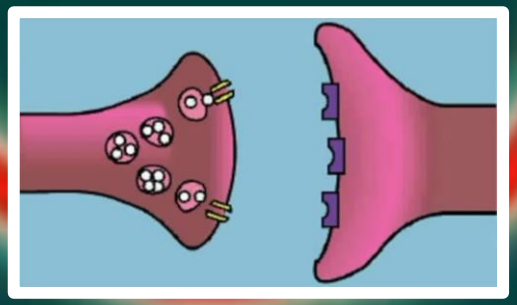
신경세포와 학습, 그리고 신경망

제주대학교 컴퓨터공학과
변영철 교수

github.com/yungbyun/ai2

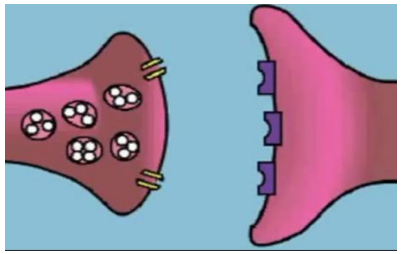
학습 (Learning)

시냅스 조정

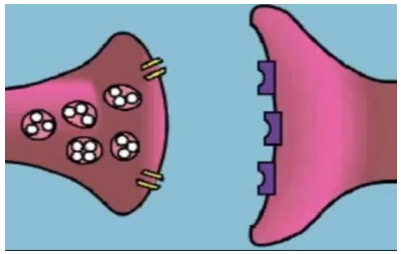


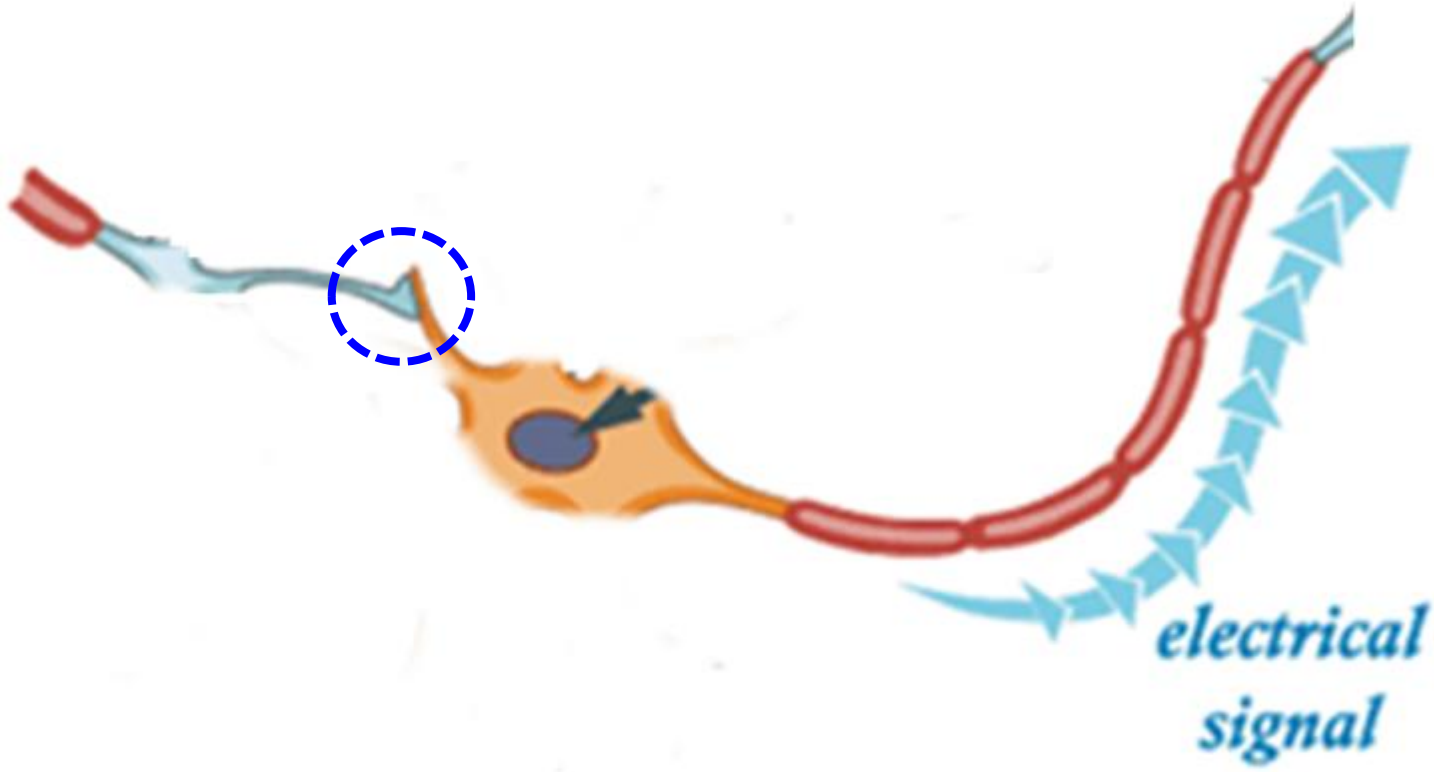
인간의 뇌
시냅스(파라미터)
수 = 약 100조개

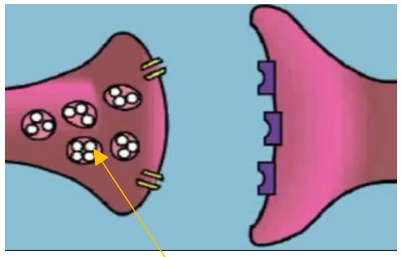
GPT3.5=1,750억 개
GPT4=5,000억 개?



