Idea Factory Intensive Program #2

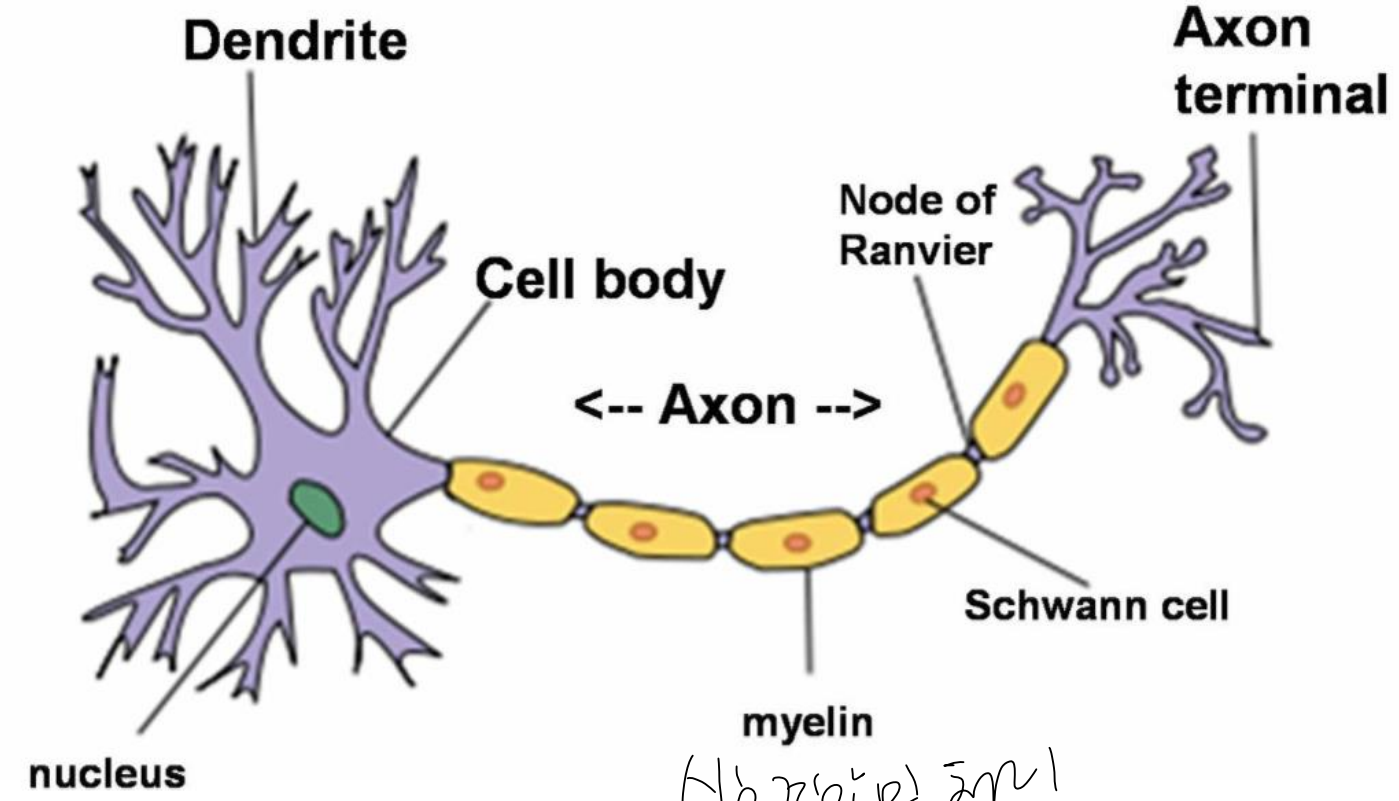
딥러닝 홀로서기 #2

이론강의/PyTorch실습/코드리뷰

딥러닝(Deep Learning)에 관심이 있는 학생 발굴을 통한
딥러닝의 이론적 배경 강의 및 오픈소스 딥러닝 라이브러리 PyTorch를 활용한 실습

