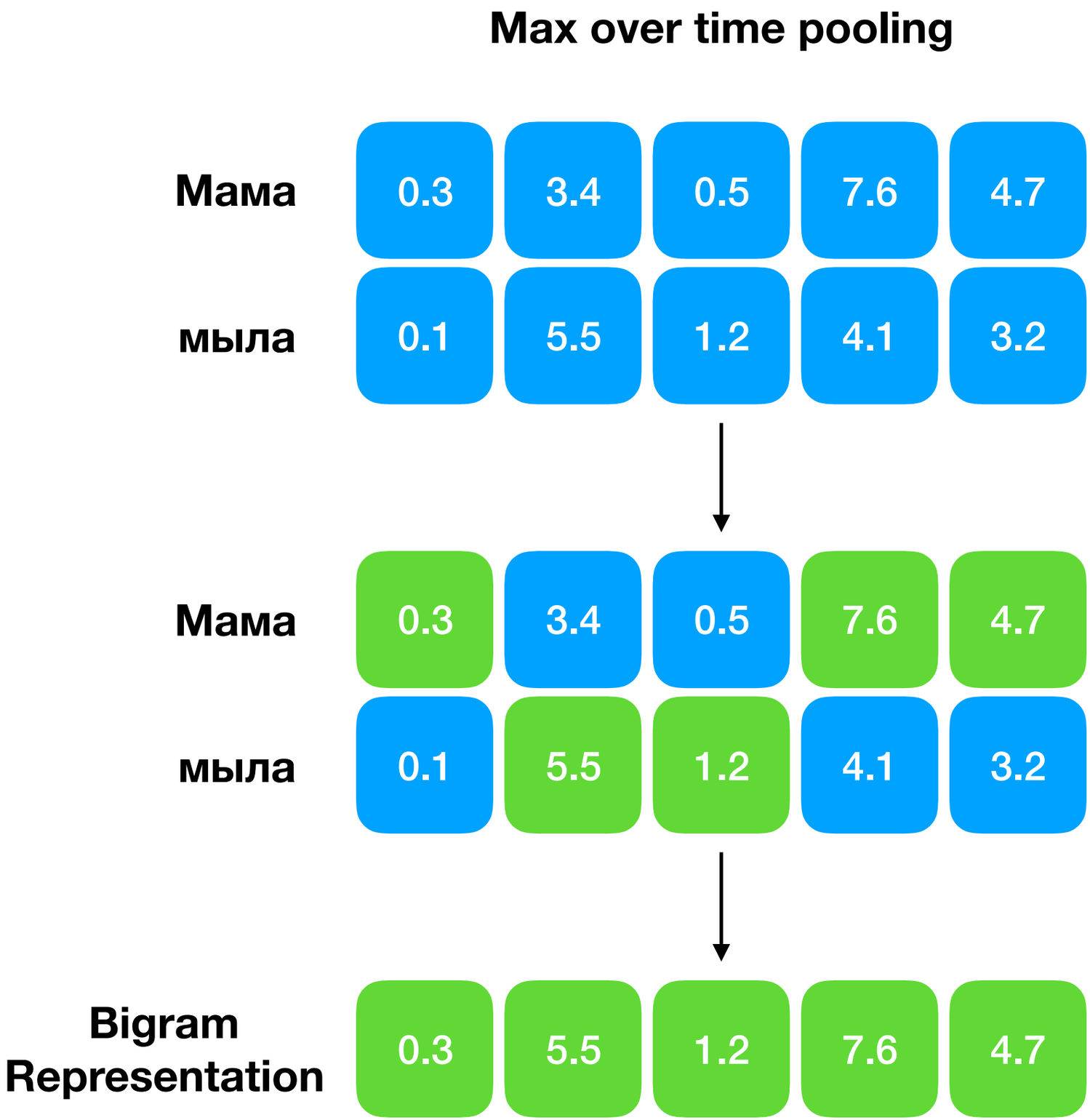
Max over time pooling



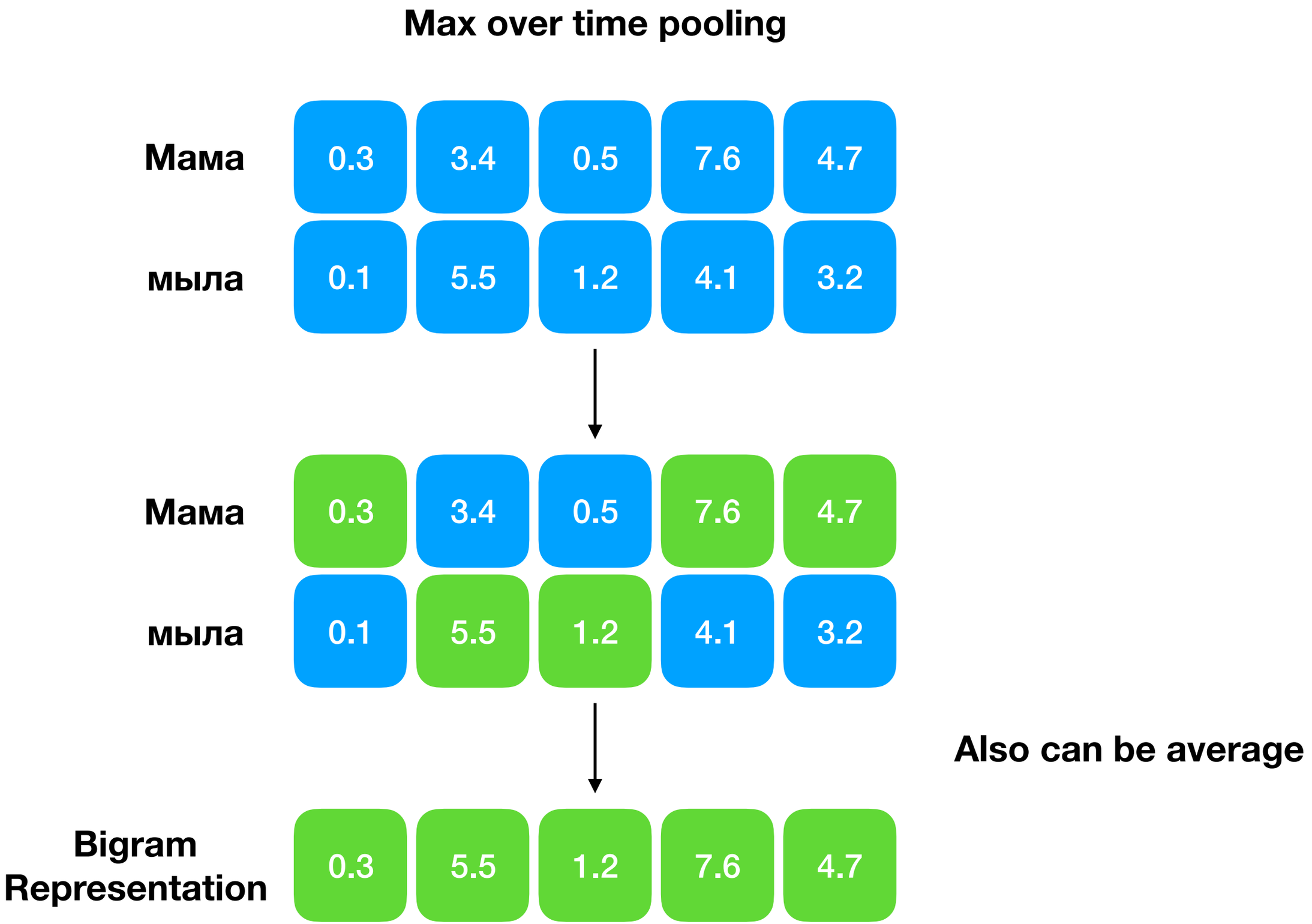
