삼성전기 AI전문가 양성과정 - 프로젝트 실습 (비영상)

자연어처리를 위한
CNN (Convolution Neural Network)

현청천

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Conv2D

Sharpen

0	0	0	0	0
0	0	-1	0	0
0	-1	5	-1	0
0	0	-1	0	0
0	0	0	0	0

Blur

0	0	0	0	0
0	1	1	1	0
0	1	1	1	0
0	1	1	1	0
0	0	0	0	0

Edge Detect

	0	1	0	
	1	-4	1	
	0	1	0	

Emboss

	-2	-1	0	
	-1	1	1	
	0	1	2	

Convolution Filter를 이용하여 이미지의 특징을 다양하게 추출 가능

참조: https://docs.gimp.org/2.10/ko/gimp-filter-convolution-matrix.html

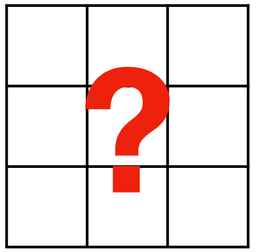
Conv2D (Convolution Layer)

1	0	1	2	0
0	1	1	0	1
1	0	2	1	1
1	2	1	0	0
1	1	0	2	2

Image

1	0	1
0	1	0
1	0	1

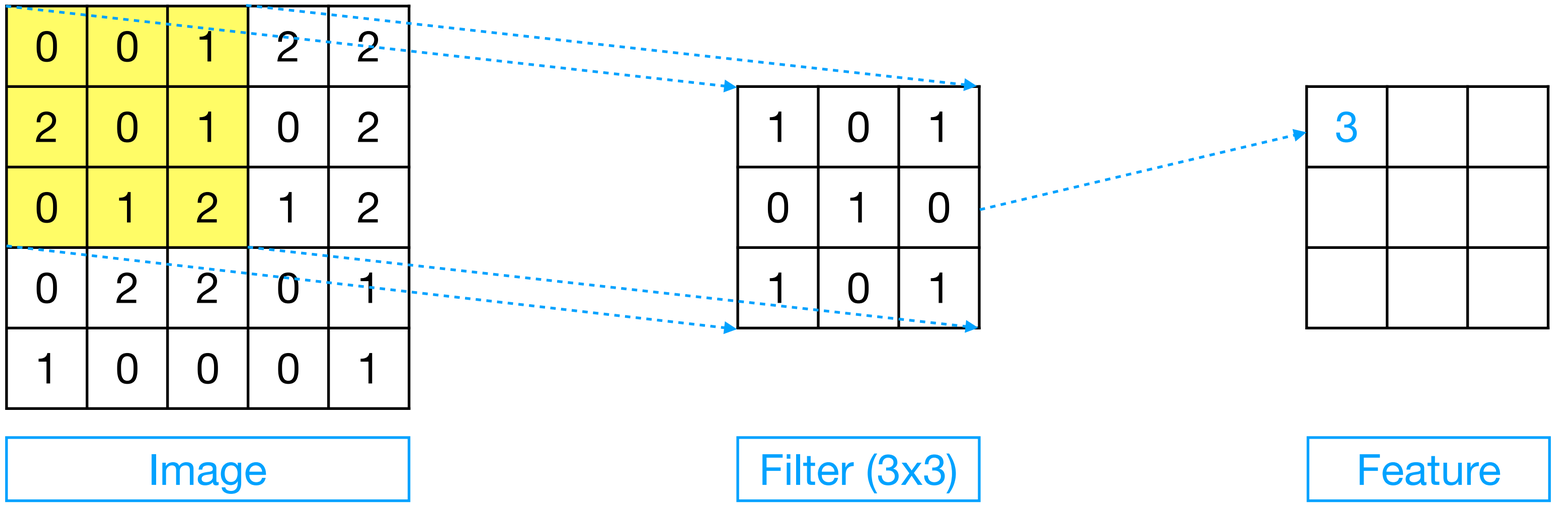
Filter (3x3)