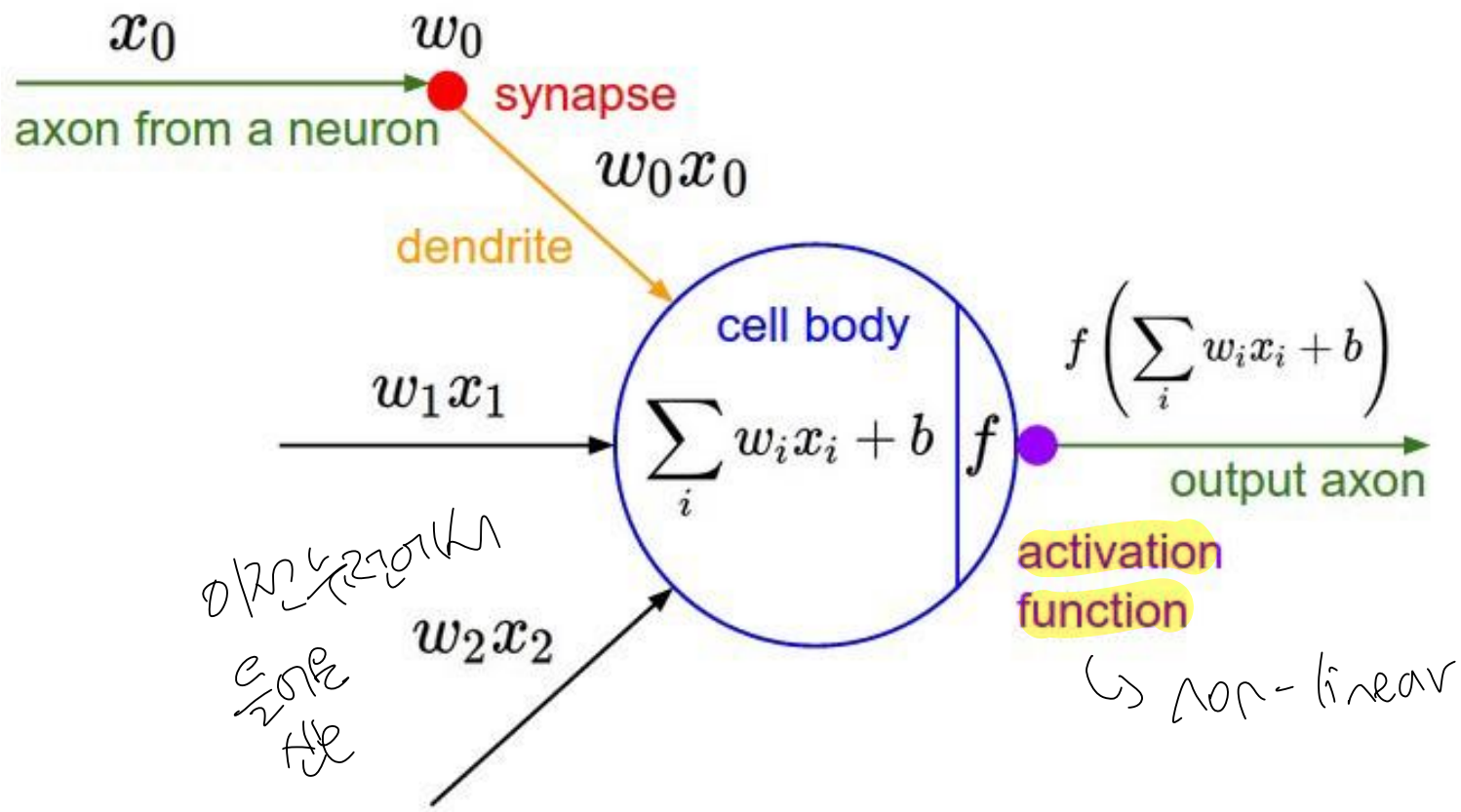
History of Deep Learning

Structure of Neuron

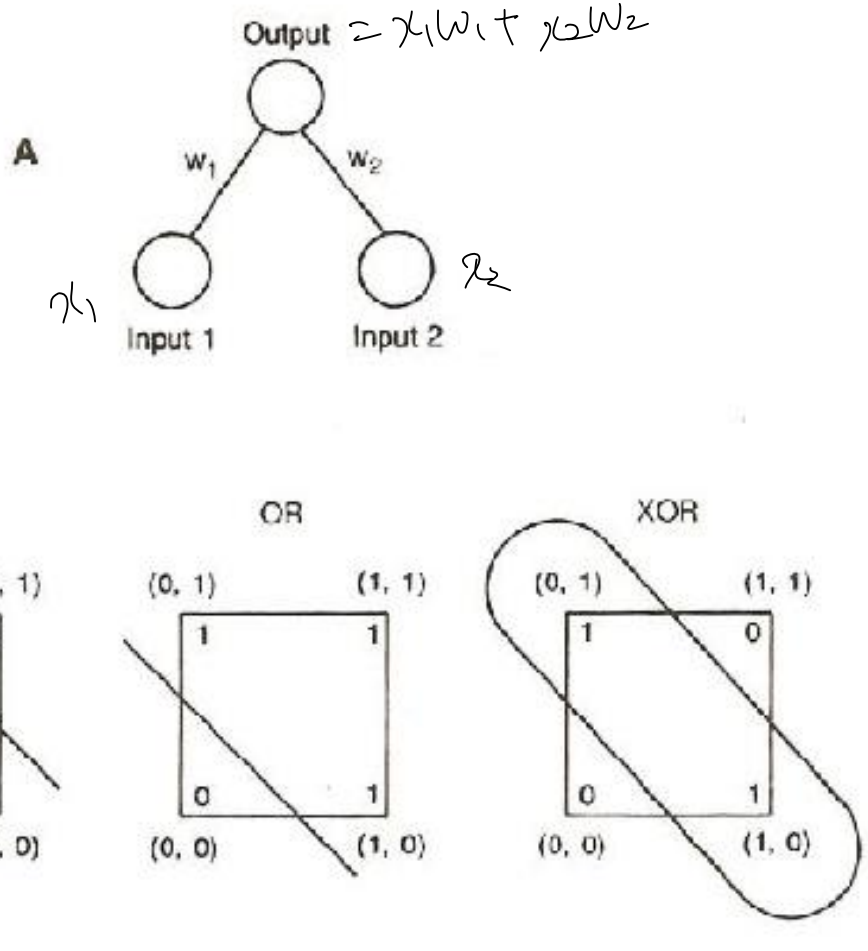


http://www.machineintellegence.com/deep-learning-basics/

Modeling Neuron (1957)