Convolutional Neural Network



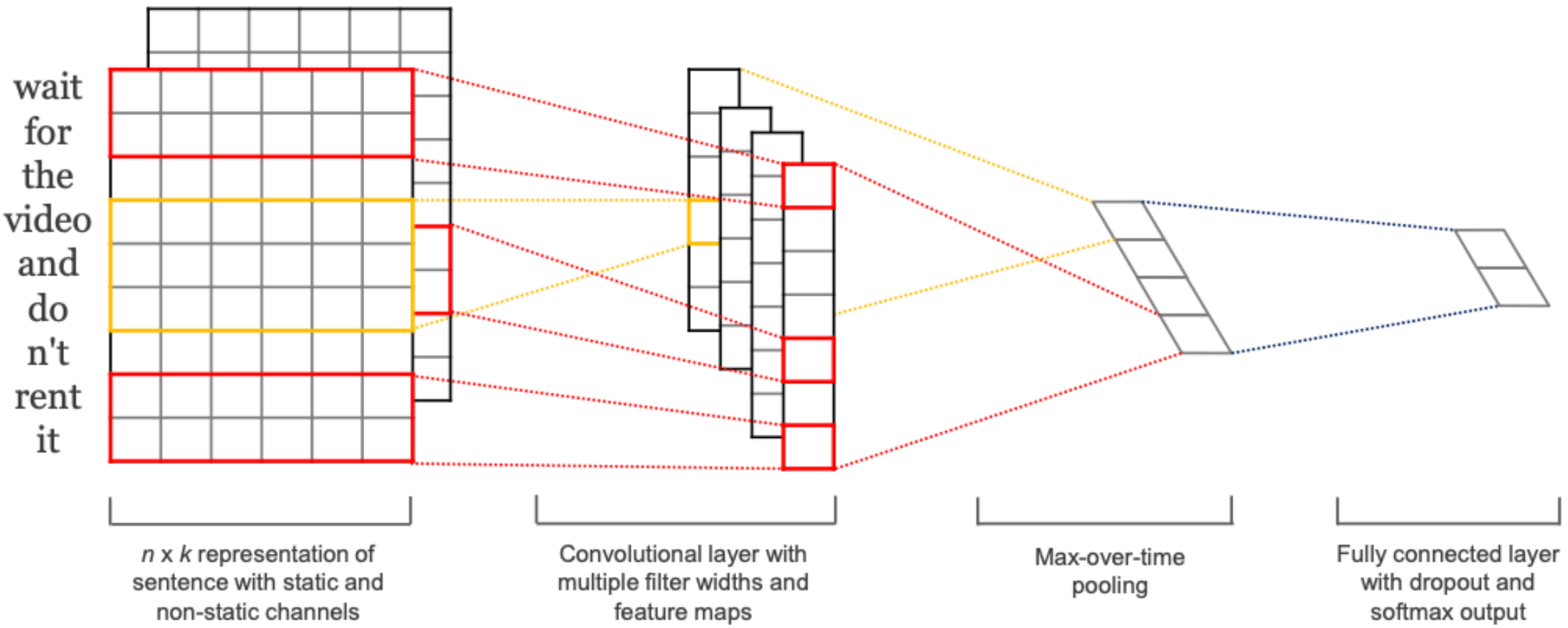