시냅스



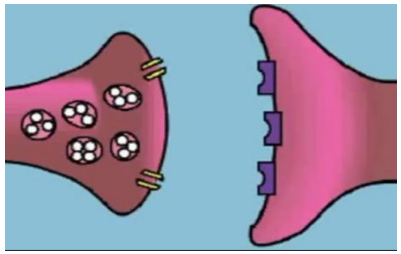

electrical
signal



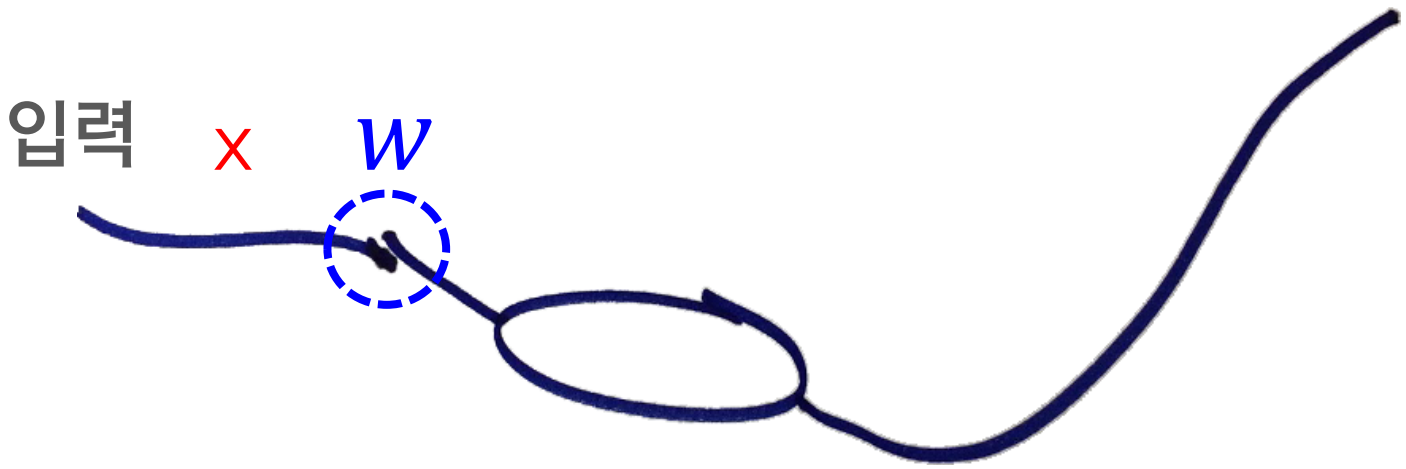
출력

입력

w : 신경전달 물질의 양



신경세포
출력(대답)



