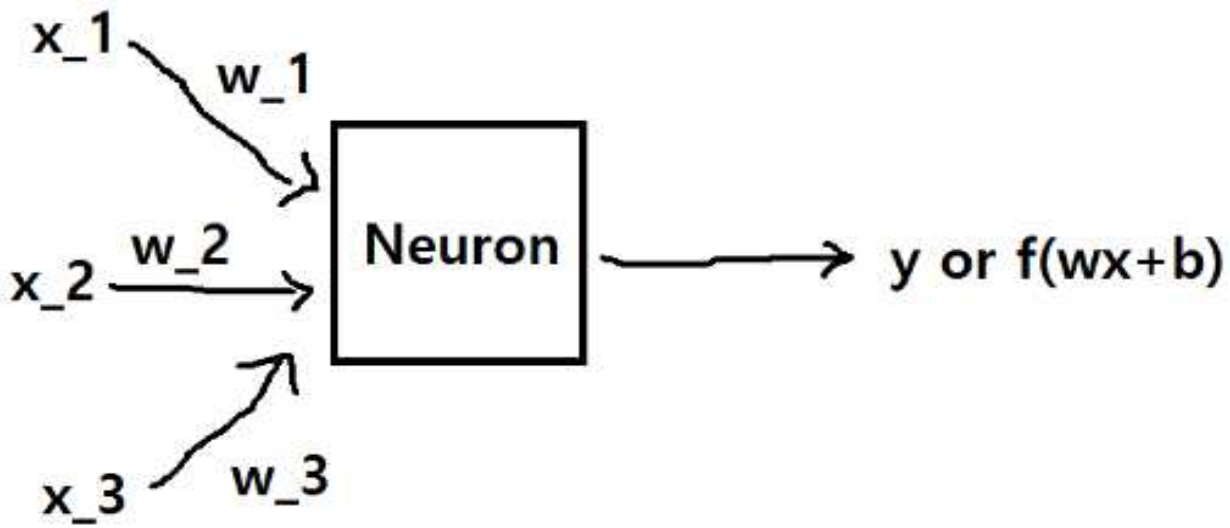
What is Neural Network?

What is Neural Network?

- Simulating Human Neurons to make Artificial Brain
- Each Inputs have A Weight
- Each Neurons have A Bias



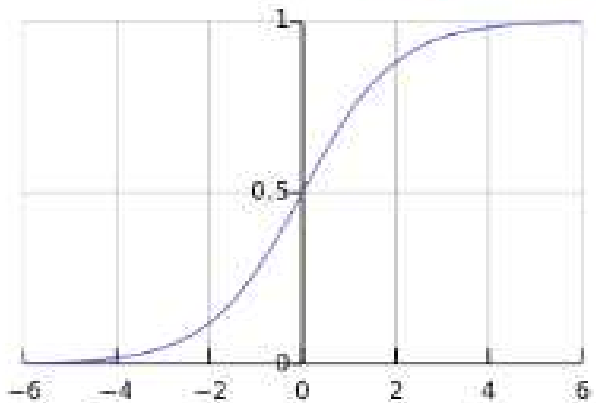
$$(x\_1 \times w\_1) + (x\_2 \times w\_2) + (x\_3 \times w\_3) + b$$

$$= wx+b$$

$f(wx+b)$ // $f(x)$ = activation function

Activation Function

1) Sigmoid



$$\frac{1}{1+e^{-t}}$$

```
1.0 / (1.0 + np.exp(-x))
```

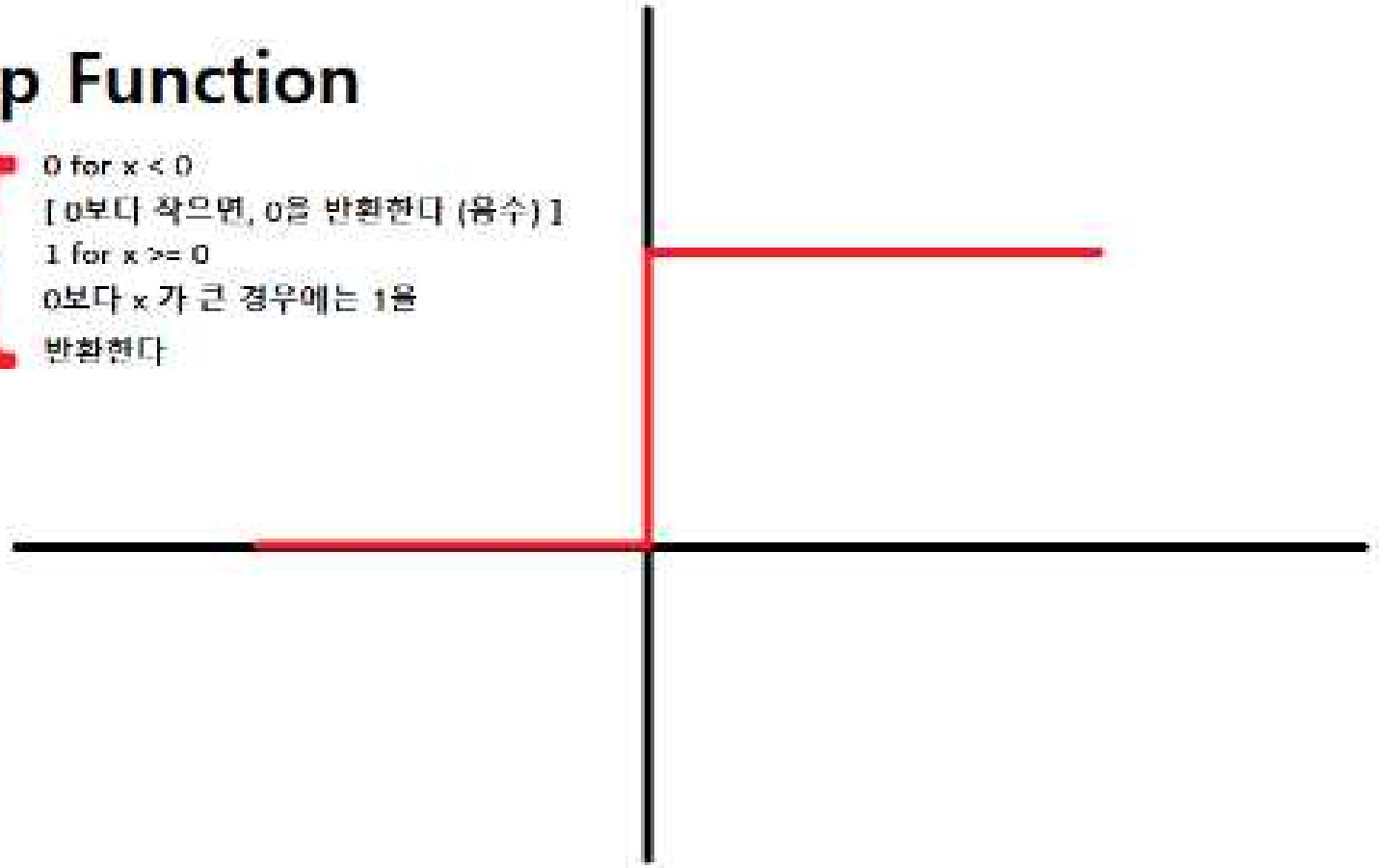
COMMONLY USED ON NEURAL NETWORK!