Feature

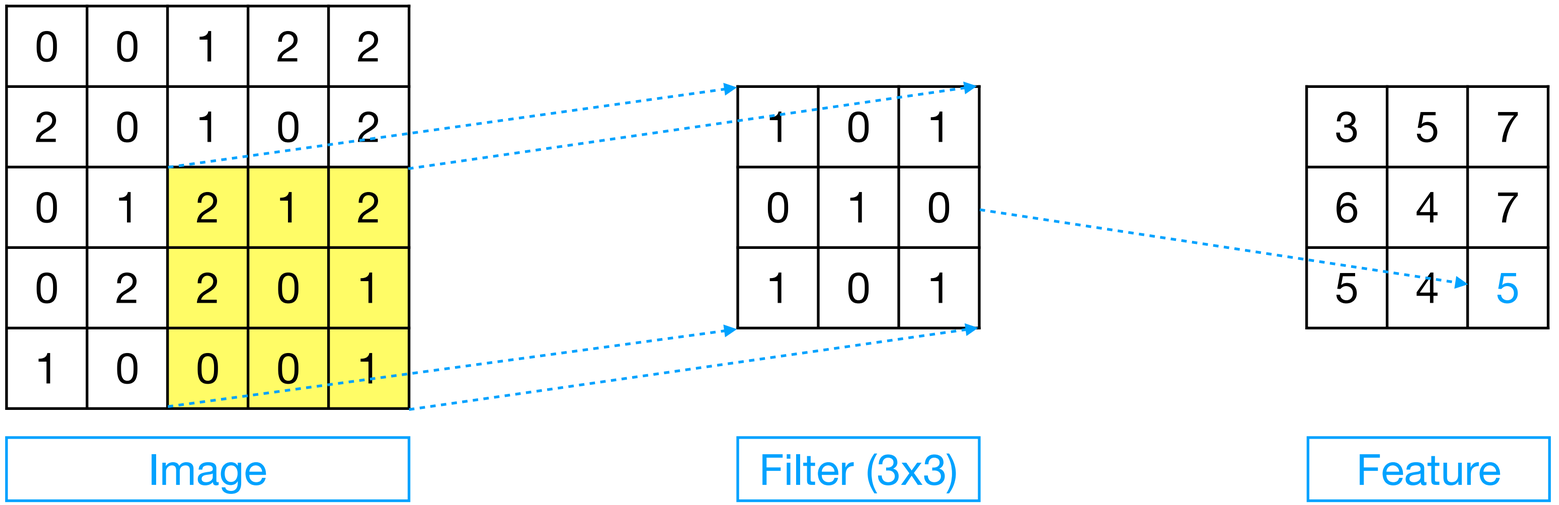
Conv2D (Convolution Layer)

$$(0 \times 1) + (0 \times 0) + (1 \times 1)$$
$$+(2 \times 0) + (0 \times 1) + (1 \times 0)$$
$$+(0 \times 1) + (1 \times 0) + (2 \times 1)$$
$$= 5$$

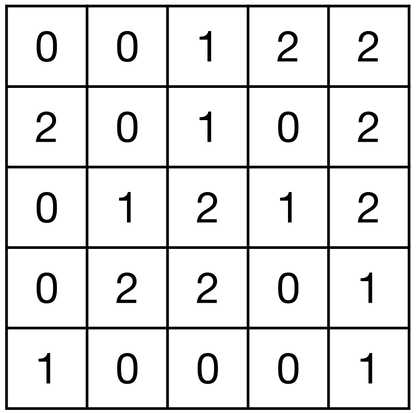


Conv2D (Convolution Layer)

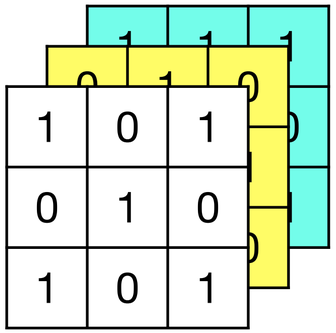
$$
\begin{aligned}
&(2\times 1)+(1\times 0)+(2\times 1)\\
&+(2\times 0)+(0\times 1)+(1\times 0)\\
&+(0\times 1)+(0\times 0)+(1\times 1)\\
&=5
\end{aligned}
$$



Conv2D (Convolution Layer)

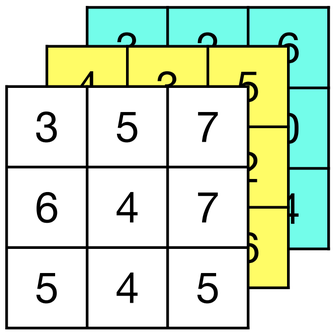


Image



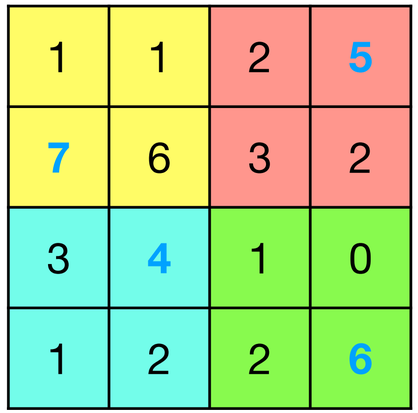
Filter (3x3)

