

Convolution Neural Network



커리큘럼

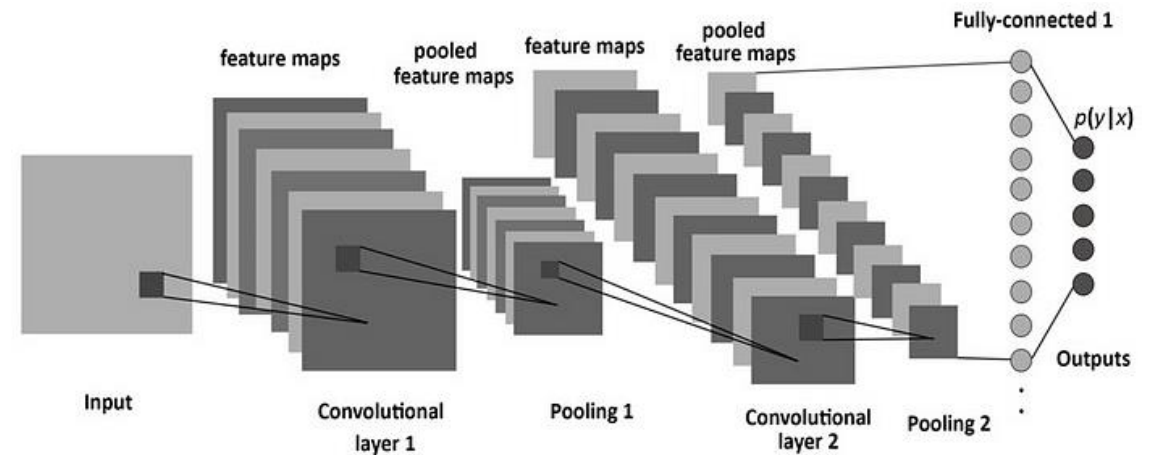
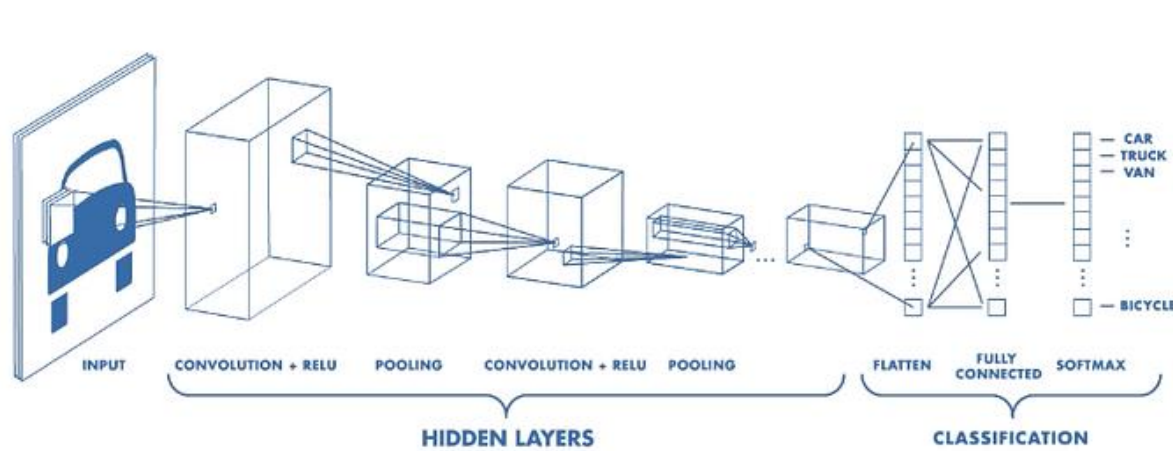
1. History of Artificial intelligence
2. Perceptron
3. Multilayer perceptron
4. Neural network
5. Deep Neural Network
6. Convolution Neural Network
7. Recurrent Neural Network
8. Autoencoder
9. Generative Adversarial Network