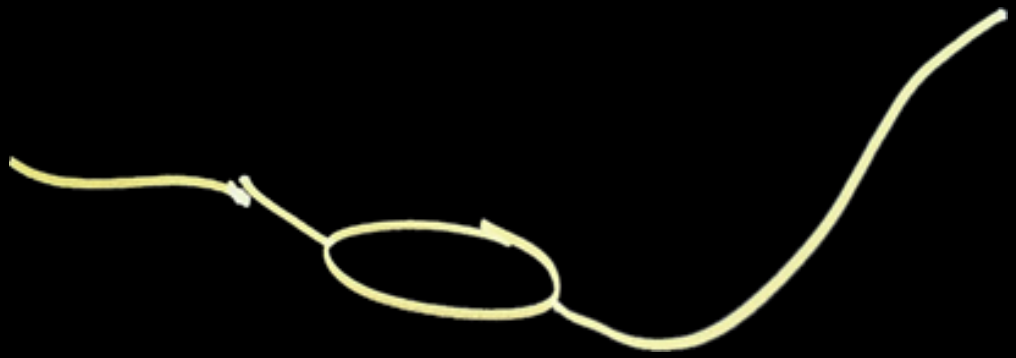
입력 x w → 신경세포 대답

w

입력

신경세포

대답



1시간 공부하면
1시간 게임하게

w

공부
시간

게임
시간

1
2
3

1
2
3

신경세포 대답

