

머신러닝/딥러닝을 위한

CNN (I)

- 컨볼루션(Convolution) 개념 -

박성호 (neowizard2018@gmail.com)

[Insight] 컨볼루션 (Convolution)

$$f(t) * g(t) = \int_{-\infty}^{\infty} f(\tau)g(t - \tau)d\tau$$



적분변수 τ 를 친숙한 x 로 바꾸고
대칭이동도 하지 않음

$$f(t) * g(t) = \int_{-\infty}^{\infty} f(x)g(x - t)dx$$


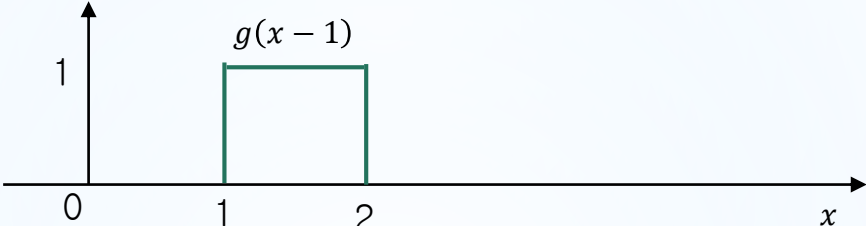
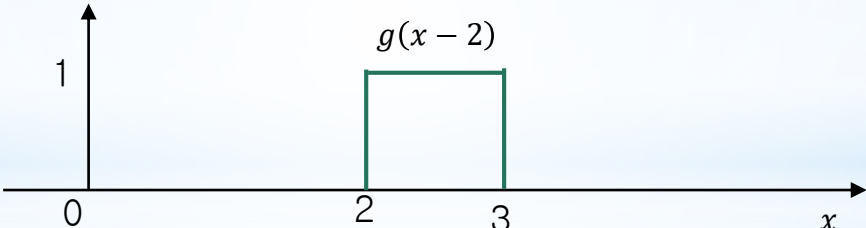

[insight 1] ① time shift ② data variation ③ average

[insight 2] 컨볼루션은 시간 t 함수.

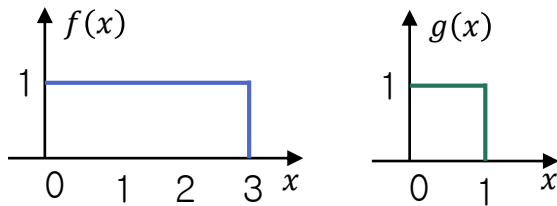
[예] $f(x) = x$, $g(x-t) = x-t$ 라고 가정하면 컨볼루션 결과는 시간 t 함수임