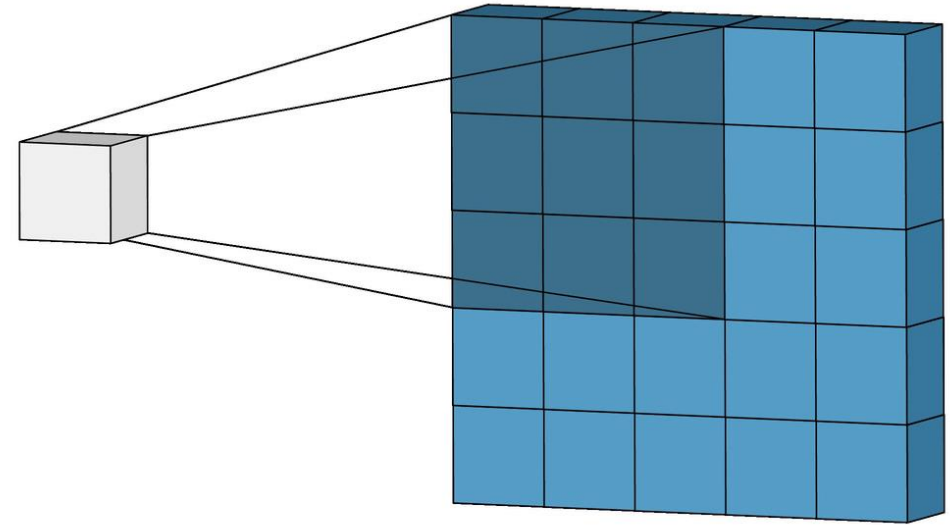
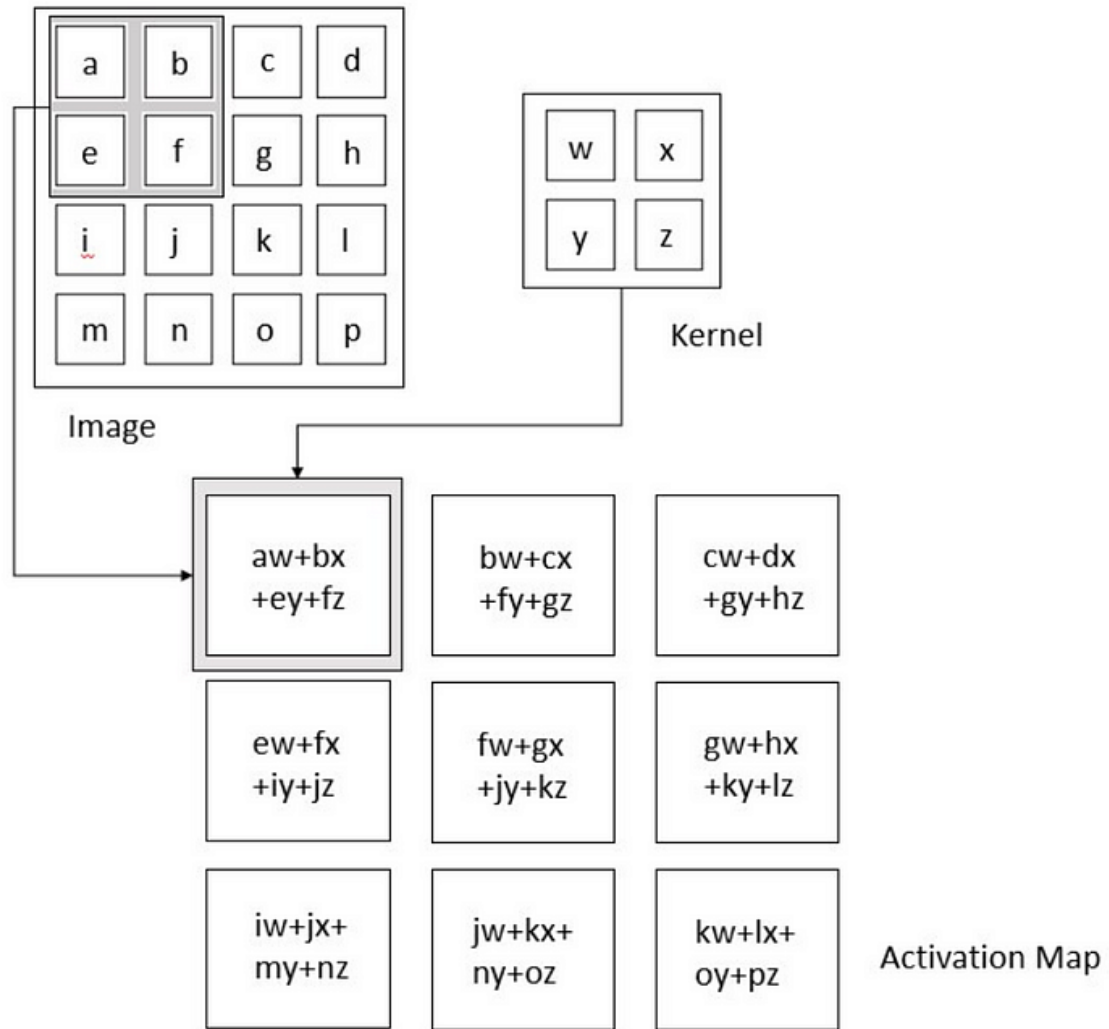
Convolutional Neural Network (CNN)