Filter 개수 3

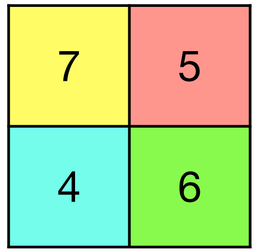


Feature

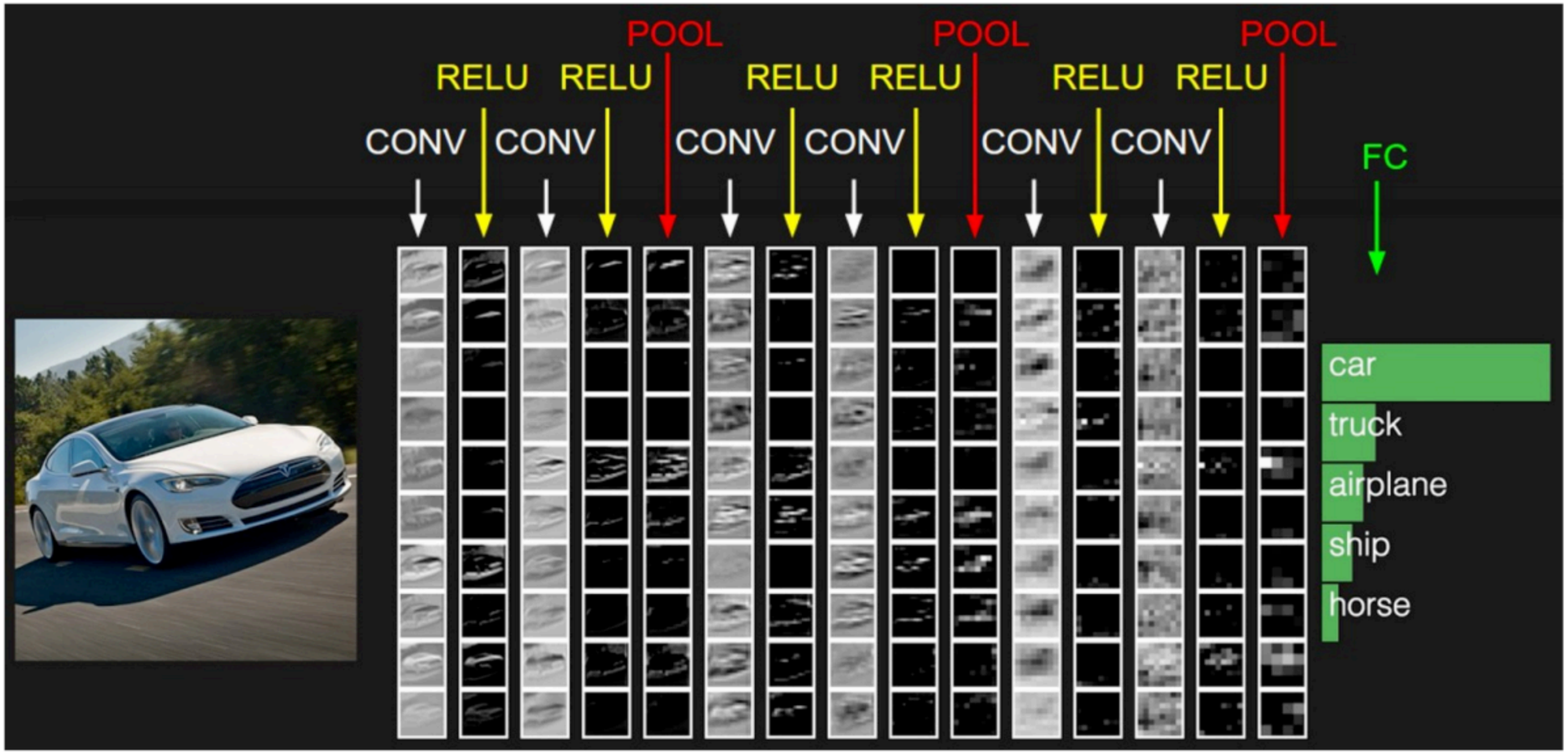
Conv2D (Max Pooling)



Filter (2x2)
Stride 2



Conv2D (Inference)



참조: https://ujwlkarn.files.wordpress.com/2016/08/car.png

Conv1D (Convolution Layer)

이순신은	-0.26	0.60	0.94	0.46
16세기	0.82	0.62	-0.75	-0.18
무신으로	0.40	0.54	0.17	0.40
임진왜란	-0.11	-0.44	-0.33	0.93
당시	-0.54	-0.02	0.71	0.31
조선	0.8	-0.88	0.19	-0.55
수군을	-0.72	-0.14	0.27	-0.09