2) Step Function

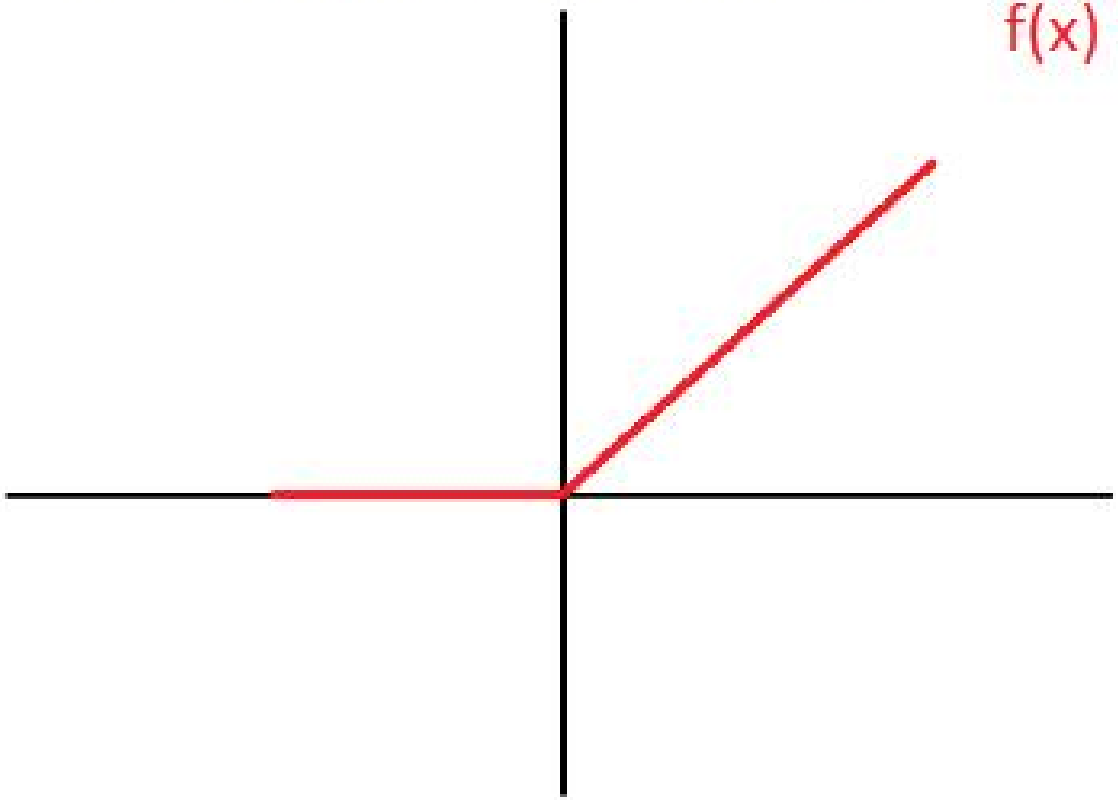
$$f(x) = \begin{cases} 0 \text{ for } x < 0 \\ 1 \text{ for } x >= 0 \end{cases}$$

[0보다 작으면, 0을 반환한다 (음수)]

0보다 x 가 큰 경우에는 1을 반환한다



3) Rectified Linear Unit (ReLU)



$$f(x) = \{\ 0 \text{ for } x < 0\ \}$$
$$\{\ x \text{ for } x >= 0\ \}$$

Benefits when USE Relu Function

이러한 ReLu가 가지는 이점은 다음과 같다.

1. Sparse activation : 0이하의 입력에 대해 0을 출력함으로 부분적으로 활성화 시킬수 있다.
2. Efficient gradient propagtion : gradient의 vanishing이 없으며 gradient가 exploding 되지 않는다.
3. Efficient computation : 선형함수이므로 미분 계산이 매우 간단하다.
4. Scale-invariant :

$$\max(0, ax) = a \max(0, x)$$

http://mongxmongx2.tistory.com/25

Neural Network Layer

- There Are ***SEVERAL*** Neural Network Layer.

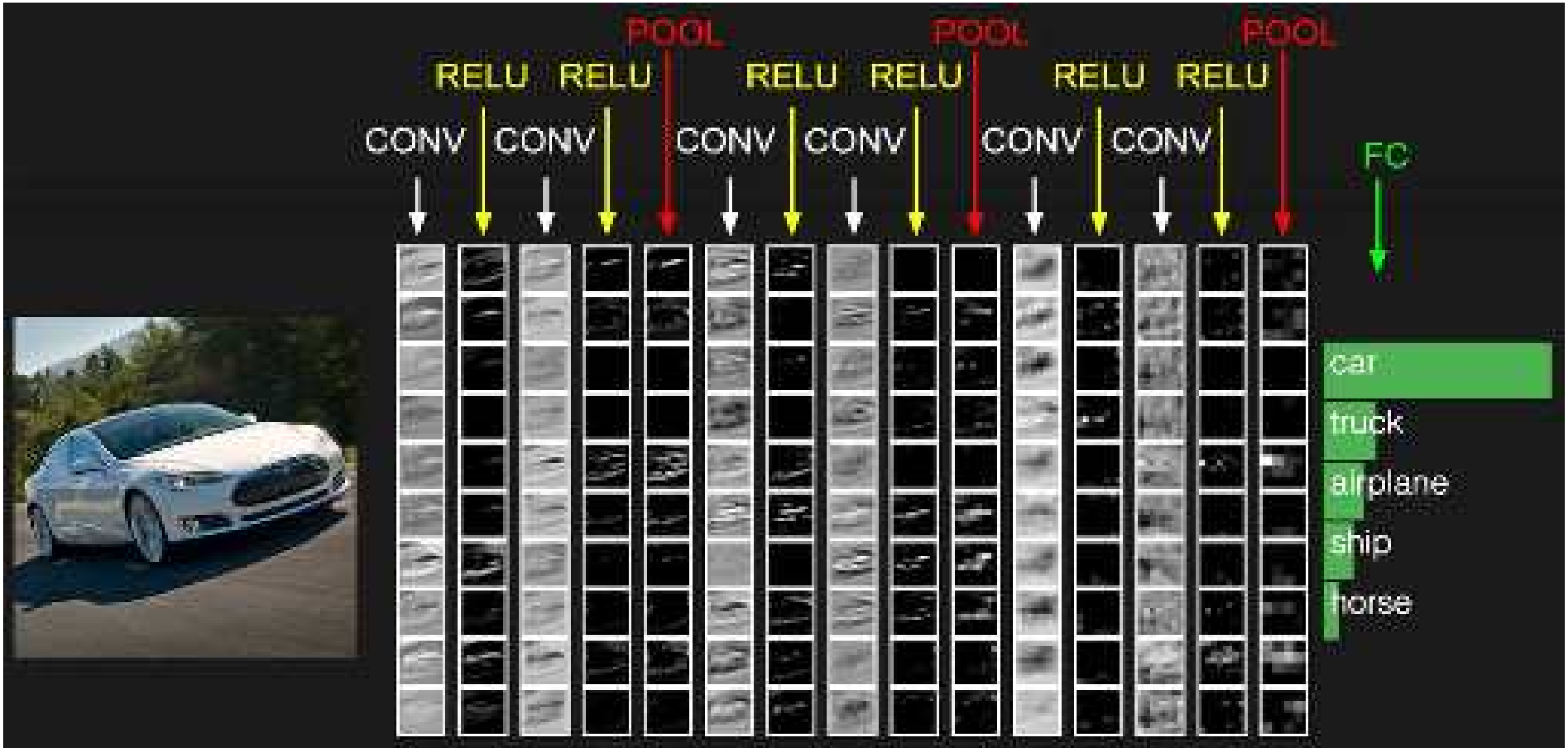
- http://jaeseung172.blog.me/220931561891