Convolutional Neural Network



Convolutional Neural Network

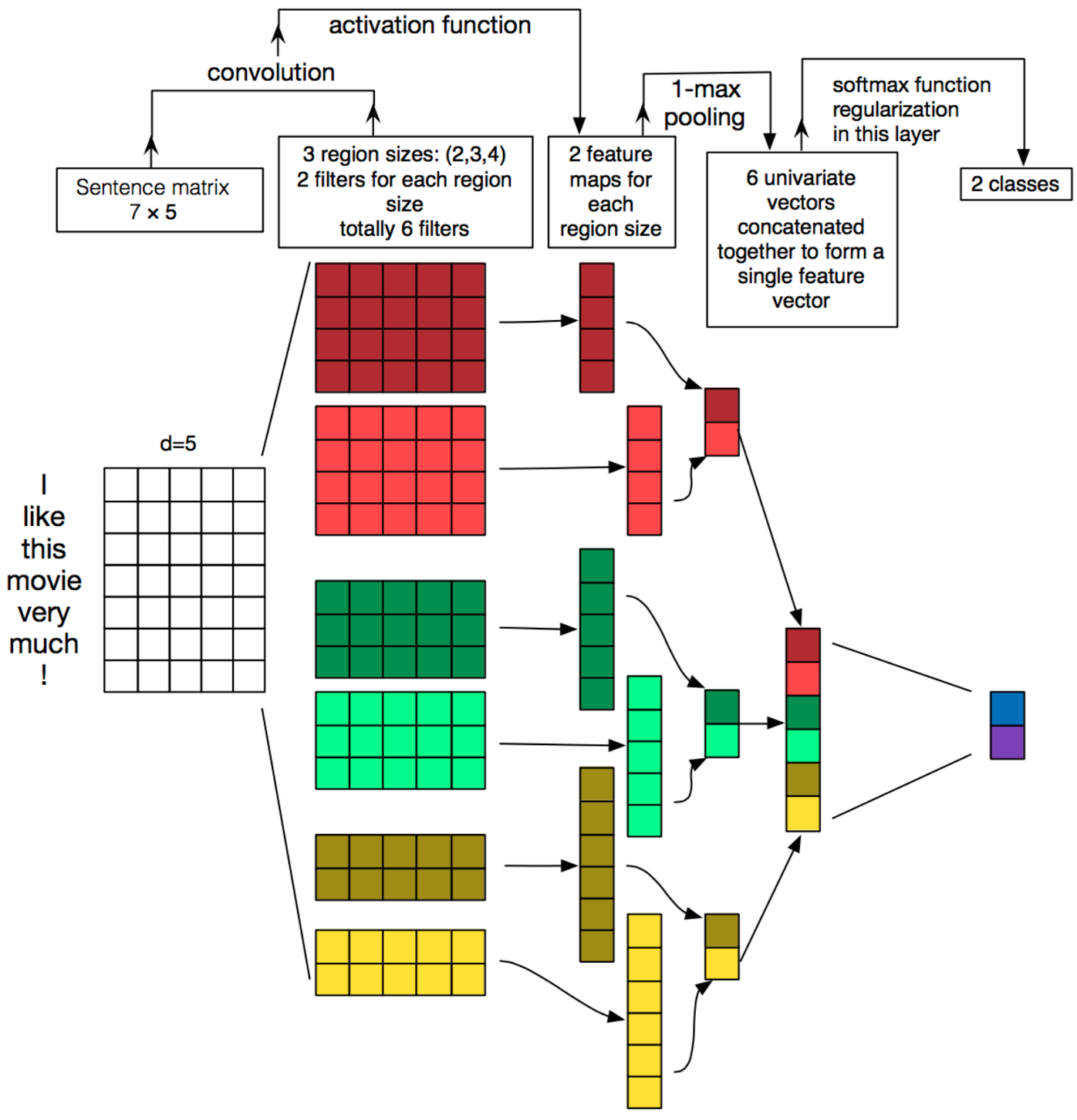