Word Embedding

1	0	1	0
0	1	0	1
1	0	1	0

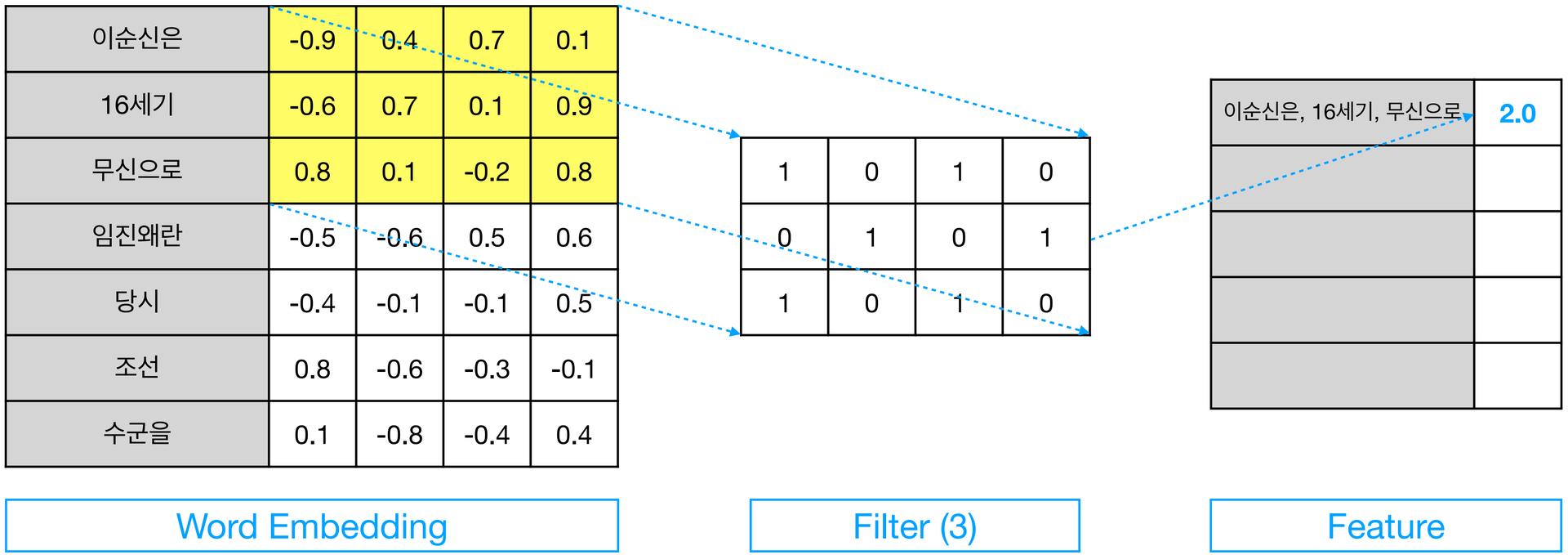
Filter (3)

Feature

참조: http://web.stanford.edu/class/cs224n/slides/cs224n-2019-lecture11-convnets.pdf

Conv1D (Convolution Layer)

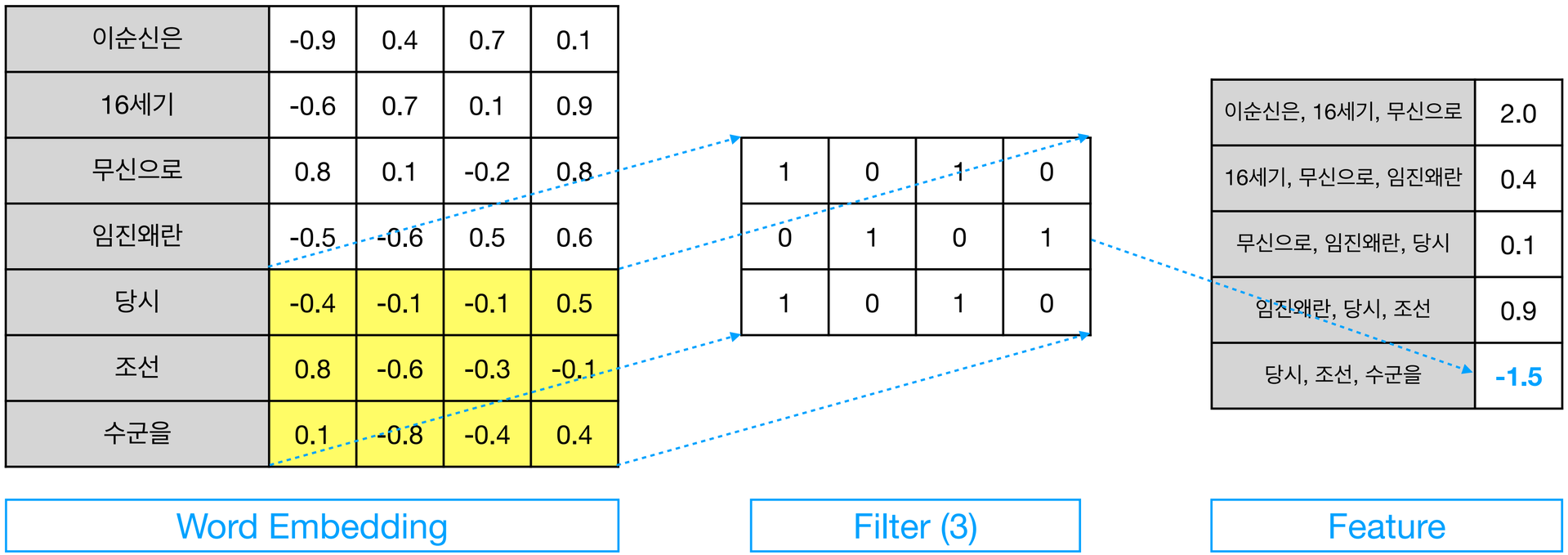
$$
\begin{aligned}
&(-0.9 \times 1) + (0.4 \times 0) + (0.7 \times 1) + (0.1 \times 0) \\
&+(-0.6 \times 0) + (0.7 \times 1) + (0.1 \times 0) + (0.9 \times 1) \\
&+(0.8 \times 1) + (0.1 \times 0) + (-0.2 \times 1) + (0.8 \times 0) \\
&= 2.0
\end{aligned}
$$