  [Calculate Multilayers...]

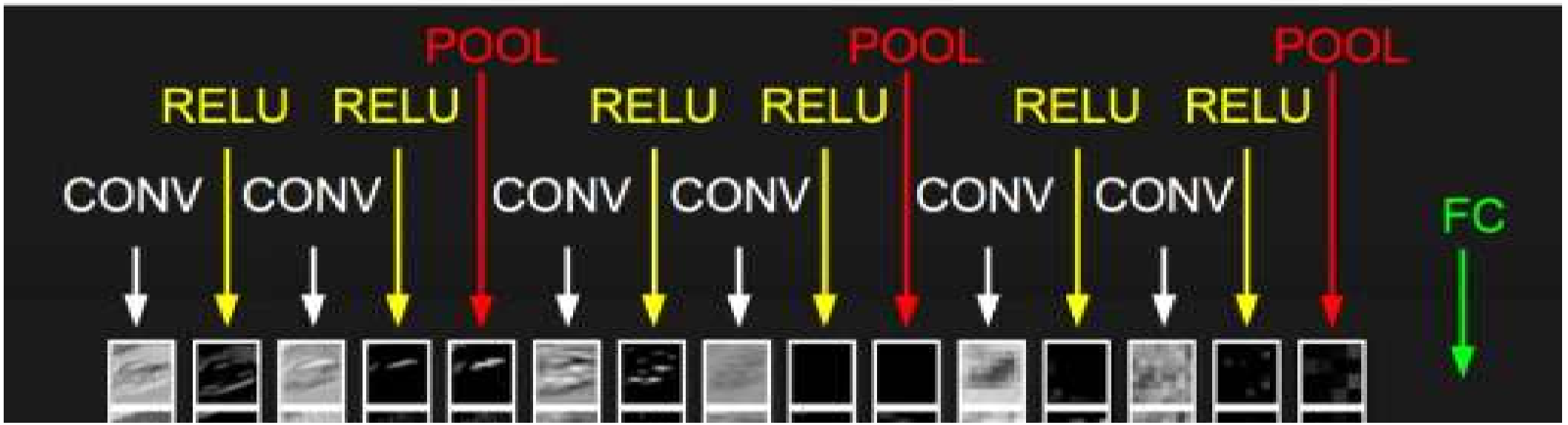
  - http://jaeseung172.blog.me/220931561891

이미지 인식을 위한
Convolutional
Neural
Network

원리

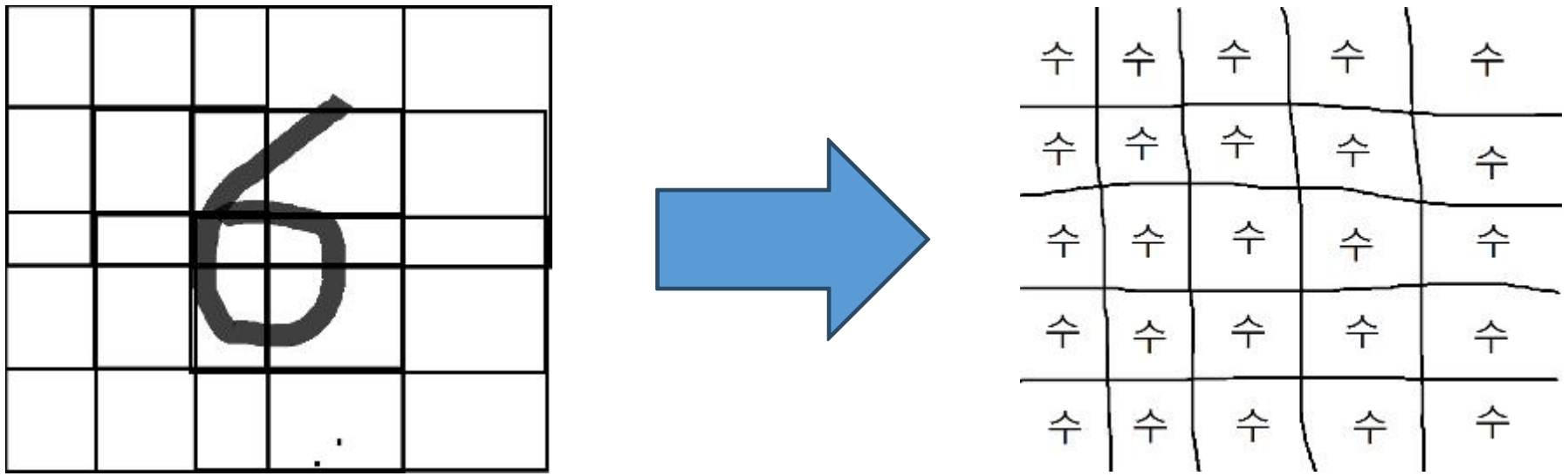

POOL
POOL
POOL
RELU
RELU
RELU
RELU
RELU
RELU
CONV
CONV
CONV
CONV
CONV
CONV
FC
car
truck
airplane
ship
horse

Steps


POOL
POOL
POOL
RELU
RELU
RELU
RELU
RELU
RELU
CONV
CONV
CONV
CONV
CONV
CONV
FC

STEP 01

[MATRIX]