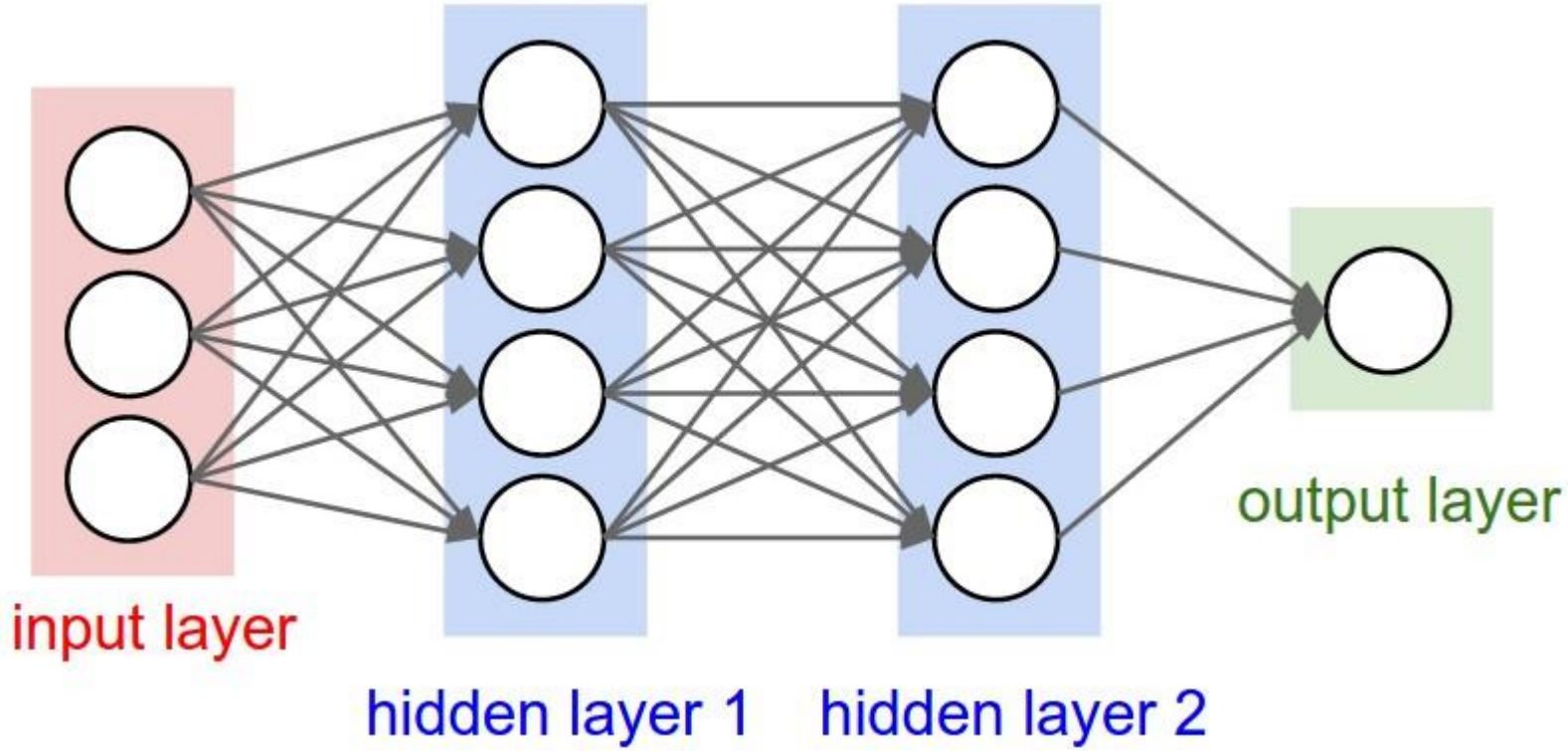


And/Or Problem



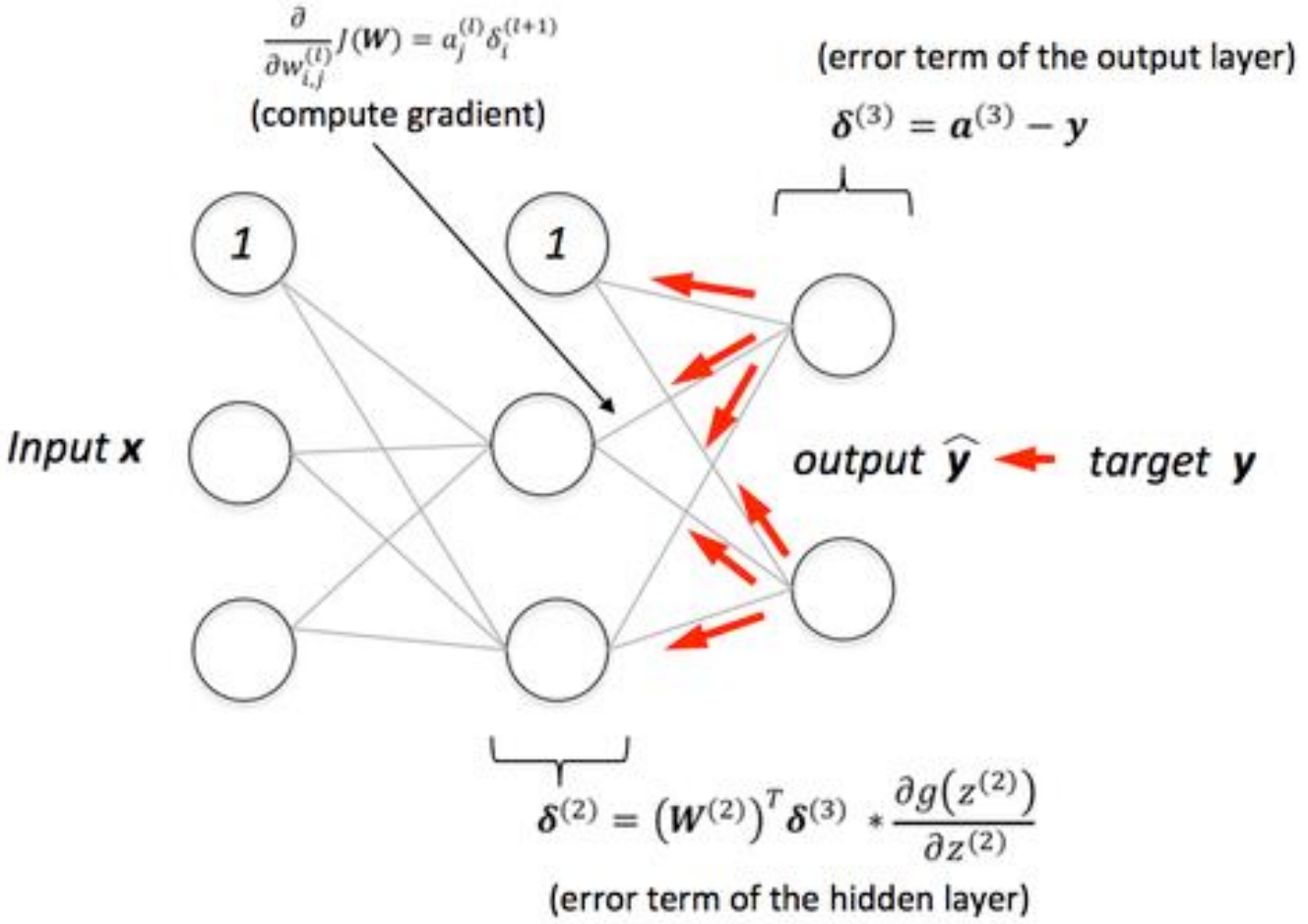
https://web.stanford.edu/group/pdplab/pdphandbook/handbookch6.html