정답 y

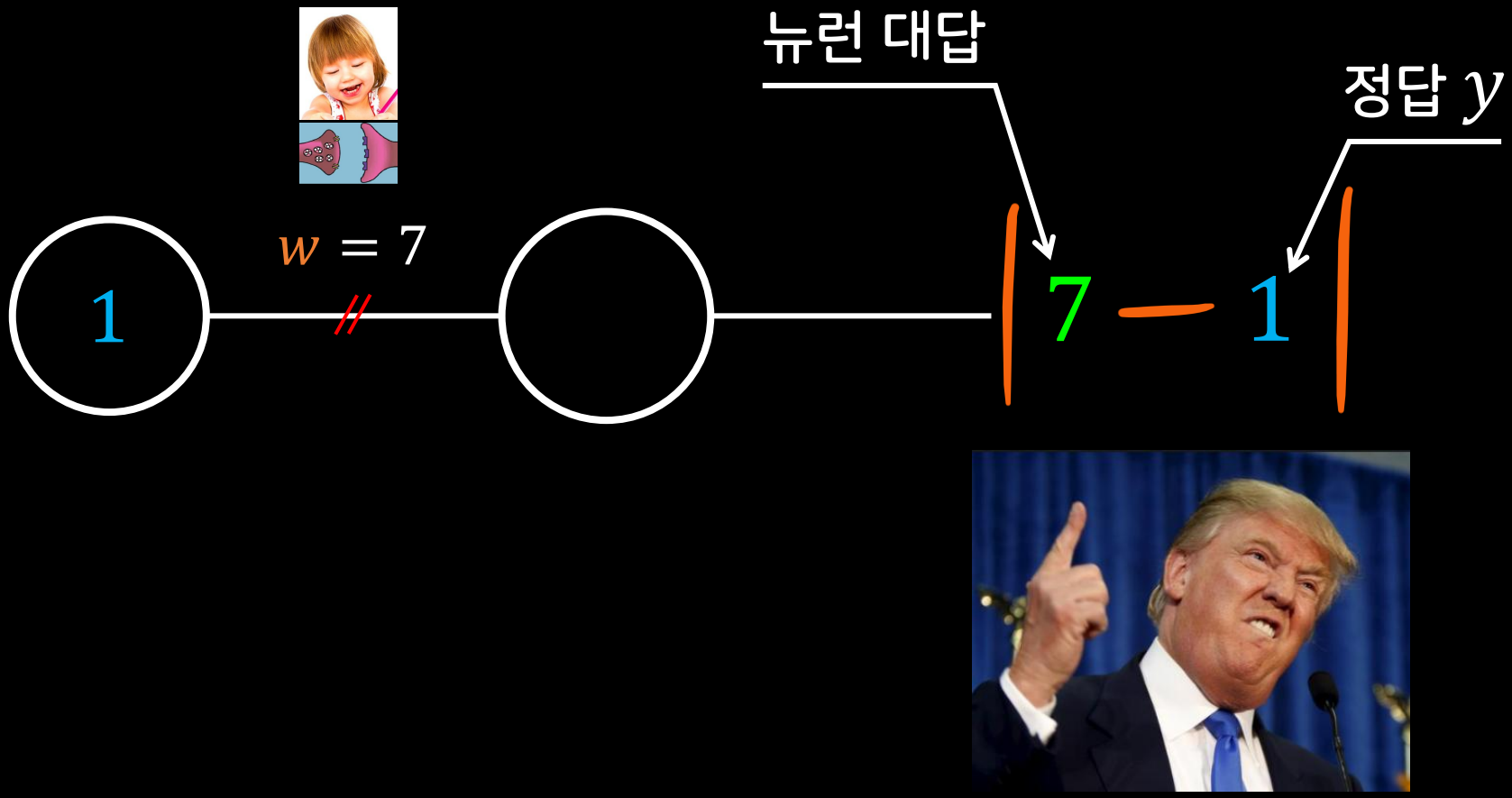
$w = 1$

1

1 − 1

“

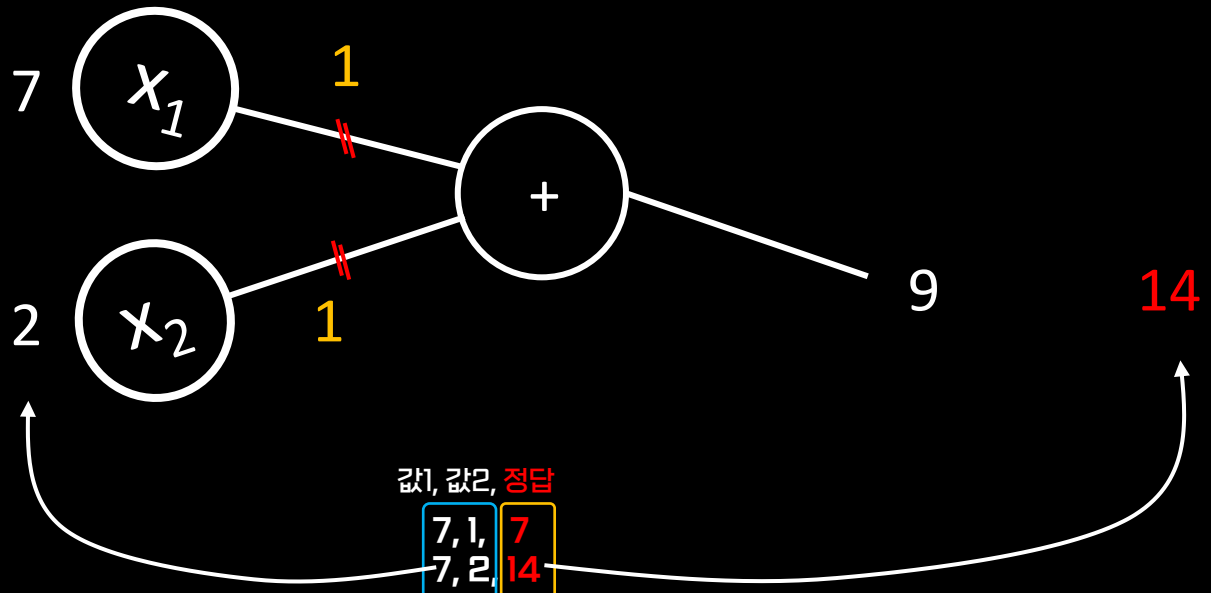
두 사람, 키 ‘차이’ 어떻게 돼요?