Convolutional Neural Network

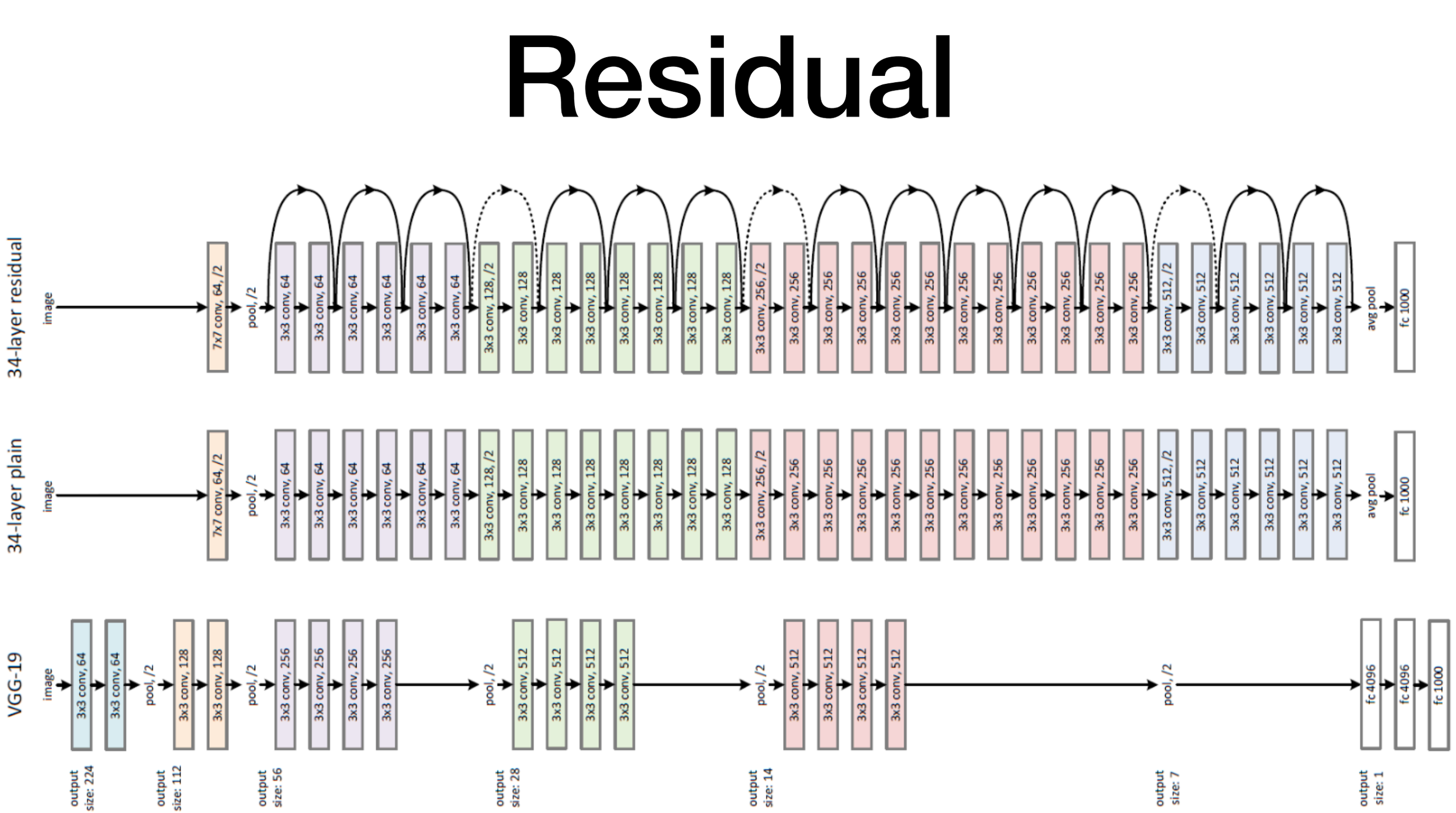