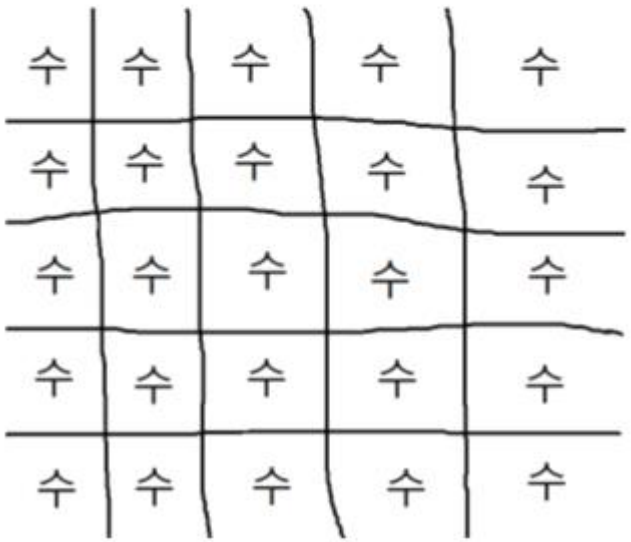


[5 x 5 x 1]

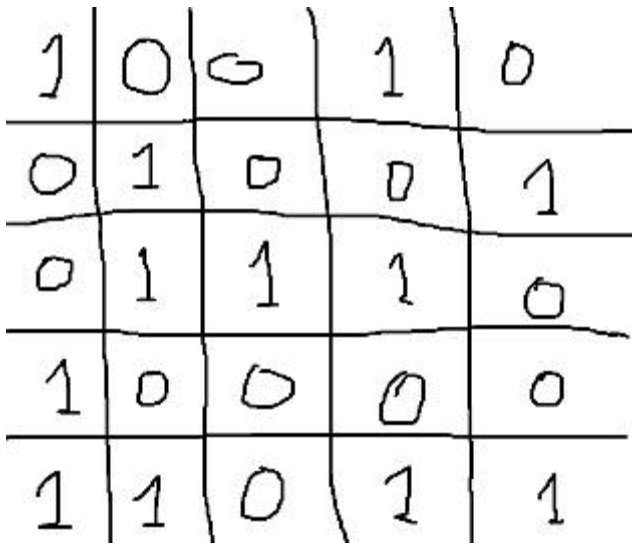
1 = <u>GrayScale</u>

STEP 02

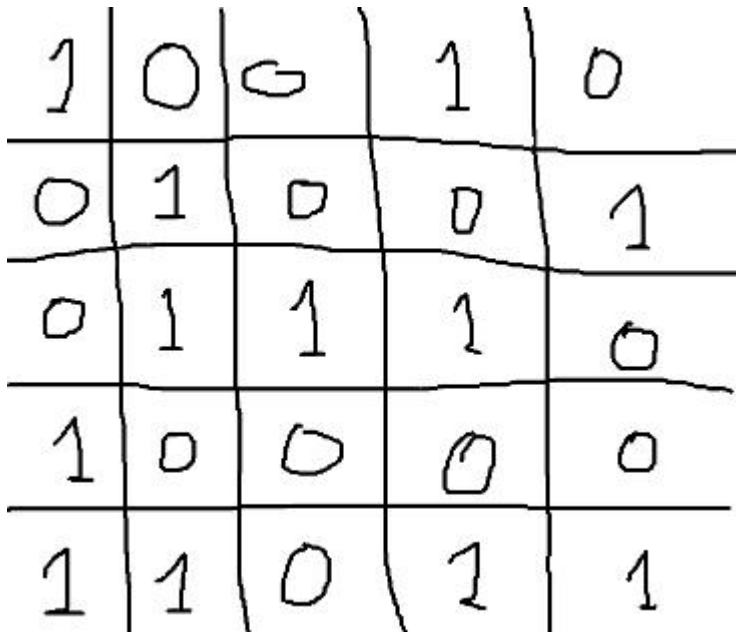
[MATRIX]