뉴런 대답
정답 y
$w = 7$
1
$|7 - 1|$

“

잘하면? 못하면?

대답을 잘하면 박수,
못하면 화를 내면 시냅스
가중치가 ‘자동으로’
조정된다.



값1, 값2, 정답

값1	값2	정답
7,	1,	7
7,	2,	14
7,	3,	21
7,	4,	28
7,	5,	35
7,	6,	42
7,	7,	49
7,	8,	56
7,	9,	63

7

7x1=7
7x2=14
7x3=21
7x4=28
7x5=35
7x6=42
7x7=49
7x8=56
7x9=63

입력 층

은닉 층

출력 층

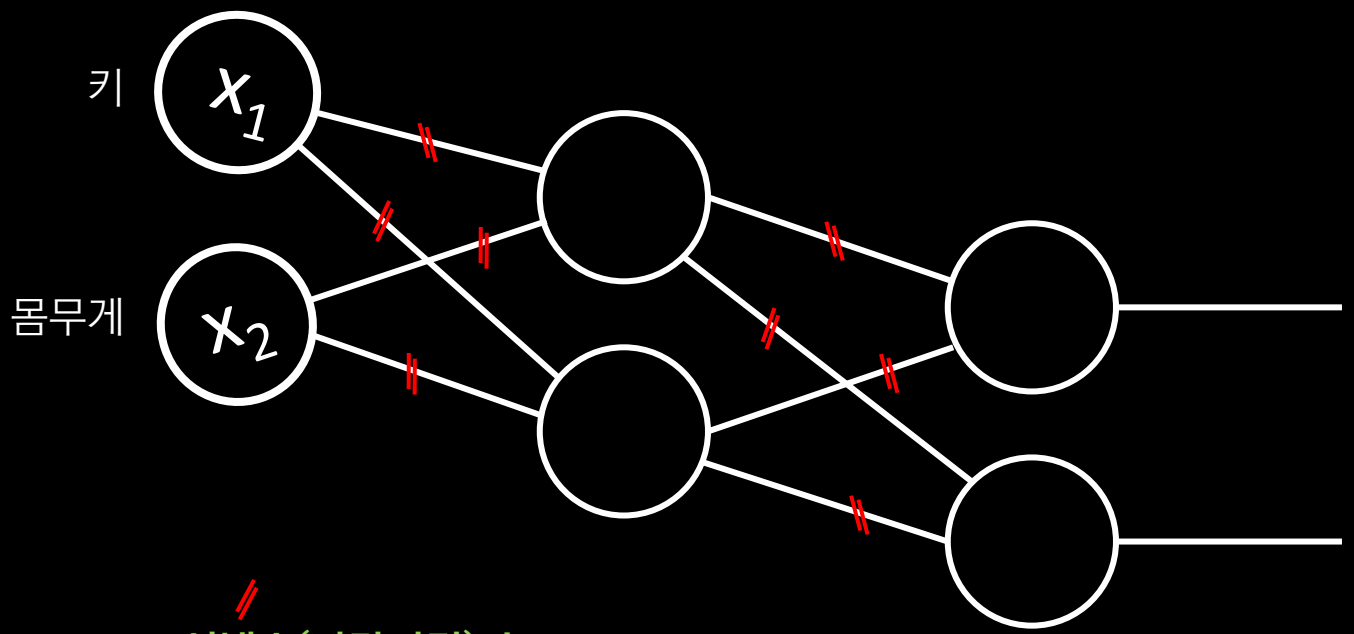
x_1

x_2

값1, 값2, 정답

7, 1,	7
7, 2,	14
7, 3,	21
7, 4,	28
7, 5,	35
7, 6,	42
7, 7,	49
7, 8,	56
7, 9,	63

뉴런이 정답을 잘 맞추도록 시냅스를 조절한다.



시냅스(파라미터) 수

알파고 → ??
알파 제로 → 5천 6백만
GPT3.5 → 1,750억
GPT4 → 3,000억 ~ 6,000억 (?)

키	몸무게	성별	
167	68	1	0
153	61	0	1
178	75	1	0


My New Zealand
Colours
My New Zealand Colours Book
My New Zealand ABC Book
My New Zealand
123 Book
Learn counting with art and objects from Te Papa