Kernel size = 1

Inception CNN

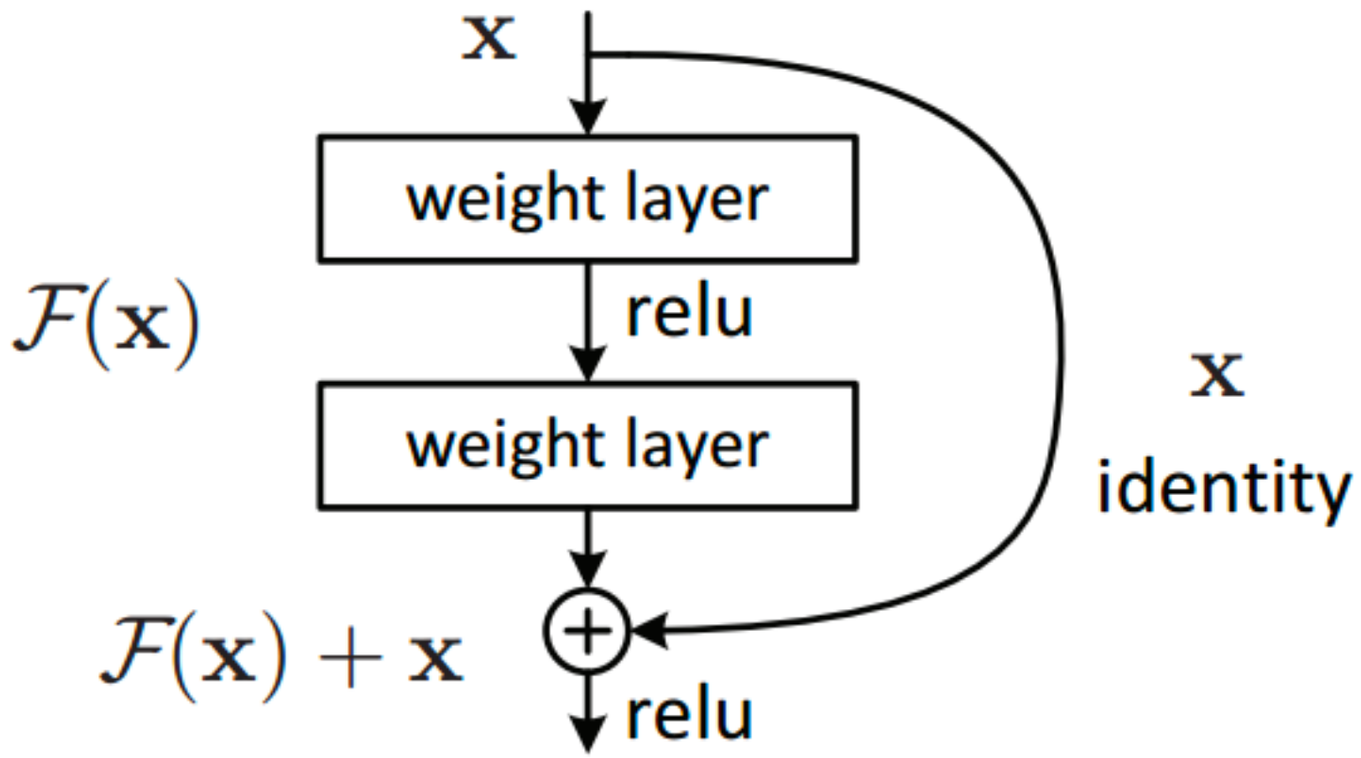


Residual