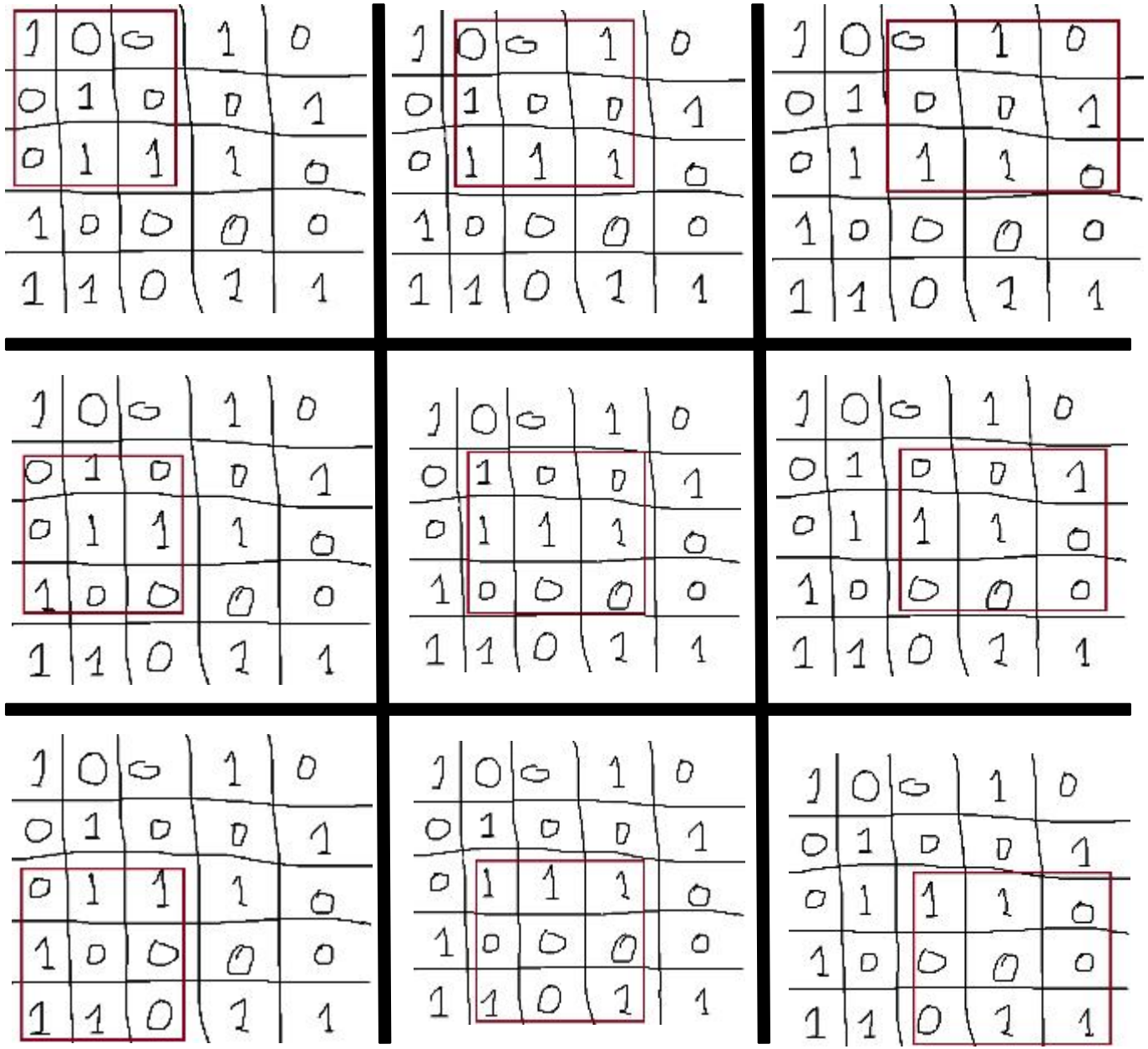


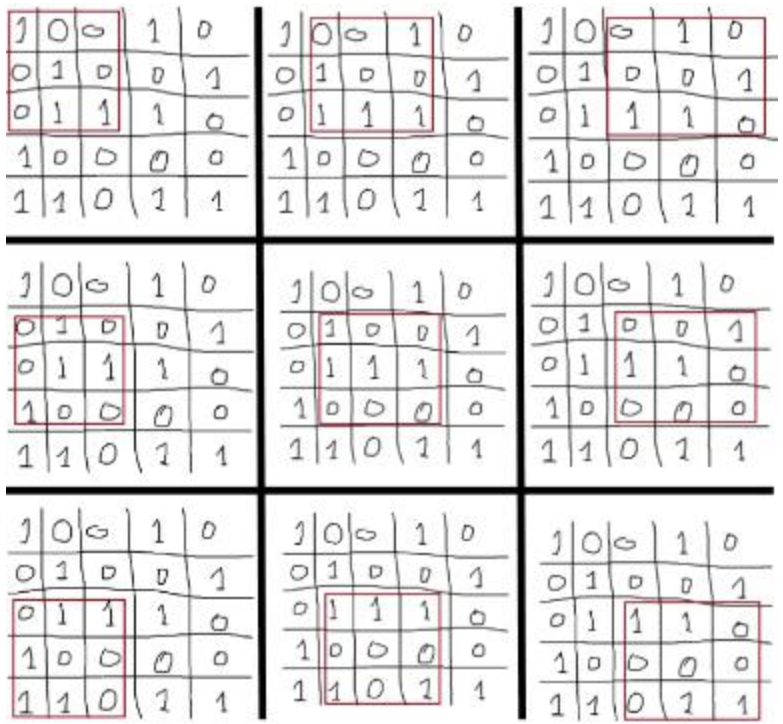
[Transfer 0 & 1]
Cause It's GrayScale!