CNN is mainly used to identify face, objects, and traffic signs apart from powering vision in robots and self-driving cars.

CNN image classifications takes an input image, process it and classify it under certain categories (Eg., Dog, Cat, Tiger, Lion).



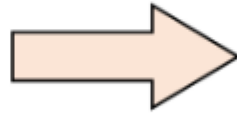
Convolution Layer



Stride

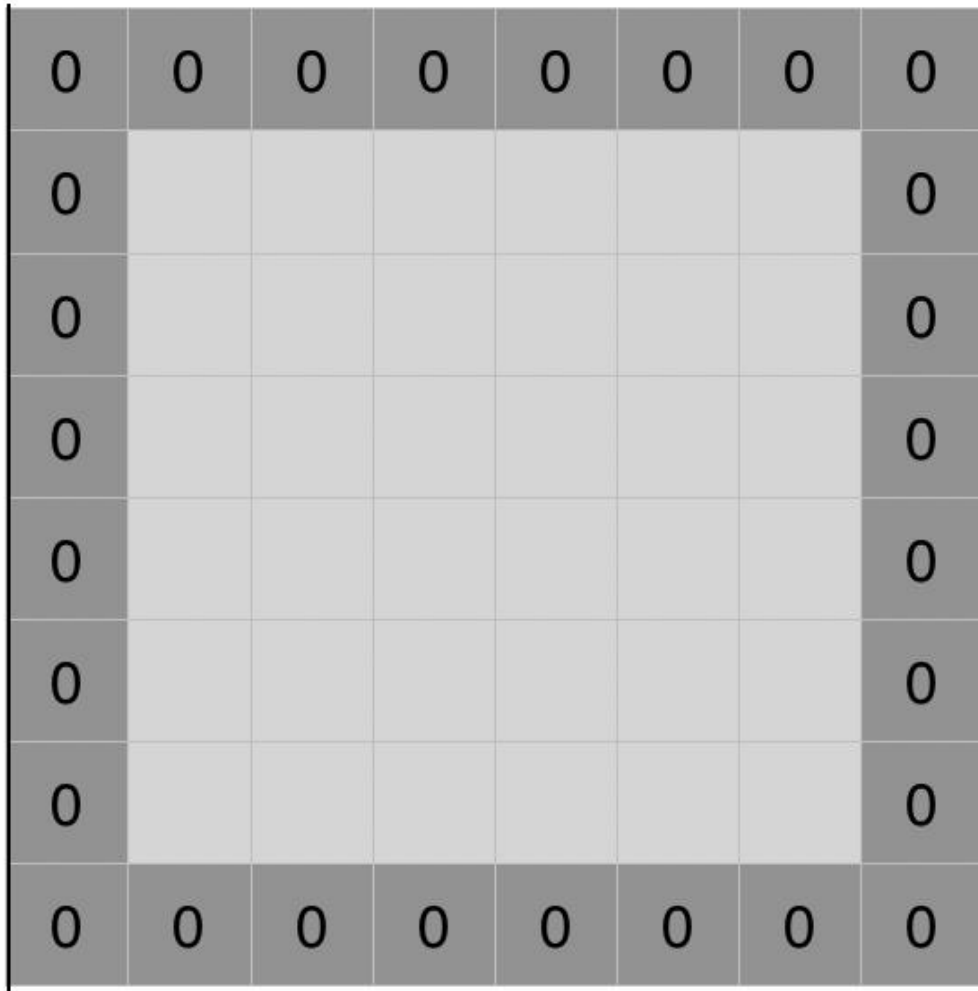
1	2	3	4	5	6	7
11	12	13	14	15	16	17
21	22	23	24	25	26	27
31	32	33	34	35	36	37
41	42	43	44	45	46	47
51	52	53	54	55	56	57
61	62	63	64	65	66	67
71	72	73	74	75	76	77