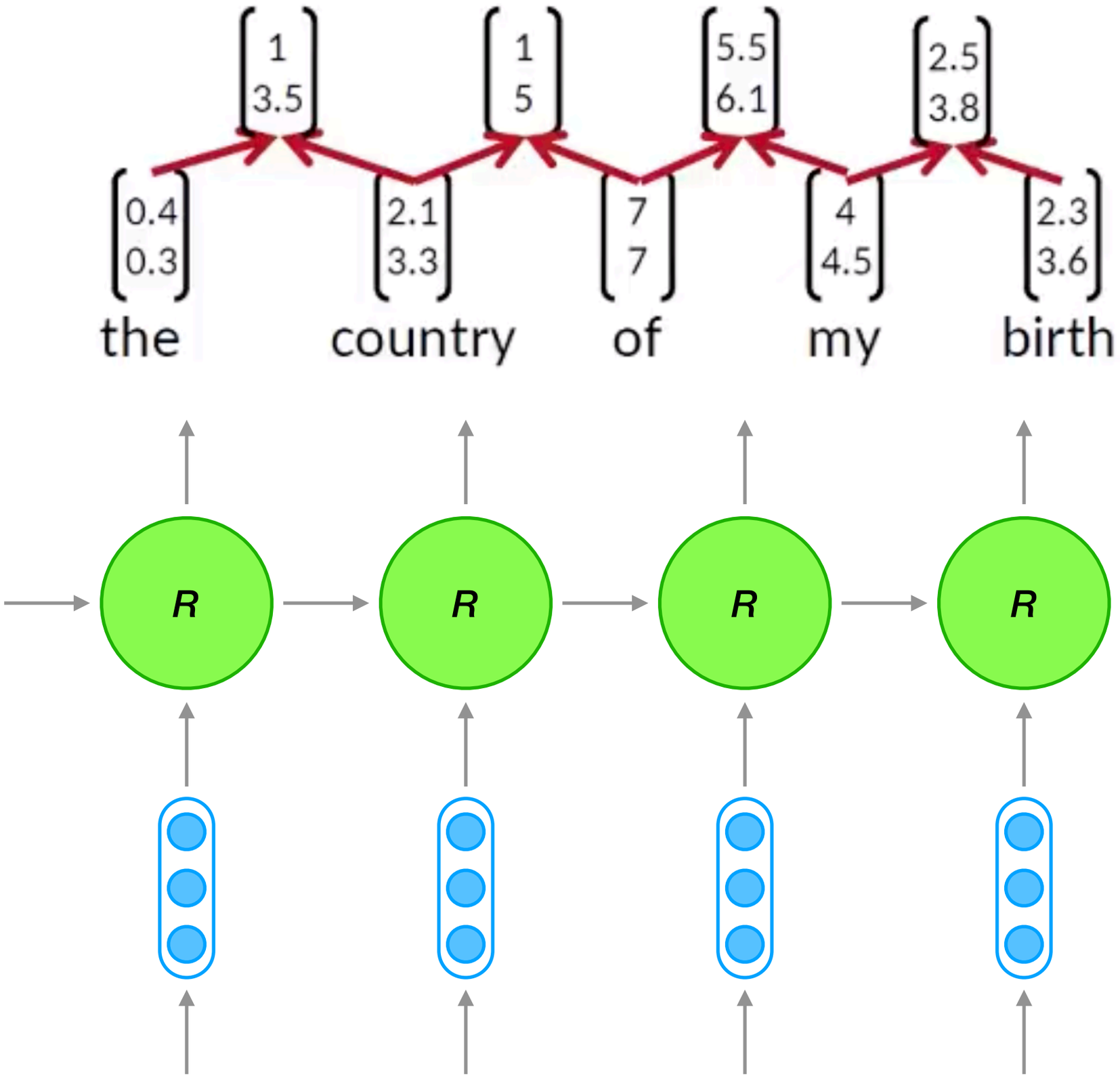
	plain	ResNet
18 layers	27.94	27.88
34 layers	28.54	**25.03**