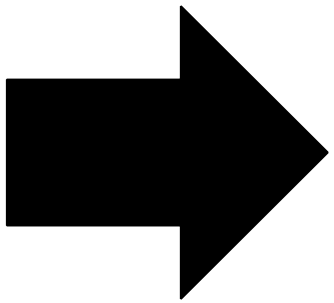


STEP 03

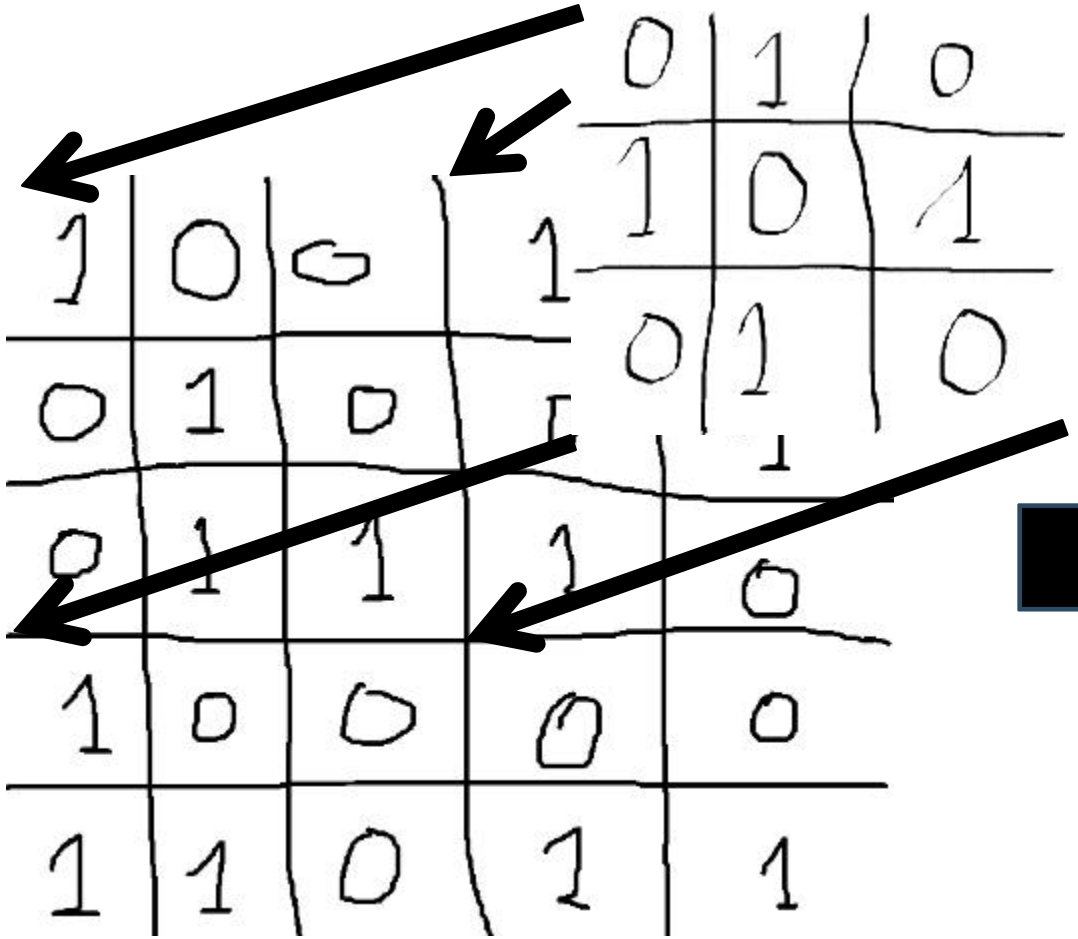




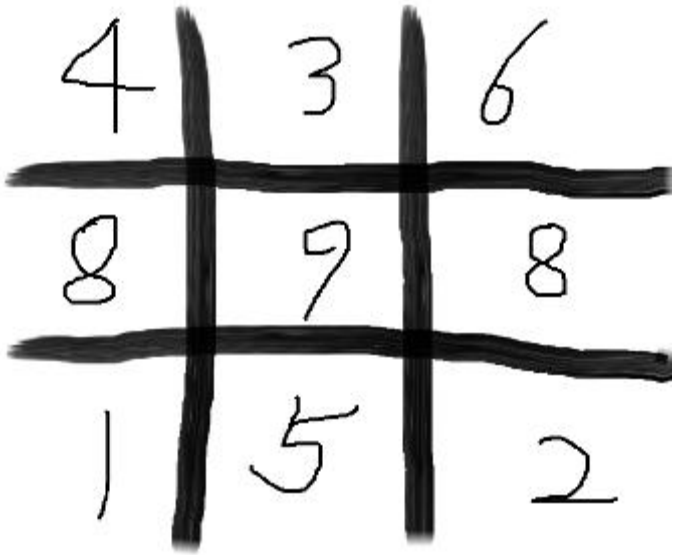




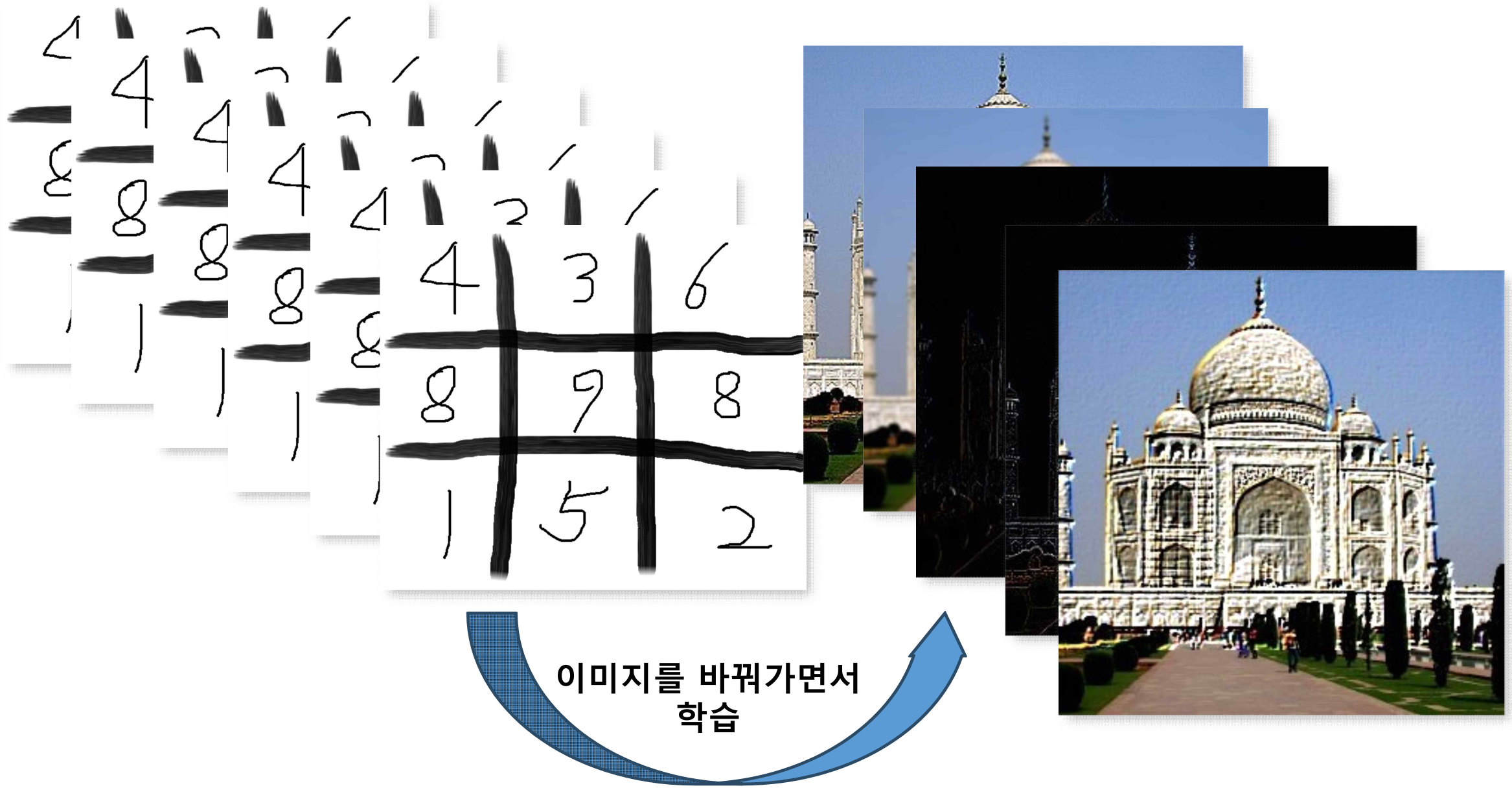