참고 및 복습 영상: https://youtu.be/63Y4tP_soXc

time shift

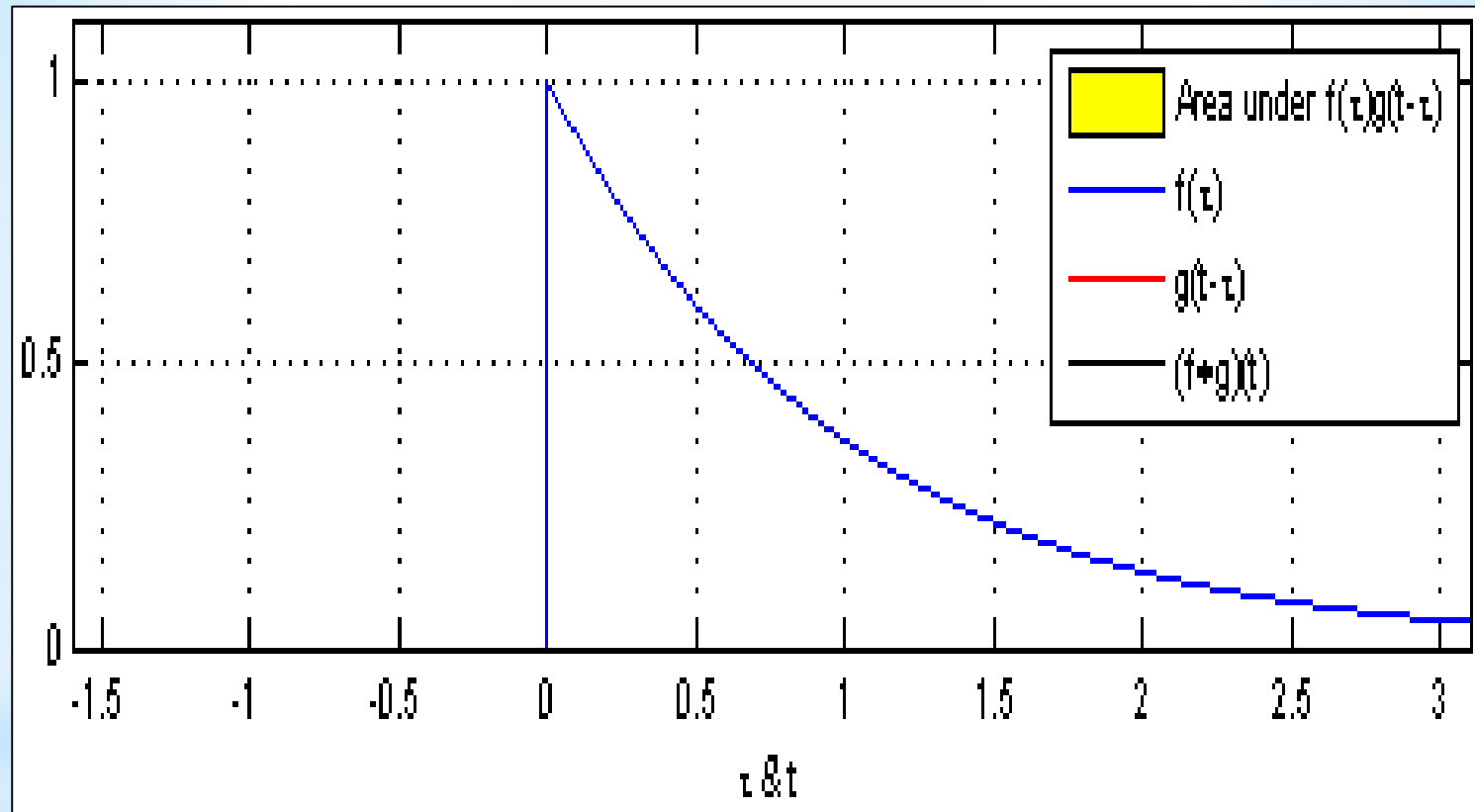
$g(x)$	 <p>A graph of the function $g(x)$ on a Cartesian coordinate system. The horizontal axis is labeled x and has tick marks at 0 and 1. The vertical axis has a tick mark at 1. The function $g(x)$ is represented by a green rectangle with a height of 1, starting at $x=0$ and ending at $x=1$. The label $g(x)$ is placed above the rectangle.</p>
$g(x - 1)$	 <p>A graph of the function $g(x - 1)$ on a Cartesian coordinate system. The horizontal axis is labeled x and has tick marks at 0, 1, and 2. The vertical axis has a tick mark at 1. The function $g(x - 1)$ is represented by a green rectangle with a height of 1, starting at $x=1$ and ending at $x=2$. The label $g(x - 1)$ is placed above the rectangle.</p>
$g(x - 2)$	 <p>A graph of the function $g(x - 2)$ on a Cartesian coordinate system. The horizontal axis is labeled x and has tick marks at 0, 2, and 3. The vertical axis has a tick mark at 1. The function $g(x - 2)$ is represented by a green rectangle with a height of 1, starting at $x=2$ and ending at $x=3$. The label $g(x - 2)$ is placed above the rectangle.</p>
$g(x - t)$	 <p>A graph of the function $g(x - t)$ on a Cartesian coordinate system. The horizontal axis is labeled x and has tick marks at 0, t, and $t+1$. The vertical axis has a tick mark at 1. The function $g(x - t)$ is represented by a green rectangle with a height of 1, starting at $x=t$ and ending at $x=t+1$. The label $g(x - t)$ is placed above the rectangle.</p>

$$f(t) * g(t) = \int_{-\infty}^{\infty} f(x)g(x - t)dx$$



$f(x)$					$g(x)$		
1	2	3	0	*	2	0	1
0	1	2	3		0	1	2
3	0	1	2		1	0	2
2	3	0	1				

시간 t	연속함수 $f(t) * g(t)$	계산 결과	이산데이터 $f(t) * g(t)$	계산 결과
t = 0				
t = 1				
t = 2				



※ 출처 : <https://en.wikipedia.org/wiki/Convolution>