개

토끼

돼지

오리

animal.csv

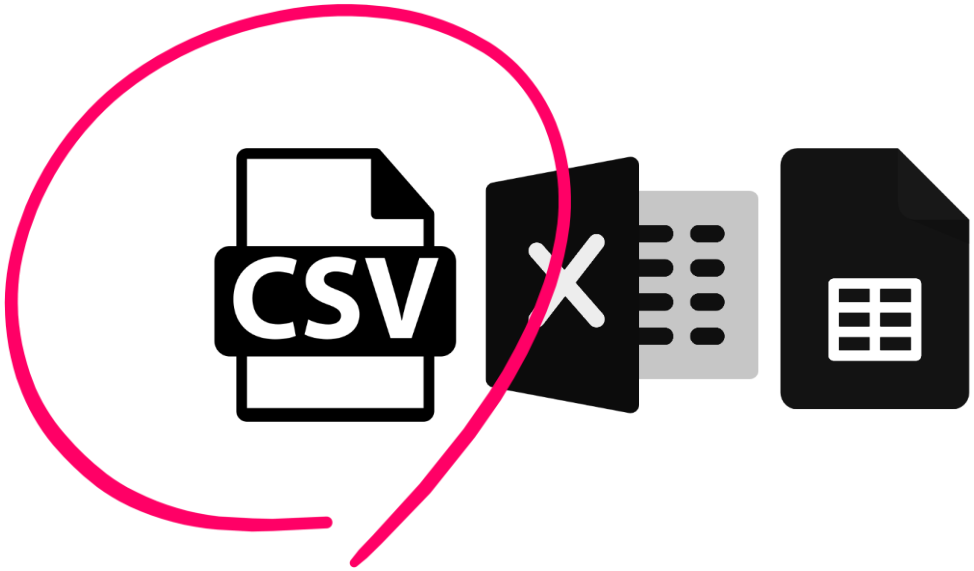
사진, 동물이름

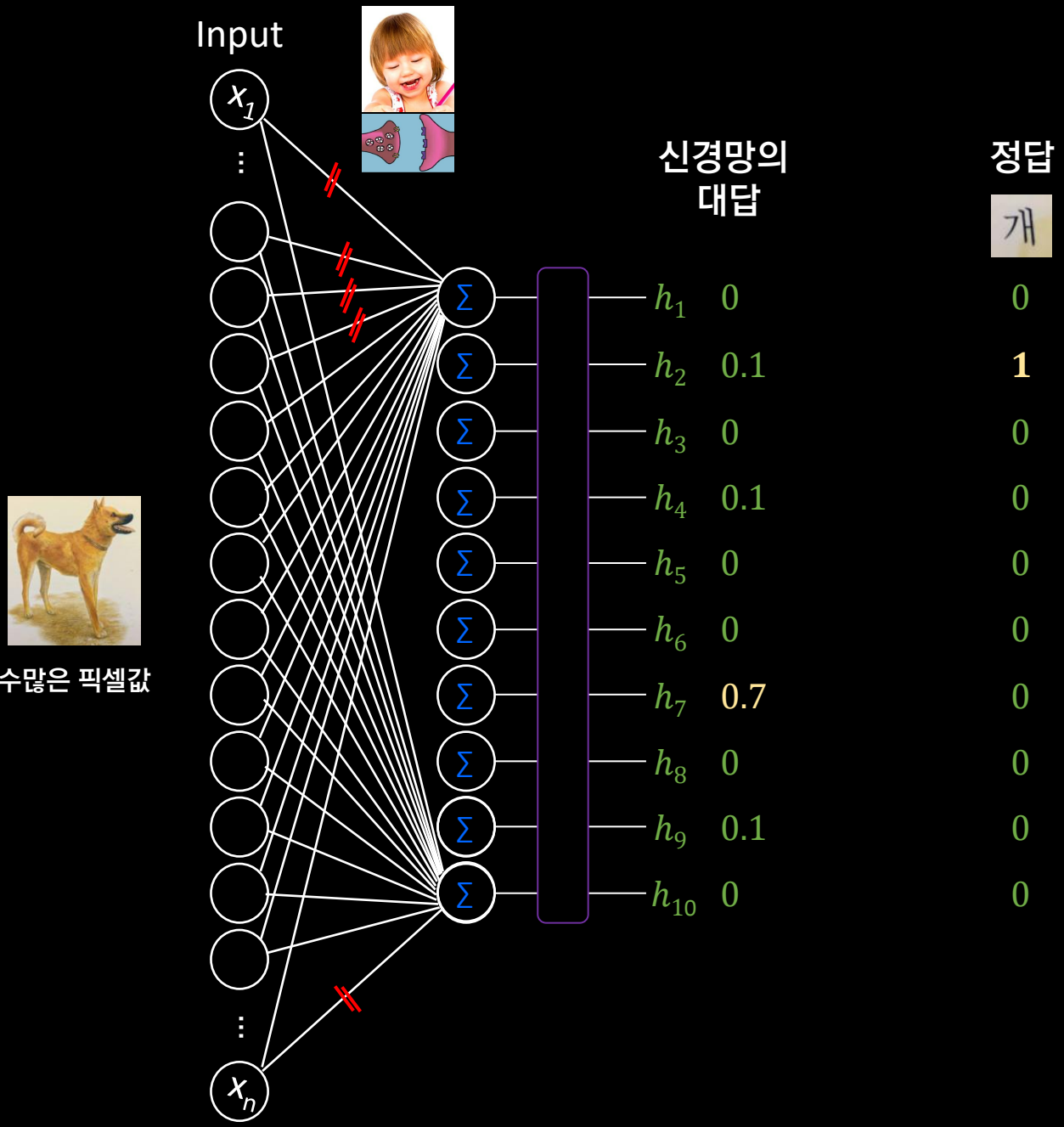
 , 개

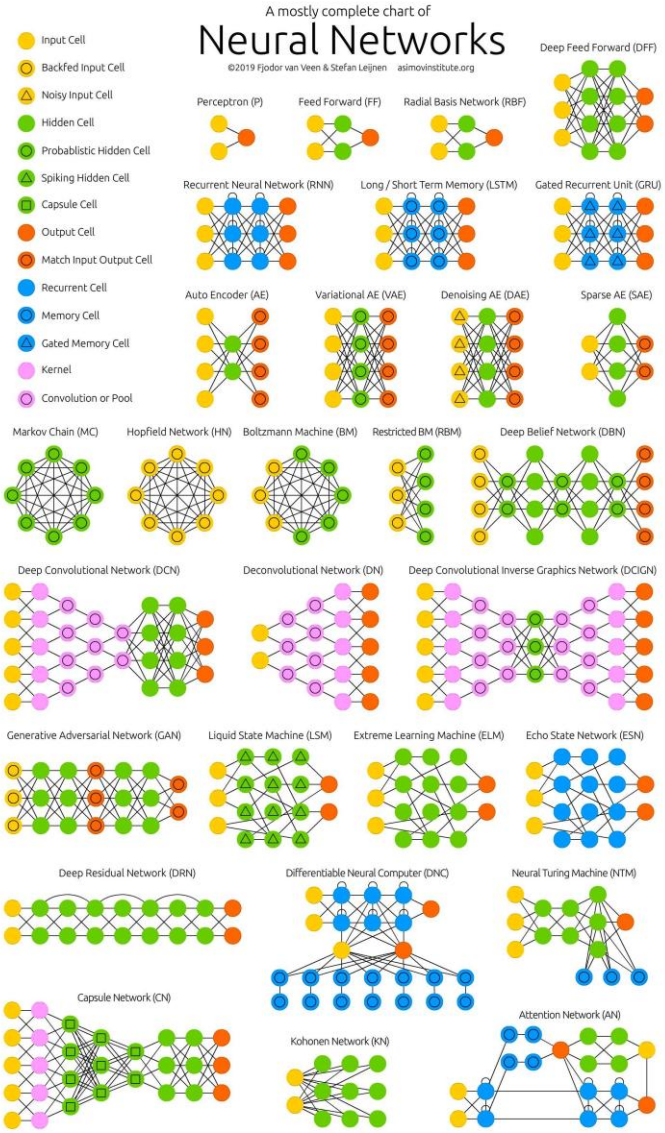
 , 토끼

 , 돼지

 , 오리




Input
x_1
x_n
수많은 픽셀값
신경망의 대답
정답
h_1 0
h_2 0.1
h_3 0
h_4 0.1
h_5 0
h_6 0
h_7 0.7
h_8 0
h_9 0.1
h_{10} 0
개
0
1
0
0
0
0
0
0
0


A mostly complete chart of
Neural Networks
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Input Cell
Backfed Input Cell
Noisy Input Cell
Hidden Cell
Probablistic Hidden Cell
Spiking Hidden Cell
Capsule Cell
Output Cell
Match Input Output Cell
Recurrent Cell
Memory Cell
Gated Memory Cell