Convolve with 3x3
filters filled with ones



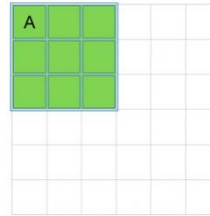
108	126	
288	306	

Padding

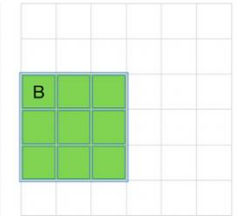
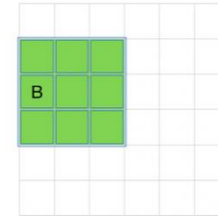
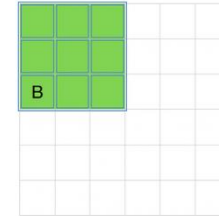


Zero-padding added to image

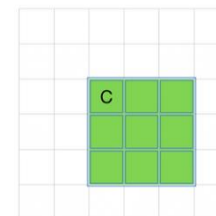
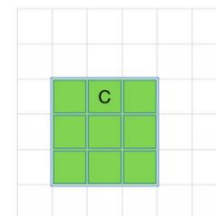
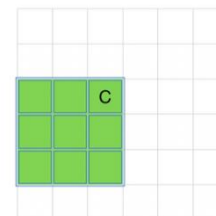
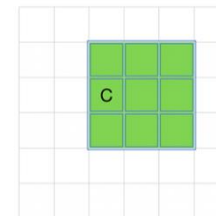
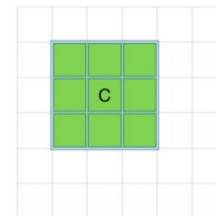
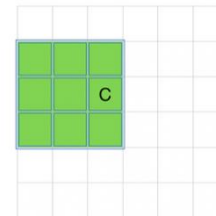
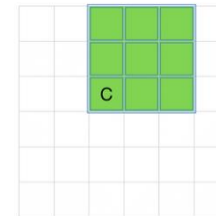
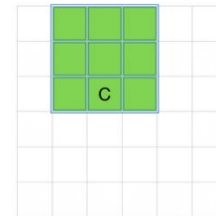
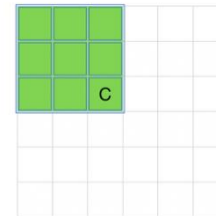
Corner Pixel