XOR can be solved by Multilayer Perceptron (1969)



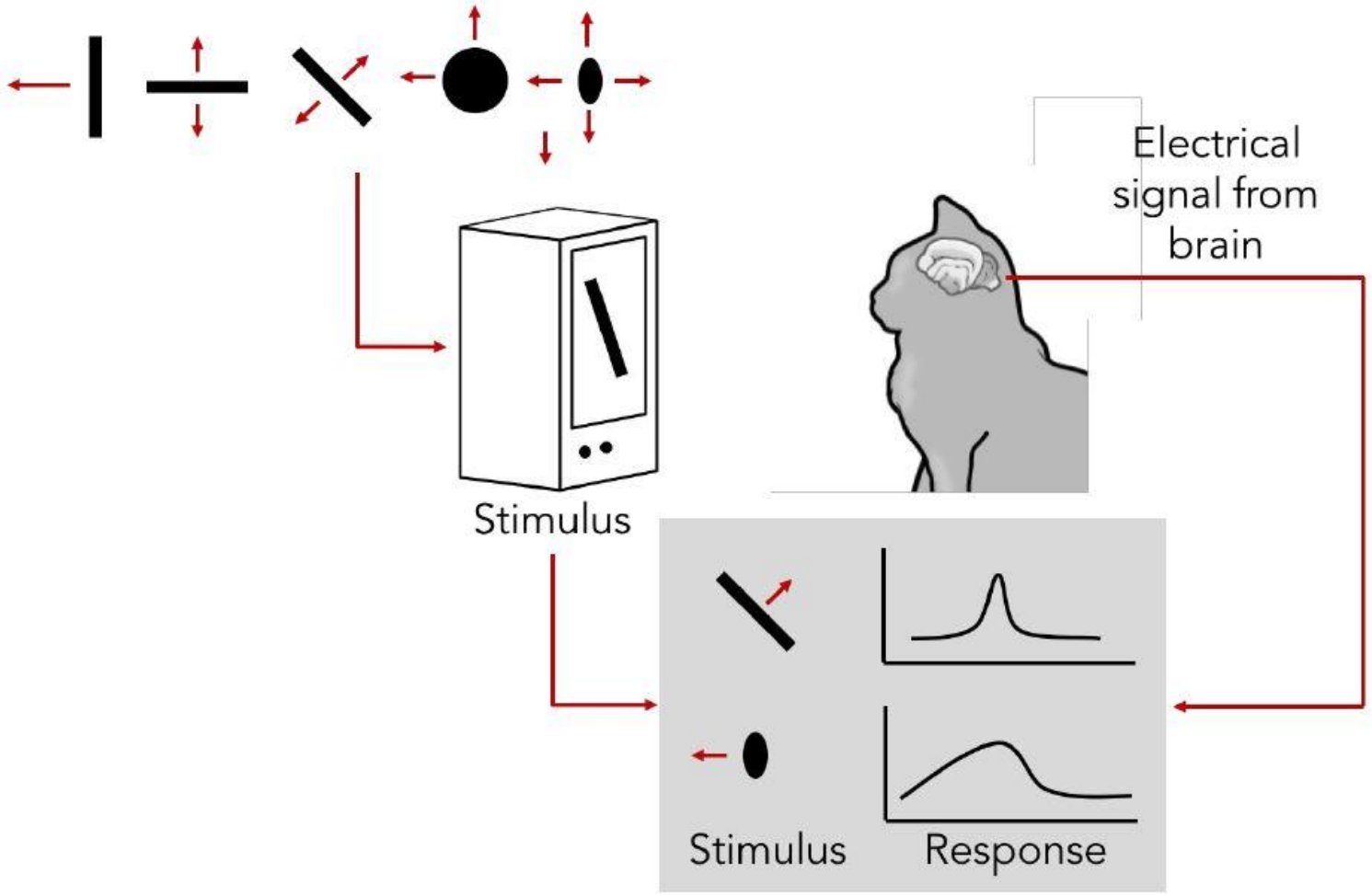
https://beamandrew.github.io/deeplearning/2017/02/23/deep_learning_101_part2.html

Backpropagation (1986)