참조: http://web.stanford.edu/class/cs224n/slides/cs224n-2019-lecture11-convnets.pdf

Conv1D (Convolution Layer)

$$
\begin{aligned}
&(0.4 \times 1) + (-0.1 \times 0) + (-0.1 \times 1) + (0.5 \times 0) \\
&+(0.8 \times 0) + (-0.6 \times 1) + (-0.3 \times 1) + (-0.1 \times 0) \\
&+(-0.1 \times 1) + (-0.8 \times 0) + (-0.4 \times 1) + (0.4 \times 0) \\
&= -1.5
\end{aligned}
$$

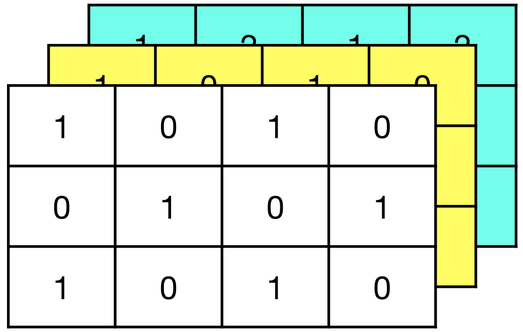


참조: http://web.stanford.edu/class/cs224n/slides/cs224n-2019-lecture11-convnets.pdf

Conv1D (Convolution Layer)

이순신은	-0.9	0.4	0.7	0.1
16세기	-0.6	0.7	0.1	0.9
무신으로	0.8	0.1	-0.2	0.8
임진왜란	-0.5	-0.6	0.5	0.6
당시	-0.4	-0.1	-0.1	0.5
조선	0.8	-0.6	-0.3	-0.1
수군을	0.1	-0.8	-0.4	0.4

Word Embedding



Filter (3)

Filter 개수 3

이순신은, 16세기, 무신으로	2.0	1.6	-1.0
16세기, 무신으로, 임진왜란	0.4	-0.1	0.8
무신으로, 임진왜란, 당시	0.1	0.3	0.3
임진왜란, 당시, 조선	0.9	0.1	1.2
당시, 조선, 수군을	-1.5	0.6	0.9

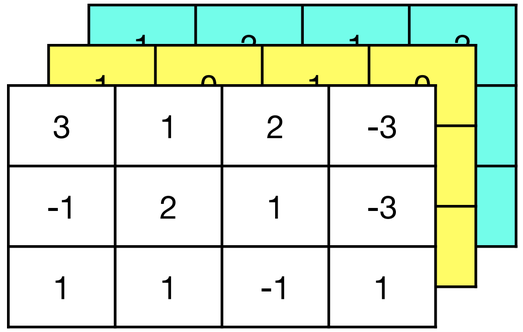
Feature

참조: http://web.stanford.edu/class/cs224n/slides/cs224n-2019-lecture11-convnets.pdf

Conv1D (Max Pooling)

이순신은	0.2	0.1	-0.3	0.4
16세기	0.5	0.2	-0.3	-0.1
무신으로	-0.1	-0.3	-0.2	0.4
임진왜란	0.3	-0.3	0.1	0.1
당시	0.2	-0.3	0.4	0.2
조선	0.1	0.2	-0.1	-0.1
수군을	-0.4	-0.4	0.2	0.3

Word Embedding



Filter (3)

Filter 개수 3

이순신은, 16세기, 무신으로	2.0	1.6	-1.0
16세기, 무신으로, 임진왜란	0.4	-0.1	0.8
무신으로, 임진왜란, 당시	0.1	0.3	0.3
임진왜란, 당시, 조선	0.9	0.1	1.2
당시, 조선, 수군을	-1.5	0.6	0.9

Max

Max Pooling	2.0	1.6	1.2

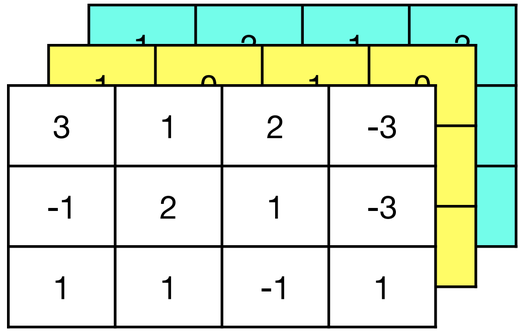
Feature max pooling

참조: http://web.stanford.edu/class/cs224n/slides/cs224n-2019-lecture11-convnets.pdf