0	1	0
1	0	1
0	1	0



그러나 여기에서는 일부! 만 볼 수 있음

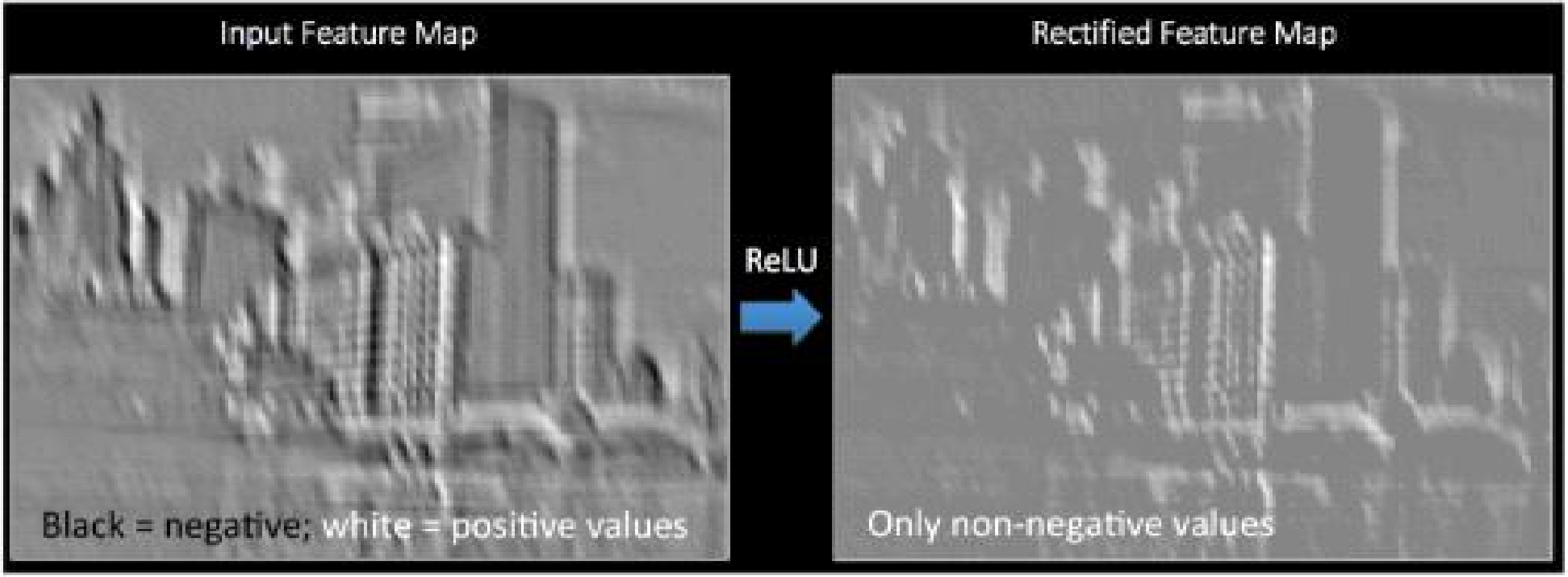


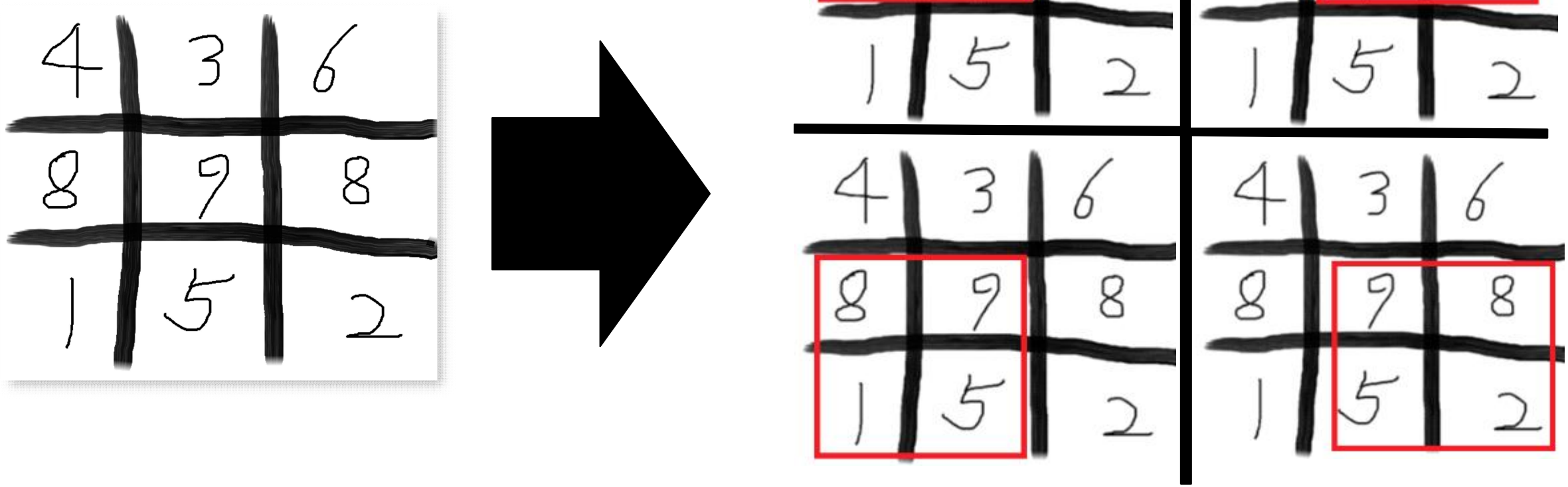
이것을 **Feature Detector** 혹은 **Kernel** 이라고 한다