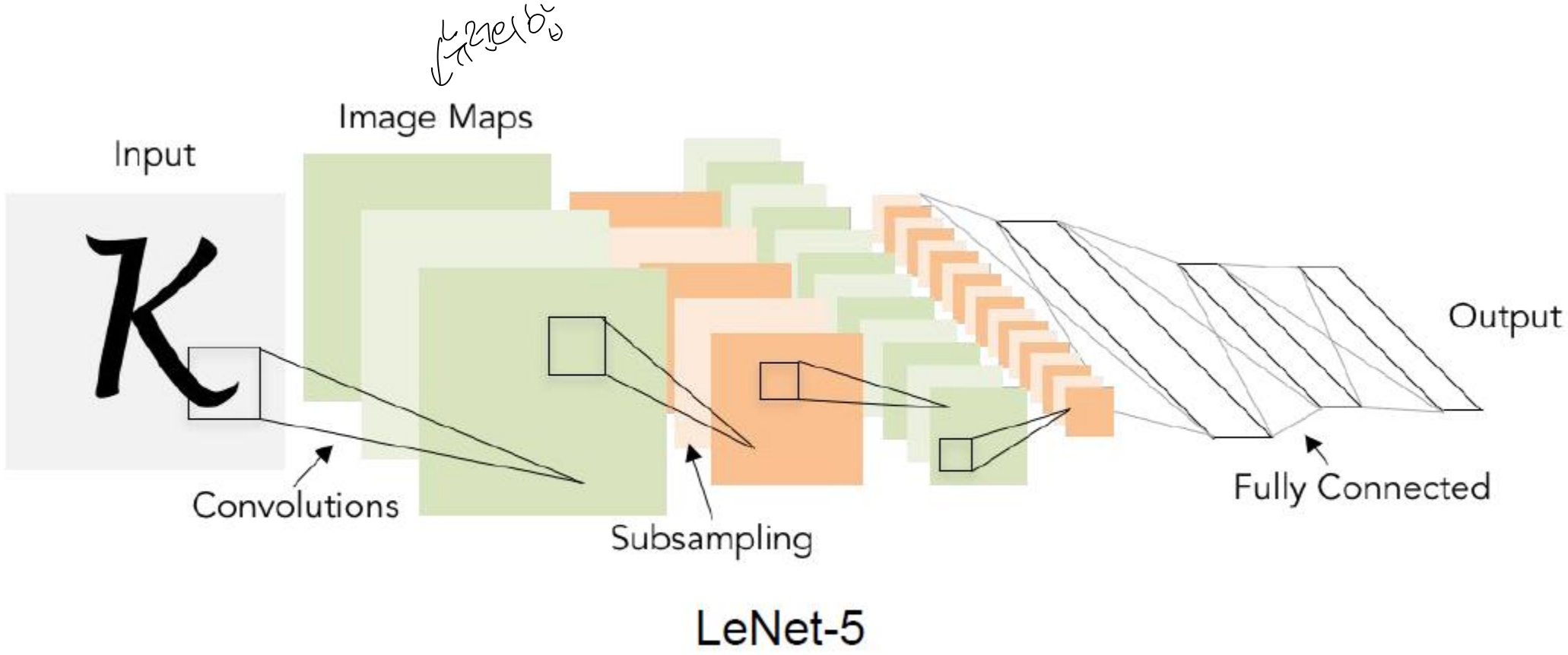


https://sebastianraschka.com/faq/docs/visual-backpropagation.html

Convolutional Neural Networks

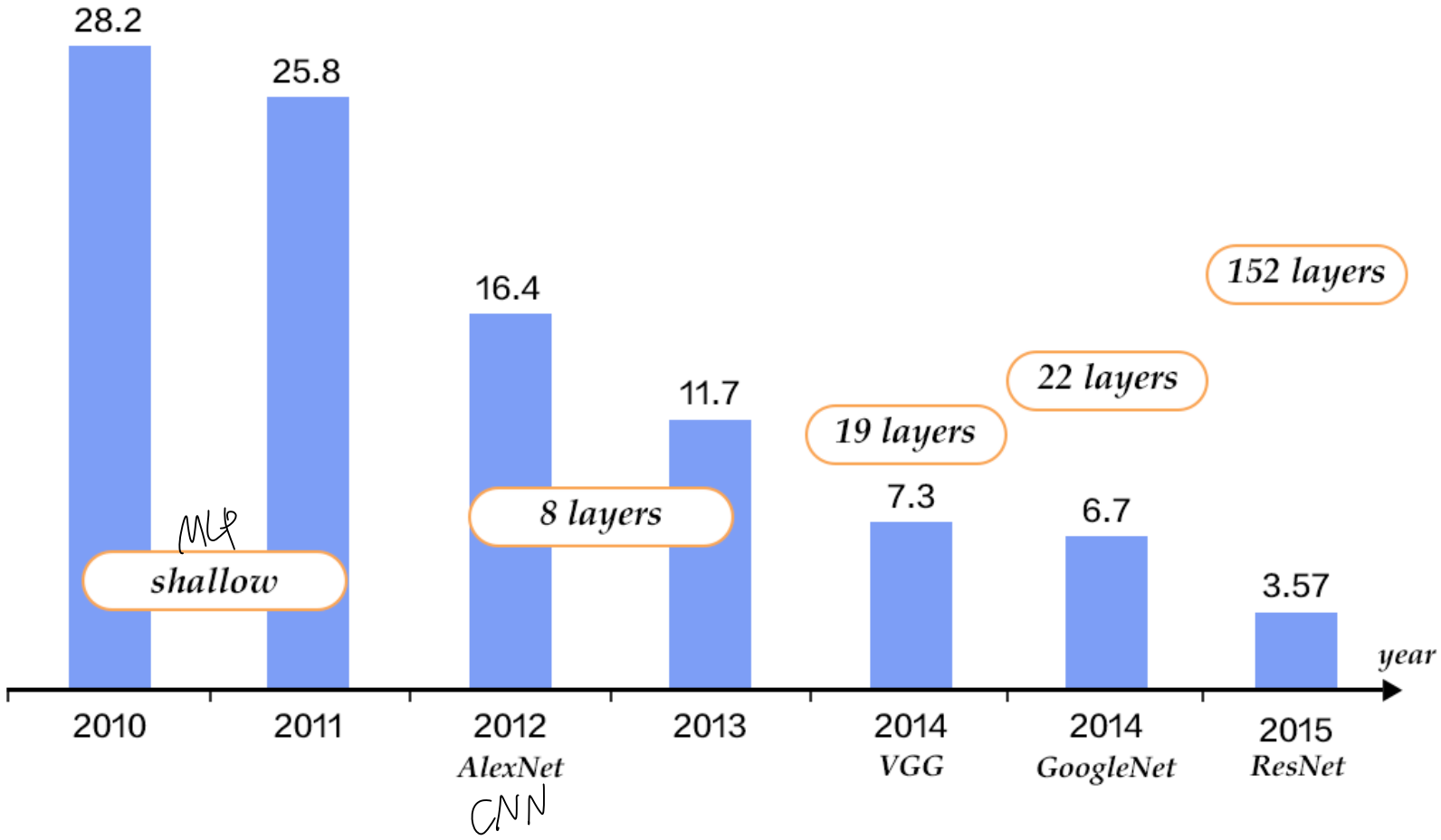


Convolutional Neural Networks (2012)



LeNet-5

ImageNet Classification