Conv1D (Avg Pooling)

이순신은	0.2	0.1	-0.3	0.4
16세기	0.5	0.2	-0.3	-0.1
무신으로	-0.1	-0.3	-0.2	0.4
임진왜란	0.3	-0.3	0.1	0.1
당시	0.2	-0.3	0.4	0.2
조선	0.1	0.2	-0.1	-0.1
수군을	-0.4	-0.4	0.2	0.3

Word Embedding



Filter (3)

Filter 개수 3

이순신은, 16세기, 무신으로	2.0	1.6	-1.0
16세기, 무신으로, 임진왜란	0.4	-0.1	0.8
무신으로, 임진왜란, 당시	0.1	0.3	0.3
임진왜란, 당시, 조선	0.9	0.1	1.2
당시, 조선, 수군을	-1.5	0.6	0.9

Avg

Max Pooling	0.38	0.5	0.44

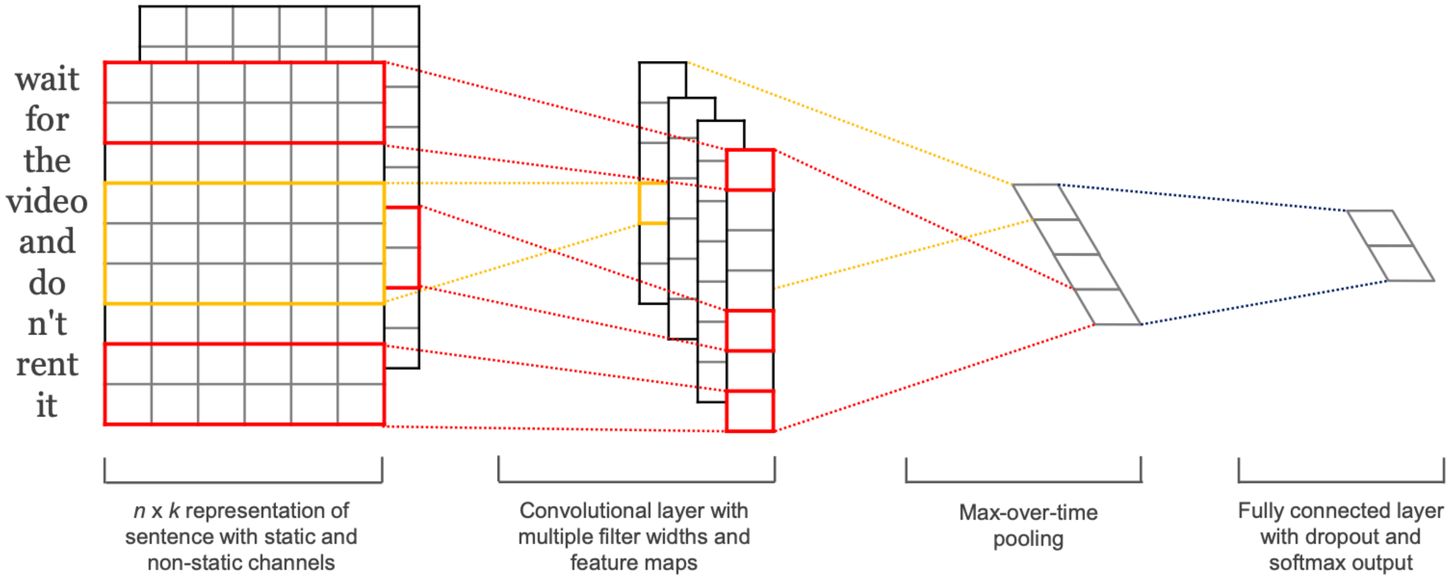
Feature avg pooling

참조: http://web.stanford.edu/class/cs224n/slides/cs224n-2019-lecture11-convnets.pdf