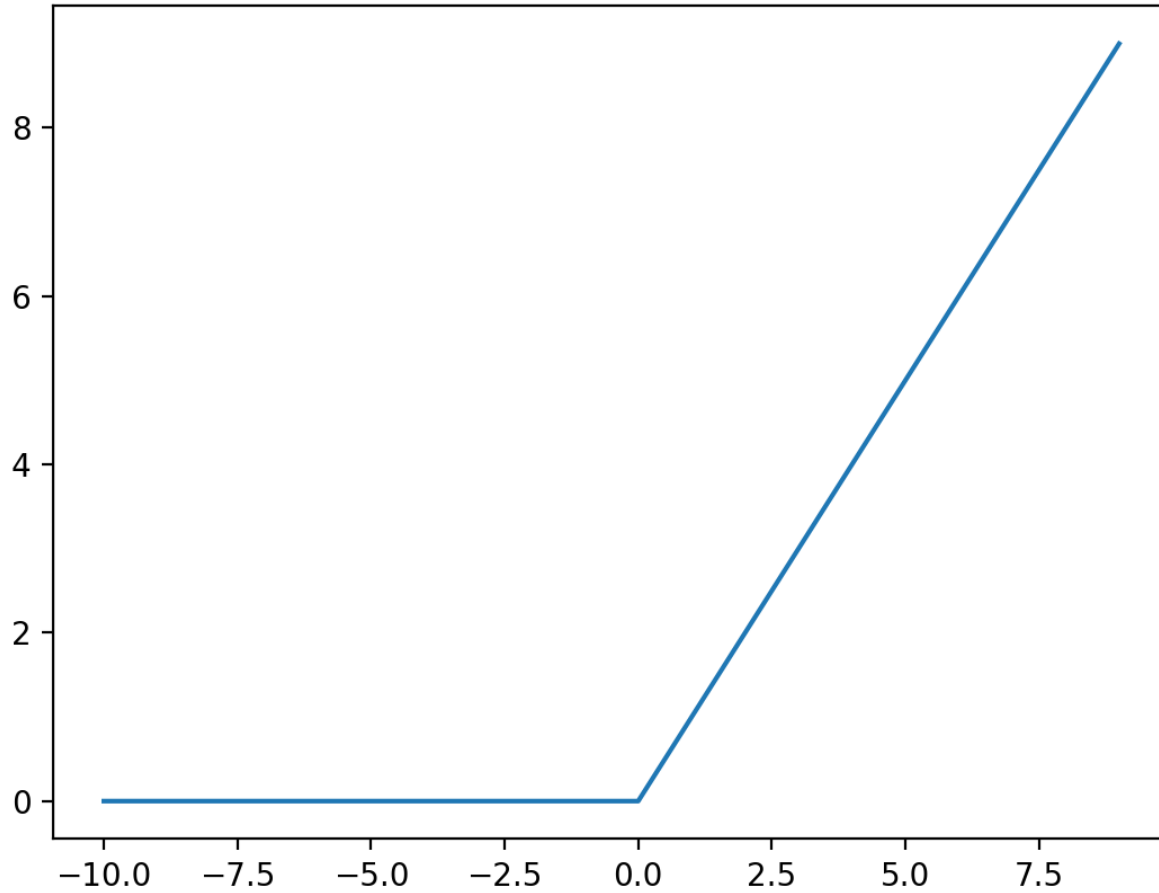
Edge Pixel



Middle Pixel



Rectified Linear Unit (ReLU)



Why ReLU is non linear?