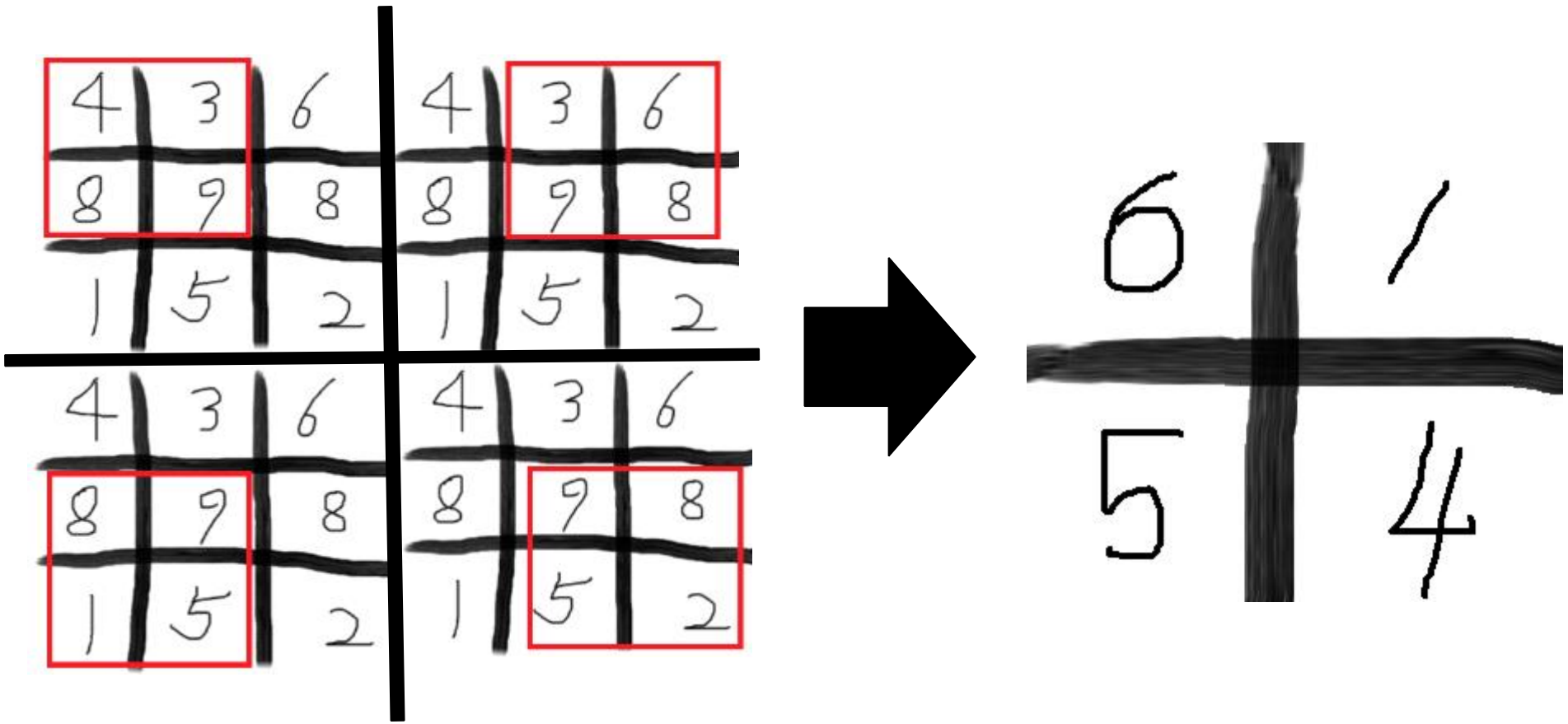


https://docs.gimp.org/en/plug-in-convmatrix.html

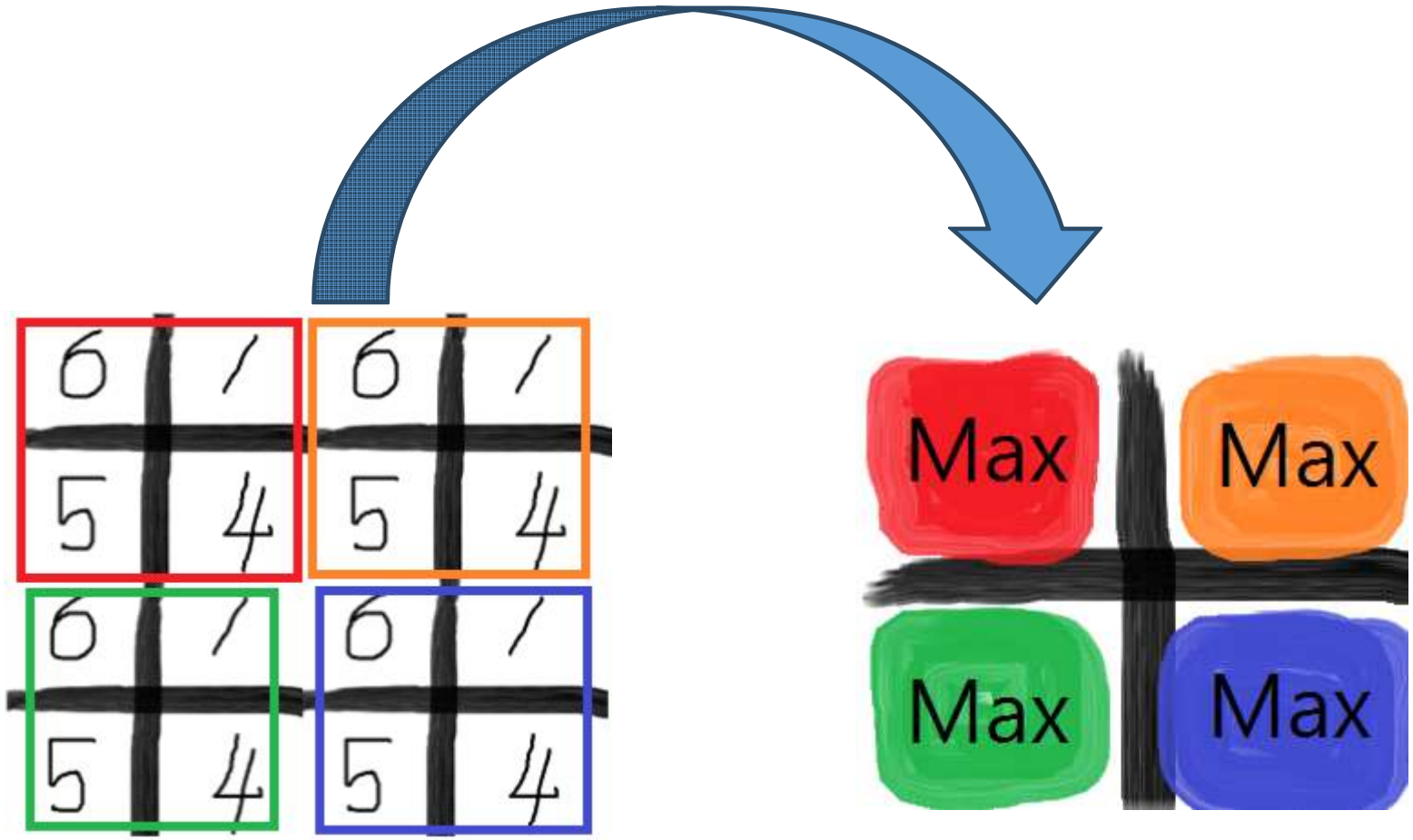
ReLU를 사용한 필터링




4 3 6
8 7 8
1 5 2
4 3 6
8 7 8
1 5 2
4 3 6
8 7 8
1 5 2
4 3 6
8 7 8
1 5 2



최대값을 뽑아서 4*4로 뽑아서, 4구역으로 만들기

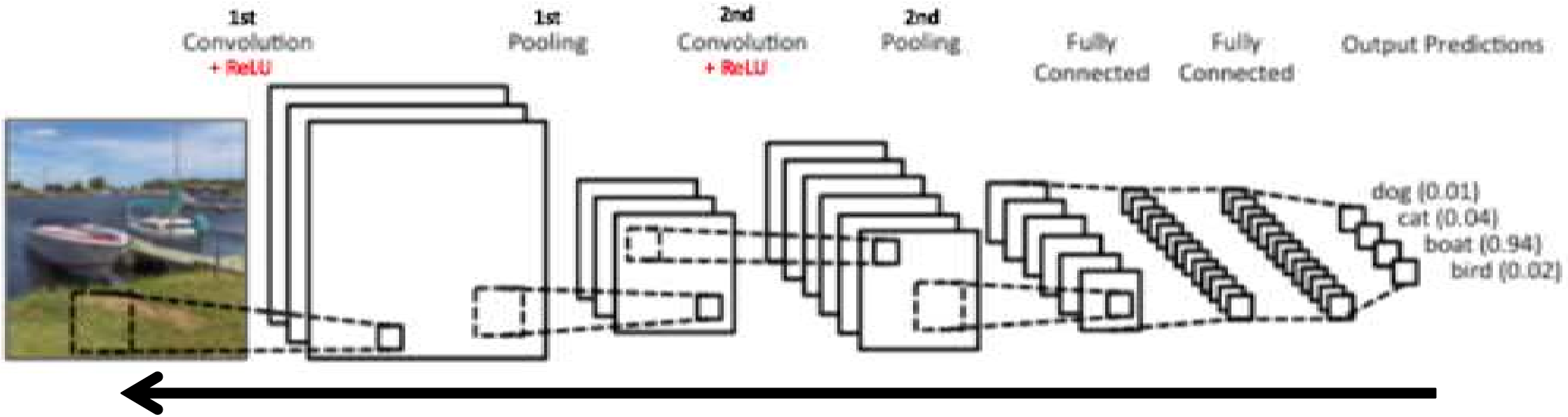


[최대값을 뽑아서 4*4 로 만들기]

Forward
Back
Propagation
Process

일단 학습

Forward Propagation



Back Propagation

돌아가면서 오류를 학습

출처

- 처음~CNN 전까지, 위키피디아
- CNN~Propagation Process: https://ujjwalkarn.me/2016/08/11/intuitive-explanation-convnets/
- BackPropagation: http://newsight.tistory.com/70