Residual

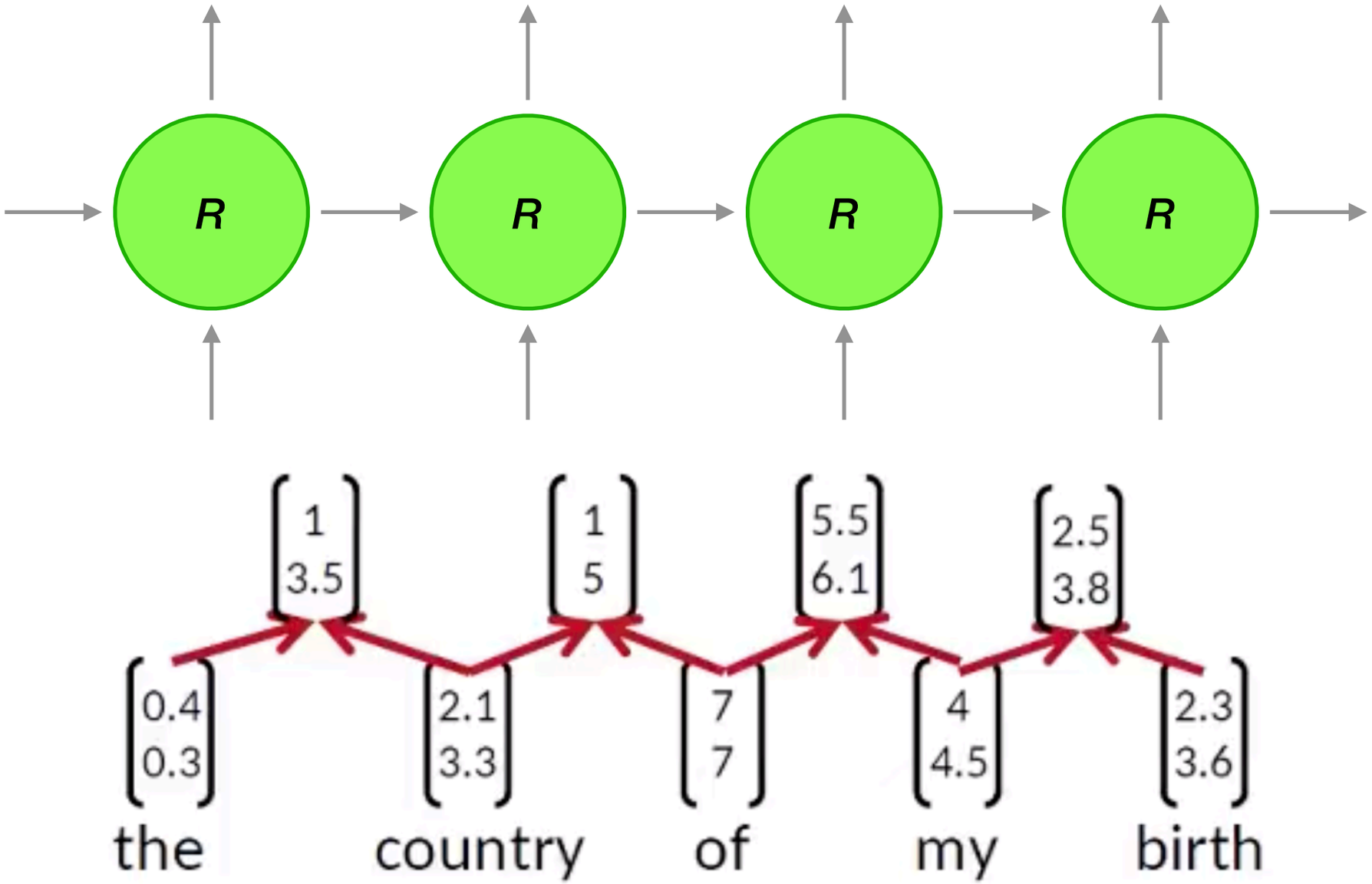

x
weight layer
$\mathcal{F}(\mathbf{x})$
relu
weight layer
x
identity
$\mathcal{F}(\mathbf{x}) + \mathbf{x}$
relu

Combination

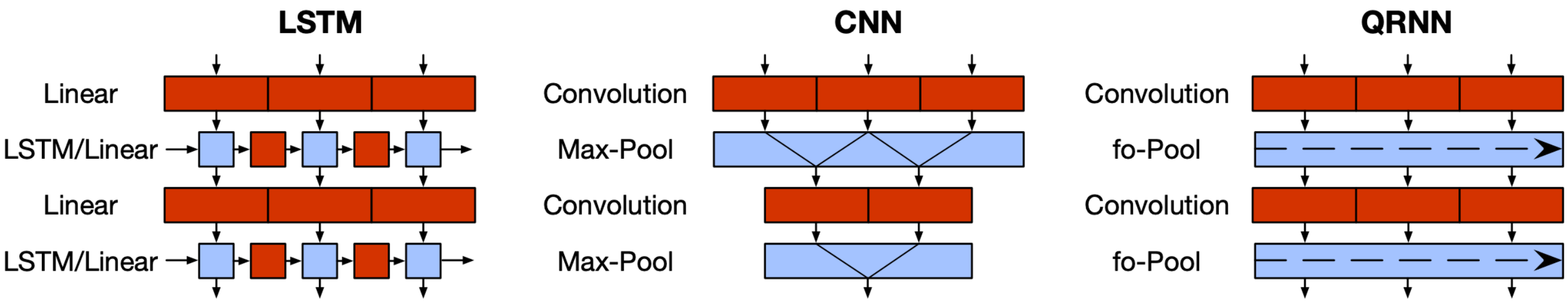
Combination



Combination



Quasi-RNN



$$\mathbf{z}_t = \tanh(\mathbf{W}^1_z \mathbf{x}_{t-1} + \mathbf{W}^2_z \mathbf{x}_t)$$
$$\mathbf{f}_t = \sigma(\mathbf{W}^1_f \mathbf{x}_{t-1} + \mathbf{W}^2_f \mathbf{x}_t)$$
$$\mathbf{o}_t = \sigma(\mathbf{W}^1_o \mathbf{x}_{t-1} + \mathbf{W}^2_o \mathbf{x}_t).$$

$$\mathbf{h}_t = \mathbf{f}_t \odot \mathbf{h}_{t-1} + (1 - \mathbf{f}_t) \odot \mathbf{z}_t,$$

Thanks for your Attention!

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