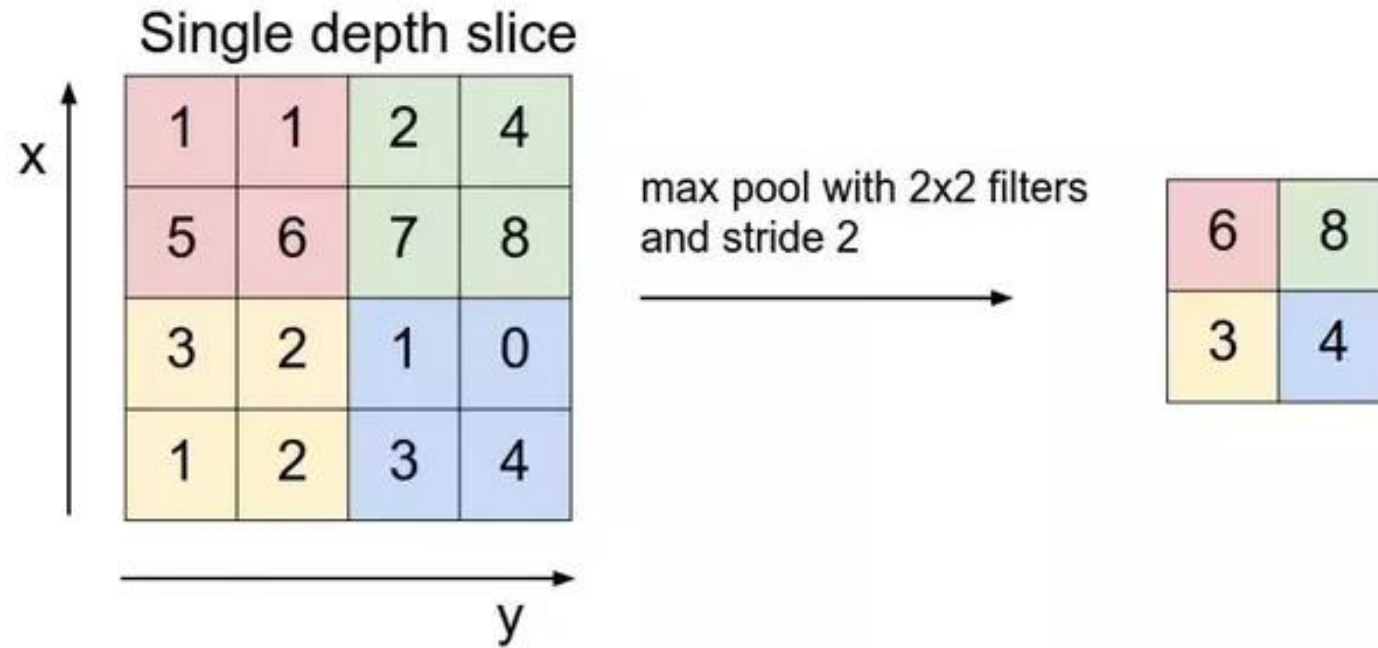
$$f(x+y) \neq f(x) + f(y)$$

$$x=2, y=-2$$

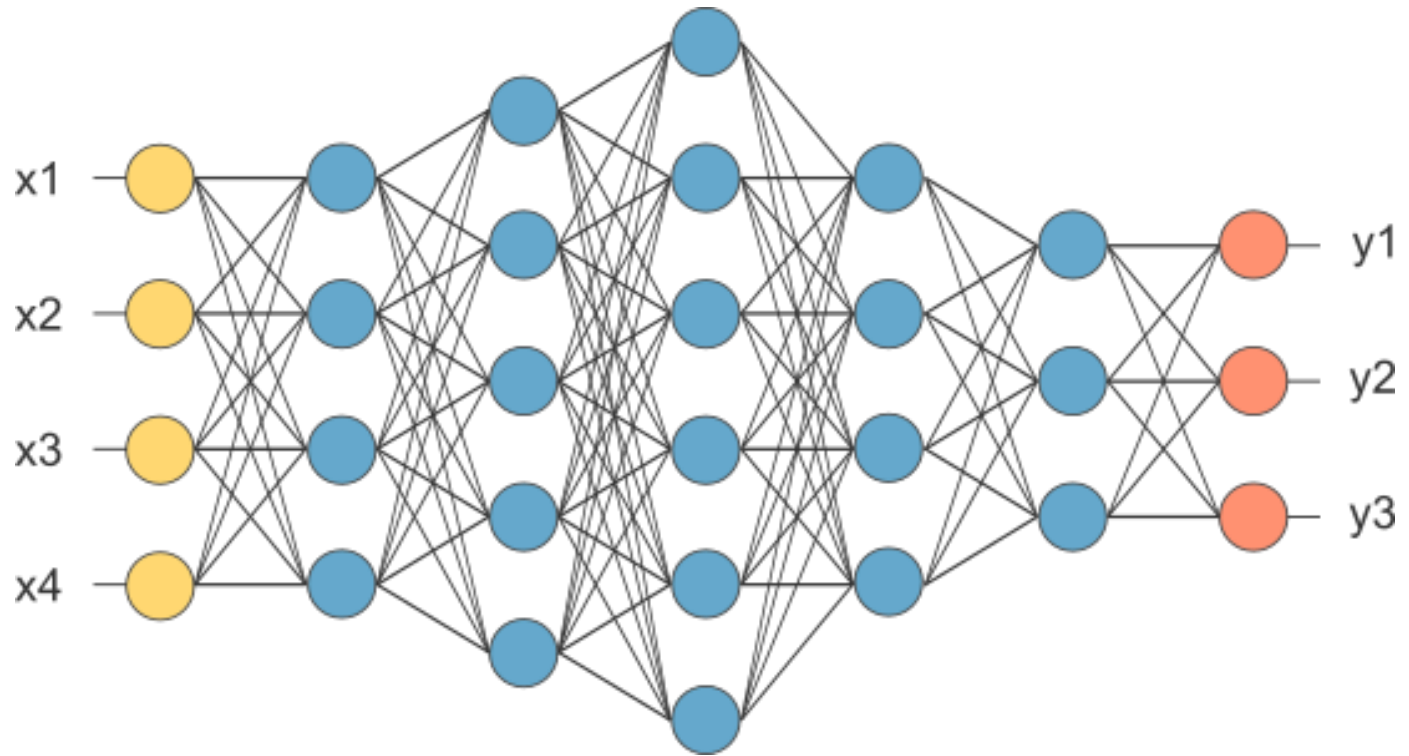
$$f(cx) \neq cf(x)$$

$$C=-1, x=2$$

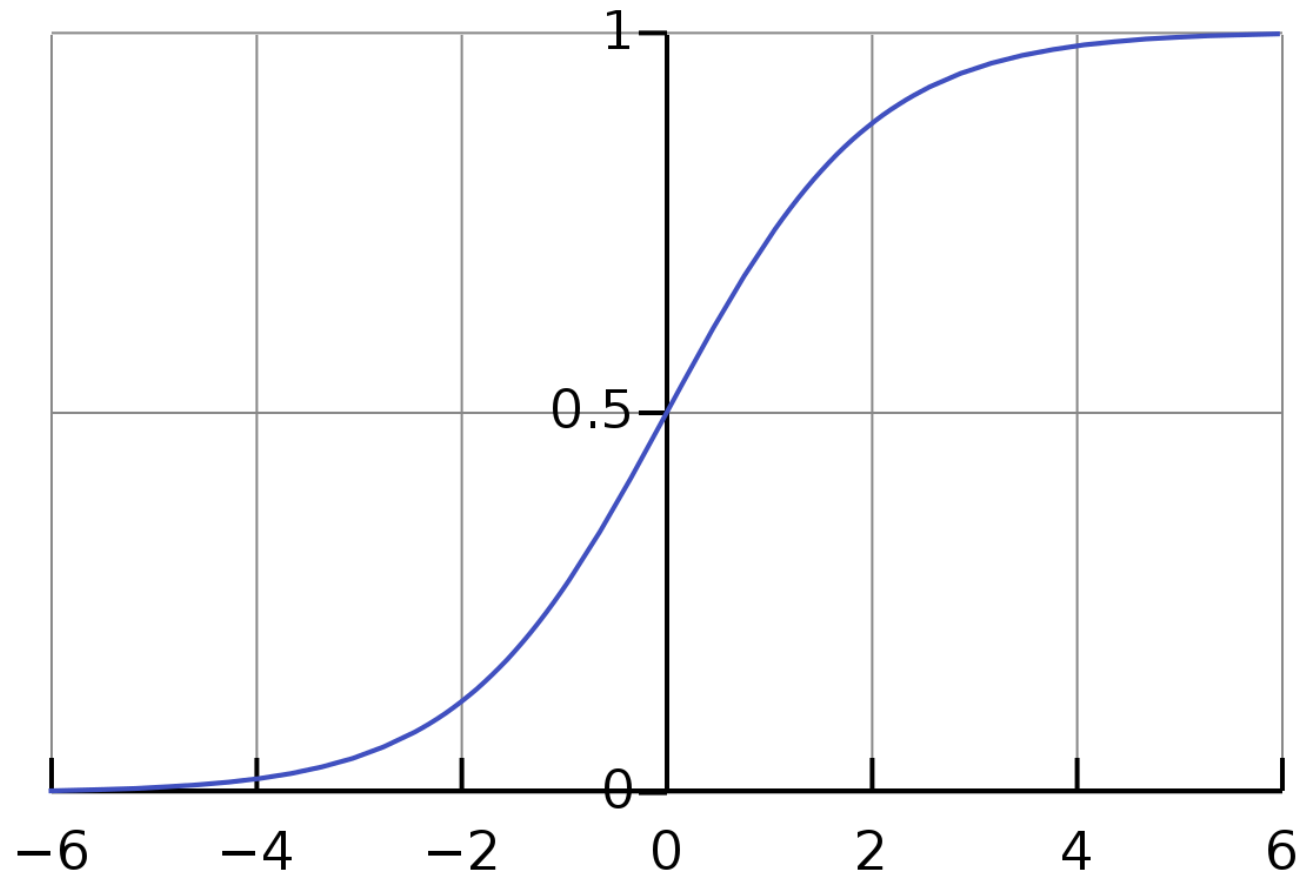