Conv1D

Convolutional Neural Networks for Sentence Classification

- Yoon kim (2014)
- CNN을 이용한 classification 모델
- 간단한 모델이면서도 좋은 성능을 냄



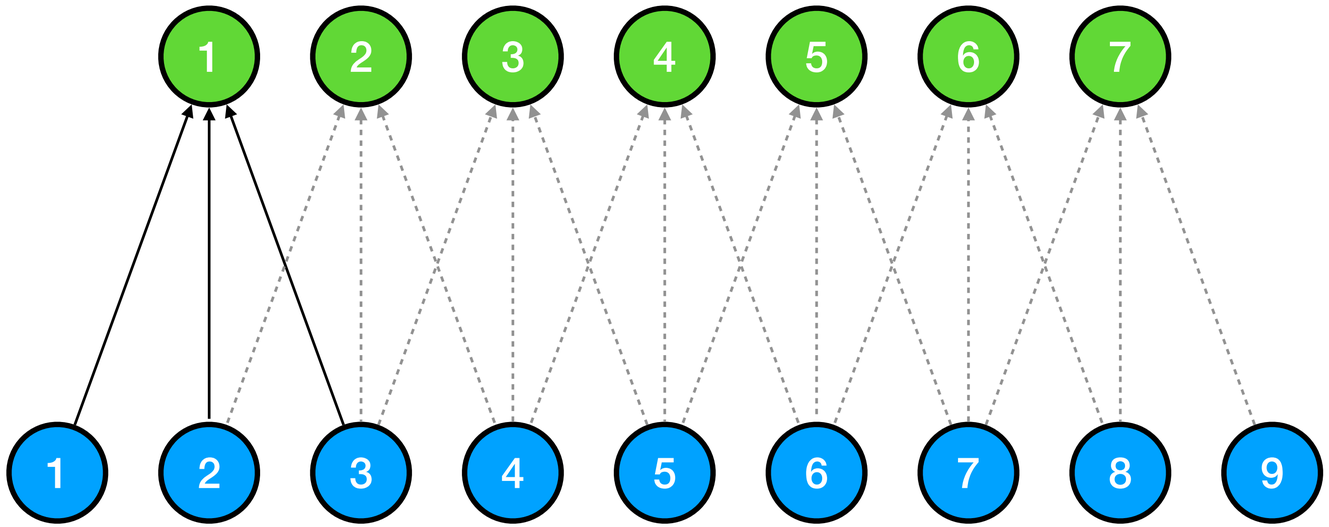
논문: https://arxiv.org/abs/1408.5882
(Yoon Kim) : https://scholar.google.com/citations?user=n_ts4eYAAAAJ

Conv1D (padding)

$$window = filter$$

$$out = seq - window + 1$$

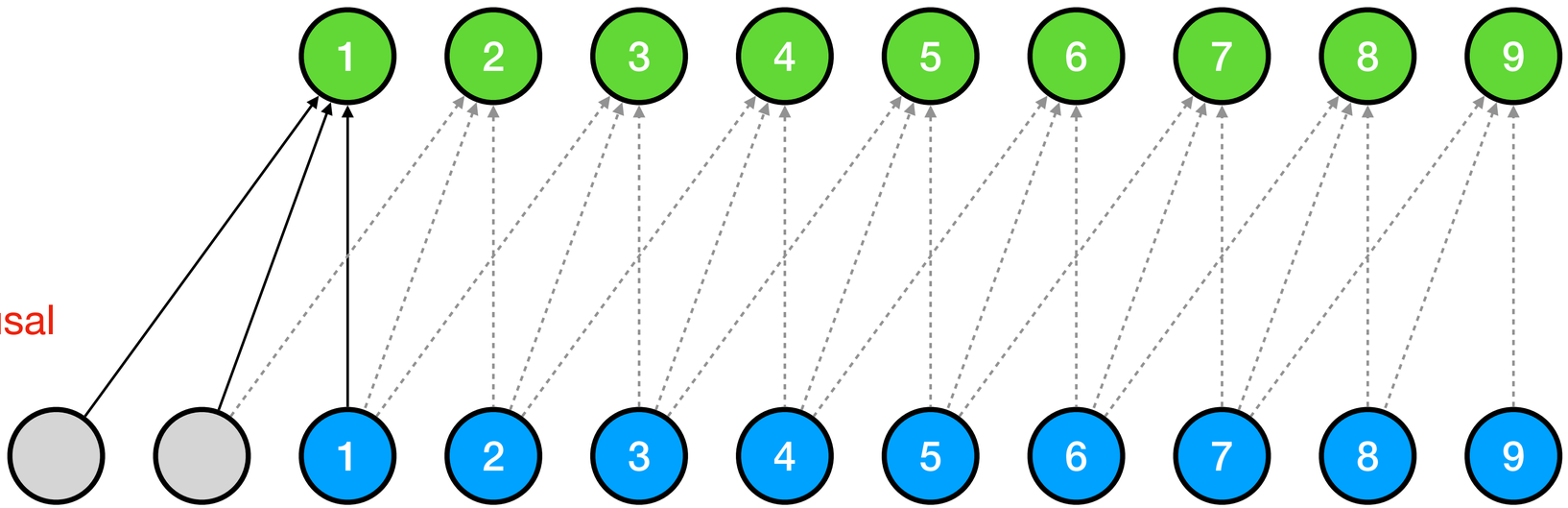
- Filter: 3
- Stride: 1
- Padding: valid