http://www.paddlepaddle.org/documentation/book/en/0.14.0/03.image_classification/index.html

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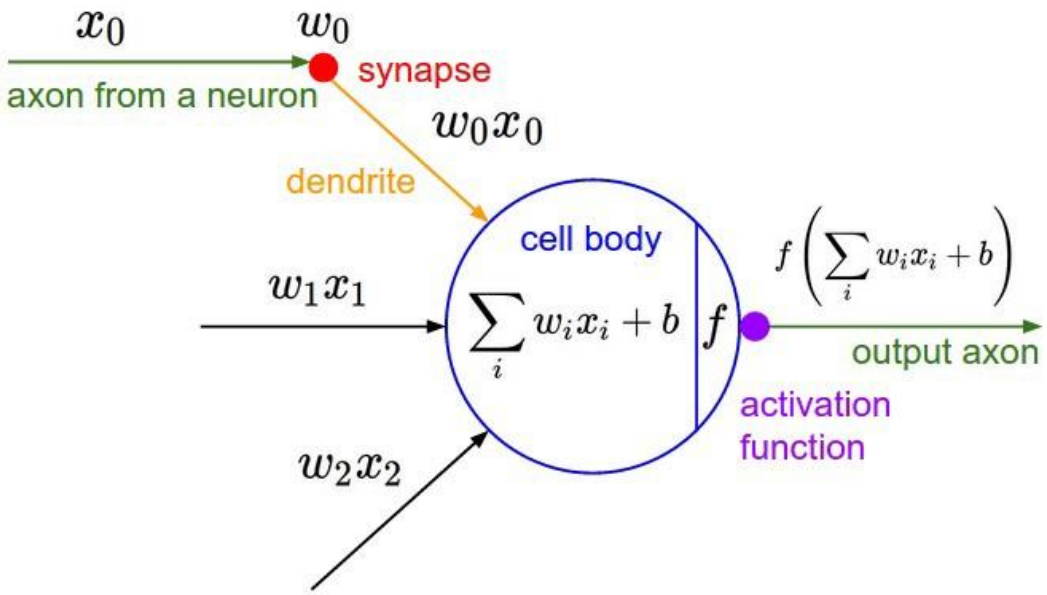
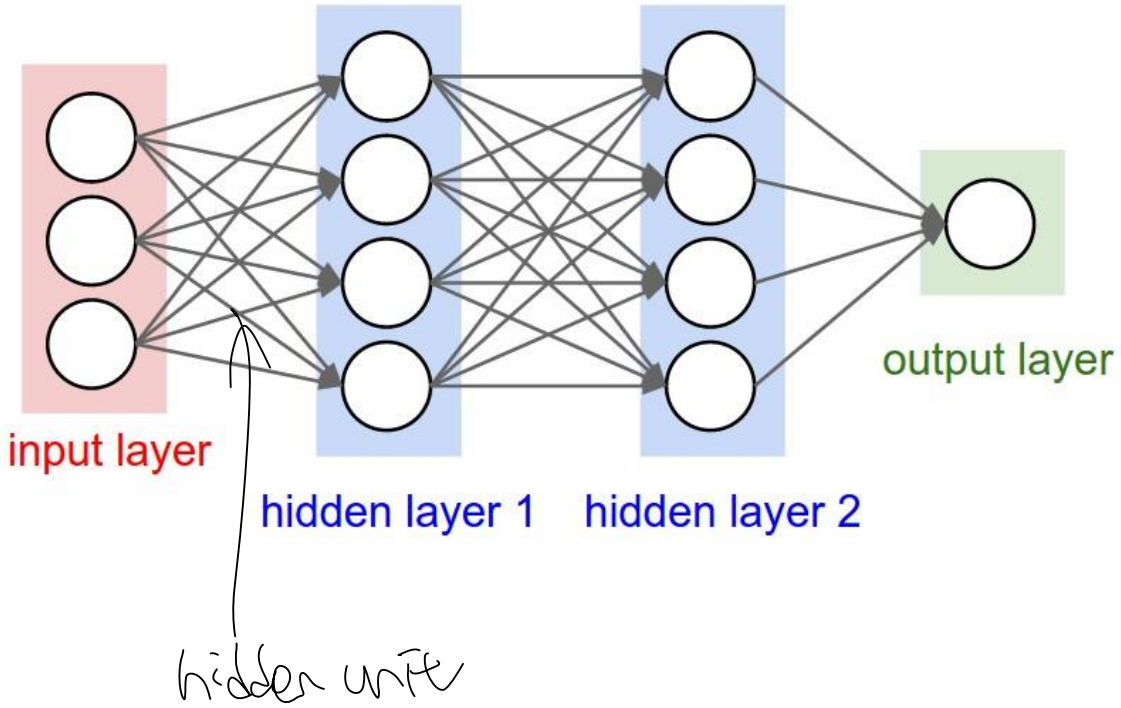
Multi–layer Perceptron