Pooling layer



Fully Connected Layer

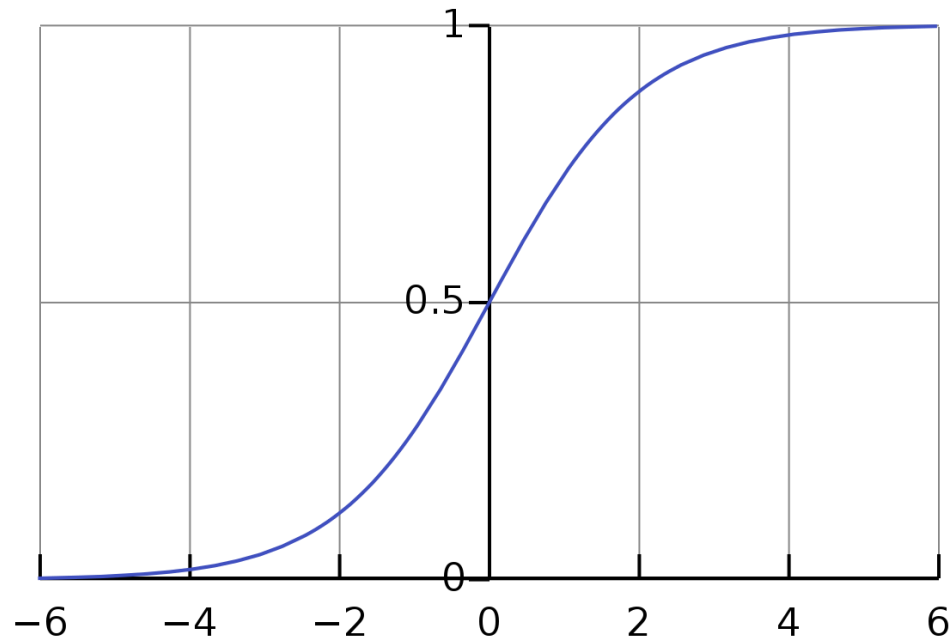


Sigmoid function

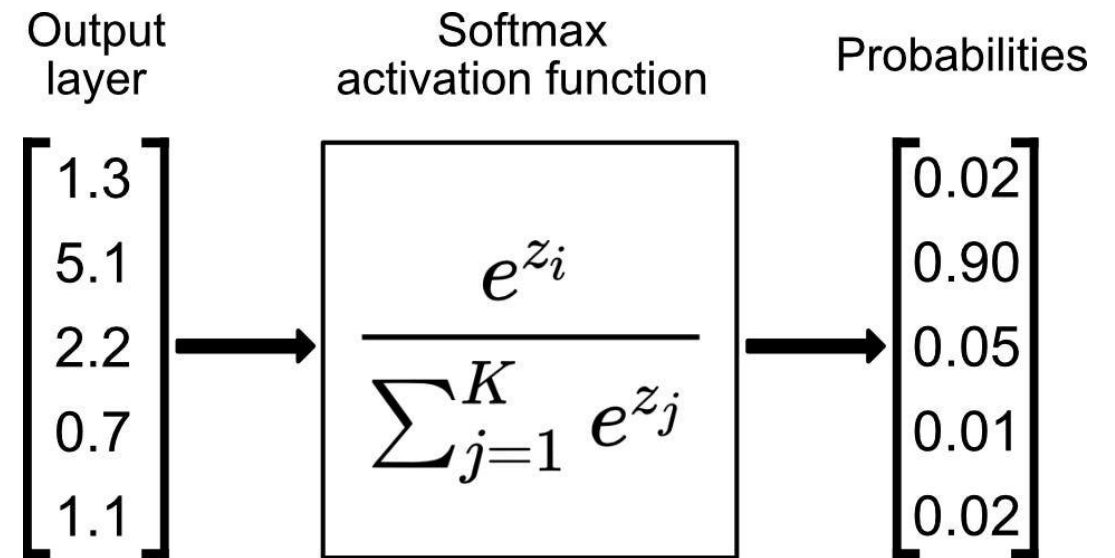


$$S(x) = \frac{1}{1 + e^{-x}}$$

Softmax function



$$\sigma(\vec{z})_i = \frac{e^{z_i}}{\sum_{j=1}^K e^{z_j}}$$



실습자료

<https://www.kaggle.com/code/kanncaa1/convolutional-neural-network-cnn-tutorial>