Conv1D (padding)

$$out = seq$$

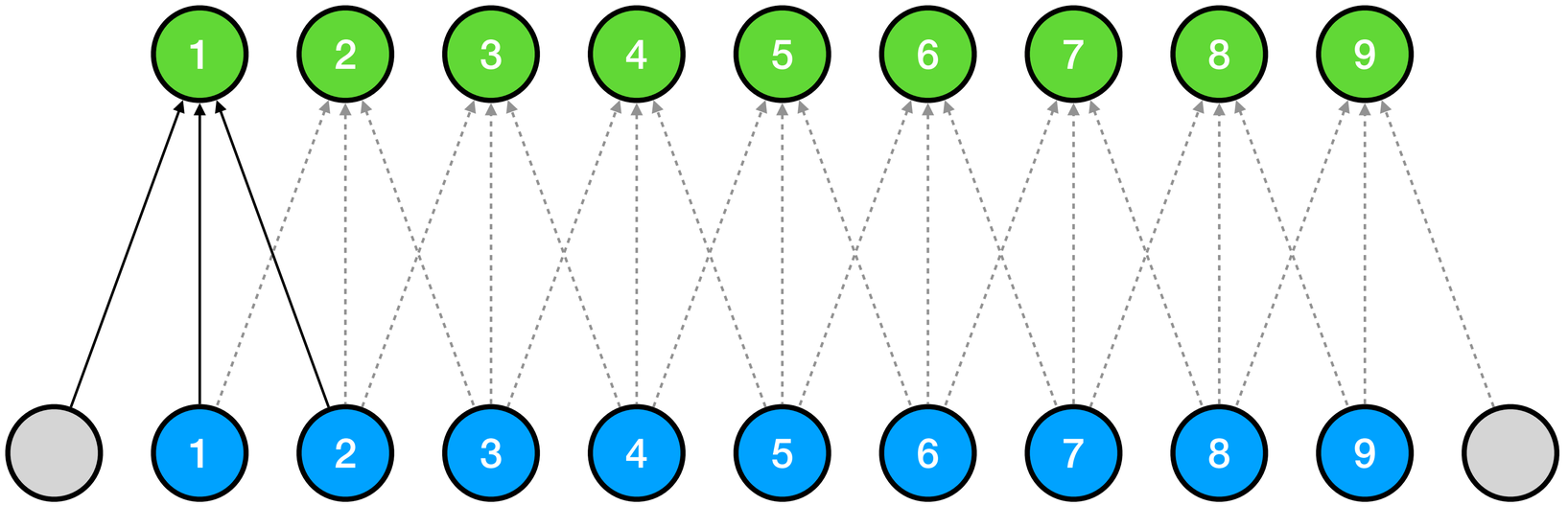
- Filter: 3
- Stride: 1
- Padding: causal



Conv1D (padding)

$$out = seq$$

- Filter: 3
- Stride: 1
- Padding: same

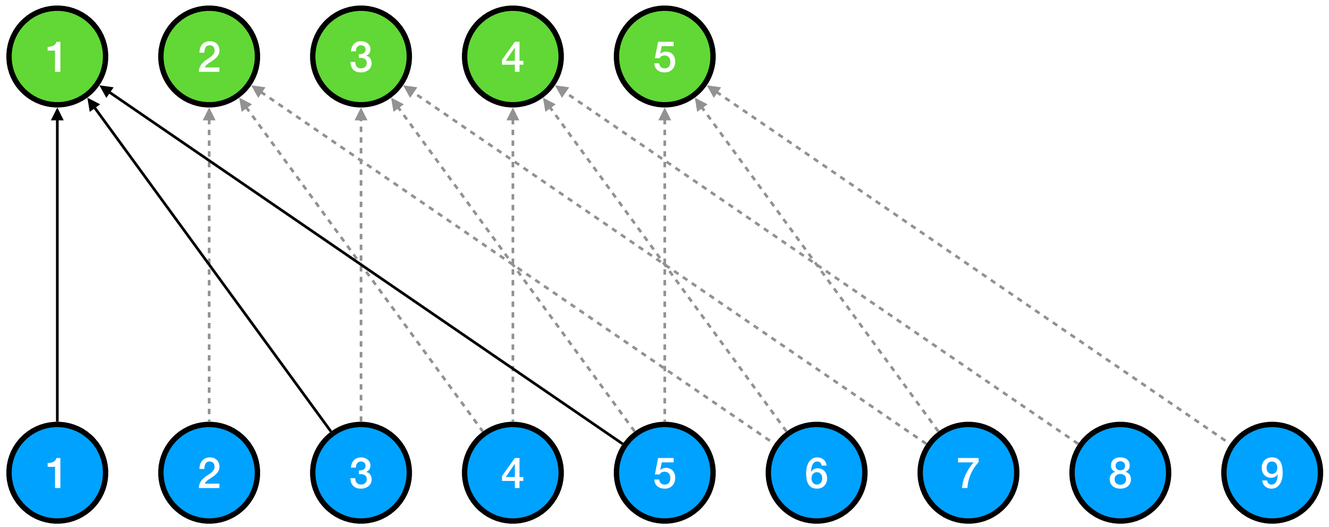


Conv1D (padding)

$$window = filter + (filter - 1) \times (dilation - 1)$$

$$out = seq - window + 1$$

- Filter: 3
- Stride: 1
- Padding: valid
- Dilation: 2



감사합니다.