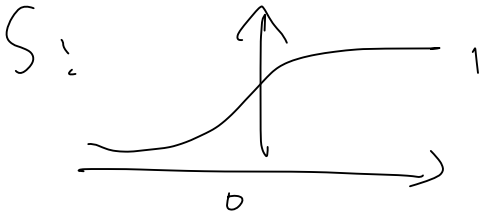
Solving XOR problem

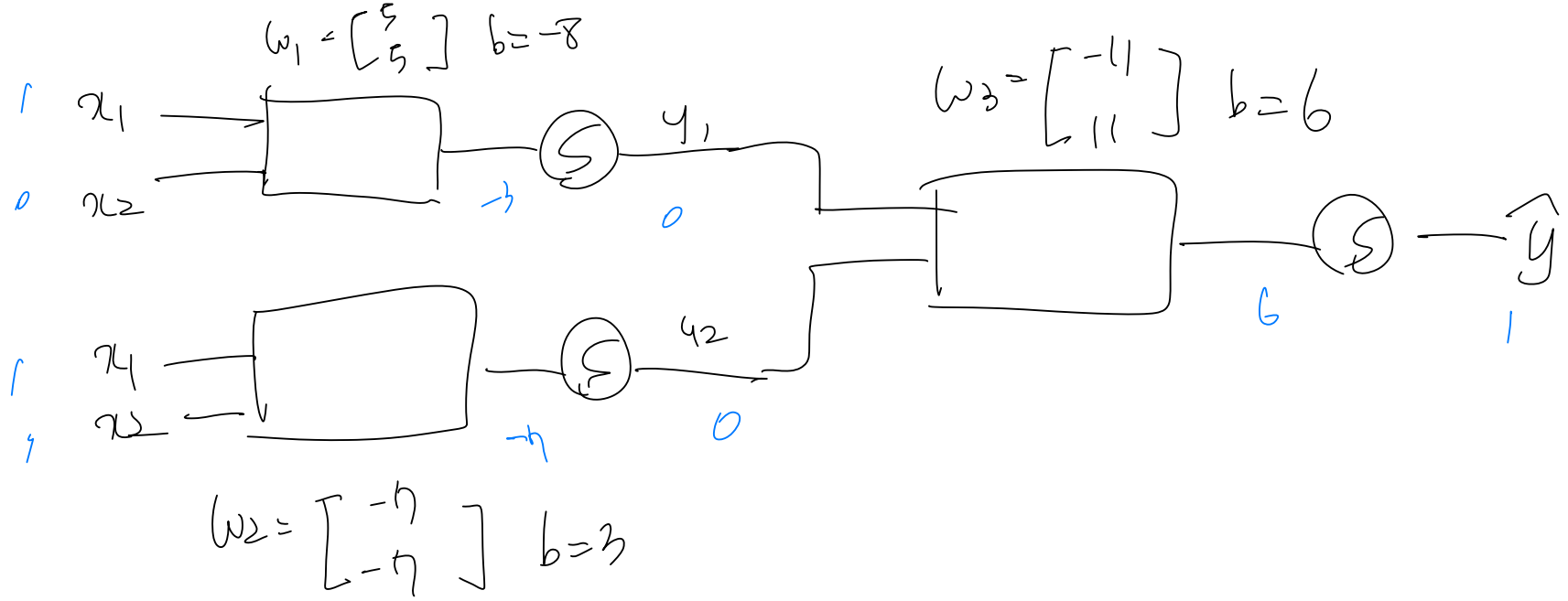




Solving XOR problem with MLP

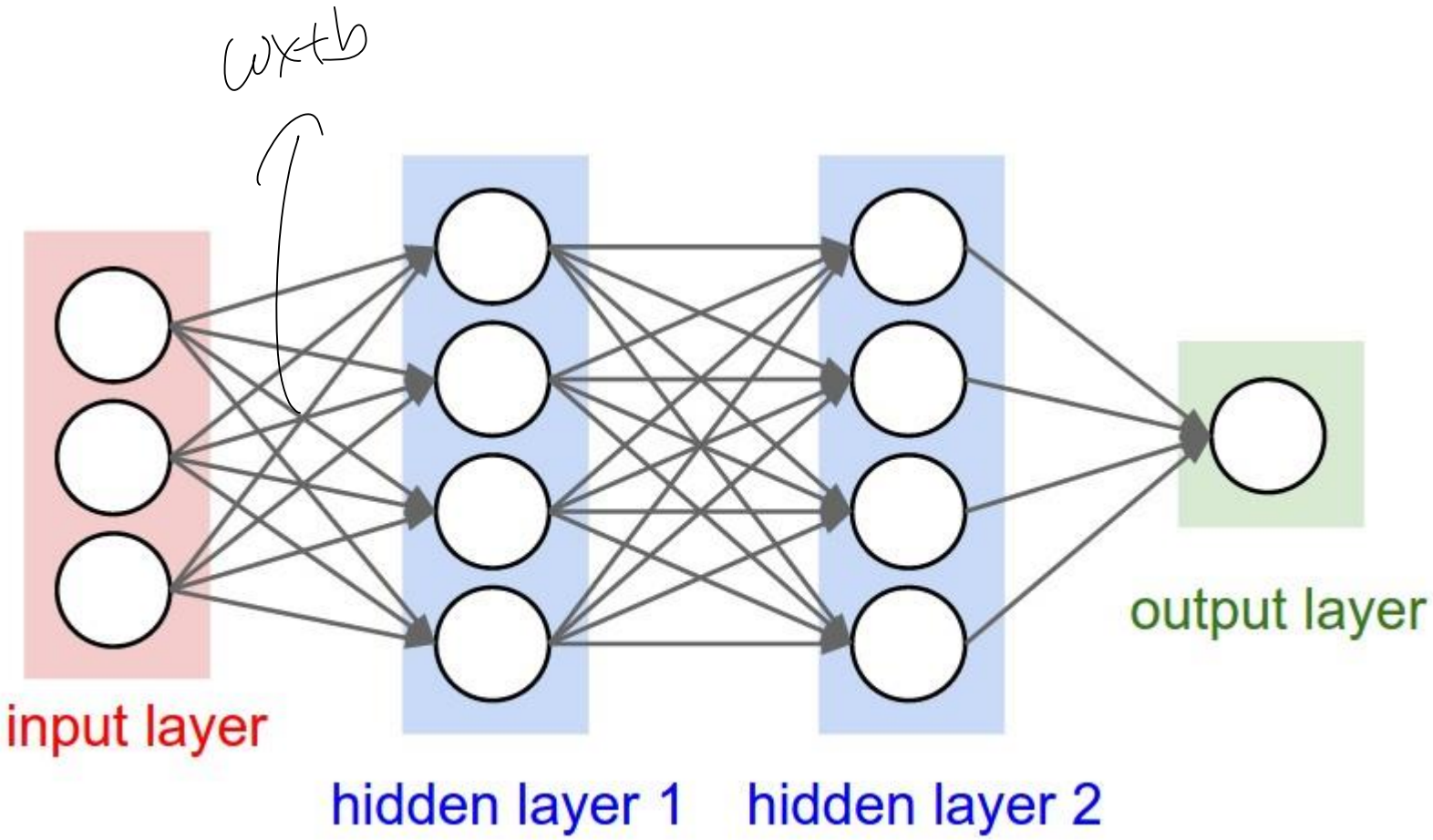
Solving XOR problem





x_1	x_2	y_1	y_2	$\hat{y}$	y
0	0	0	1	0	0
1	0	0	0	1	1
0	1				1
1	1				0

Solving XOR problem



https://beamandrew.github.io/deeplearning/2017/02/23/deep_learning_101_part2.html

Solving XOR problem

Is there any other W and b that solves XOR problem? yes

If then, how can we find it with training algorithm?