Kernel
Convolution or Pool
Perceptron (P)
Feed Forward (FF)
Radial Basis Network (RBF)
Deep Feed Forward (DFF)
Recurrent Neural Network (RNN)
Long / Short Term Memory (LSTM)
Gated Recurrent Unit (GRU)
Auto Encoder (AE)
Variational AE (VAE)
Denoising AE (DAE)
Sparse AE (SAE)
Markov Chain (MC)
Hopfield Network (HN)
Boltzmann Machine (BM)
Restricted BM (RBM)
Deep Belief Network (DBN)
Deep Convolutional Network (DCN)
Deconvolutional Network (DN)
Deep Convolutional Inverse Graphics Network (DCIGN)
Generative Adversarial Network (GAN)
Liquid State Machine (LSM)
Extreme Learning Machine (ELM)
Echo State Network (ESN)
Deep Residual Network (DRN)
Differentiable Neural Computer (DNC)
Neural Turing Machine (NTM)
Capsule Network (CN)
Kohonen Network (KN)
Attention Network (AN)

지도학습

Supervised Learning

ARTIFICIAL INTELLIGENCE

IS NOT NEW

ARTIFICIAL INTELLIGENCE

Any technique which enables computers to mimic human behavior

MACHINE LEARNING

AI techniques that give computers the ability to learn without being explicitly programmed to do so

DEEP LEARNING

A subset of ML which make the computation of multi-layer neural networks feasible

1950's 1960's 1970's 1980's 1990's 2000's 2010s

ORACLE