Universal Approximation Theorem

A feed–forward network with single hidden layer is sufficient to represent any function, but the required hidden unit might be infinitely large and may fail to learn.

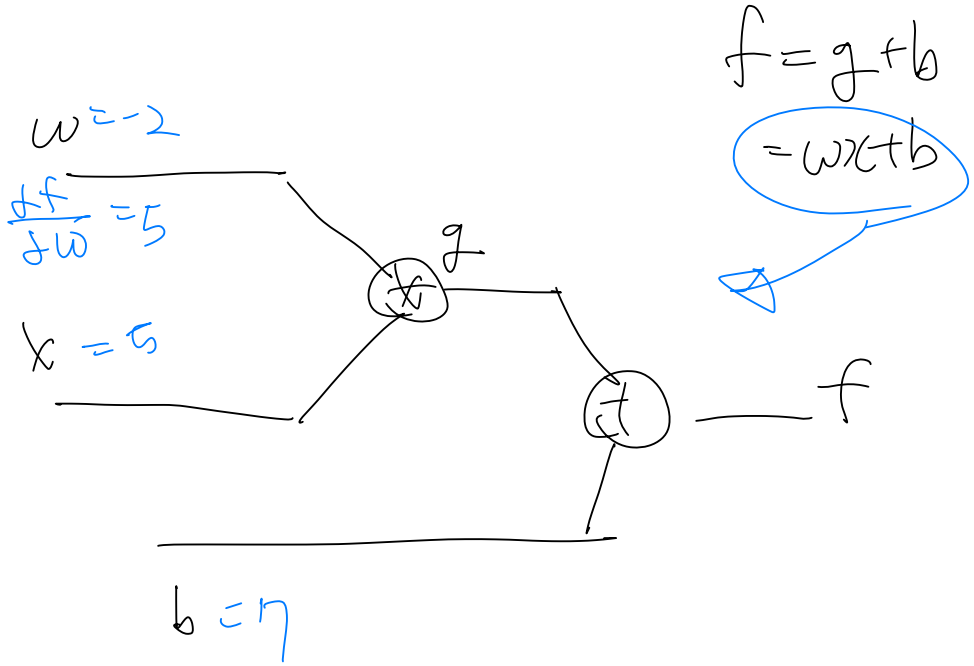
Using deeper model can reduce the number of required units for representing desired functi on.

MLP가 너무 deep 하거나 [illegible] Approximation 가능

은닉층 너무 많아도

Backpropagation

Backpropagation with Chain Rule



① feed forward

② Backpropagation

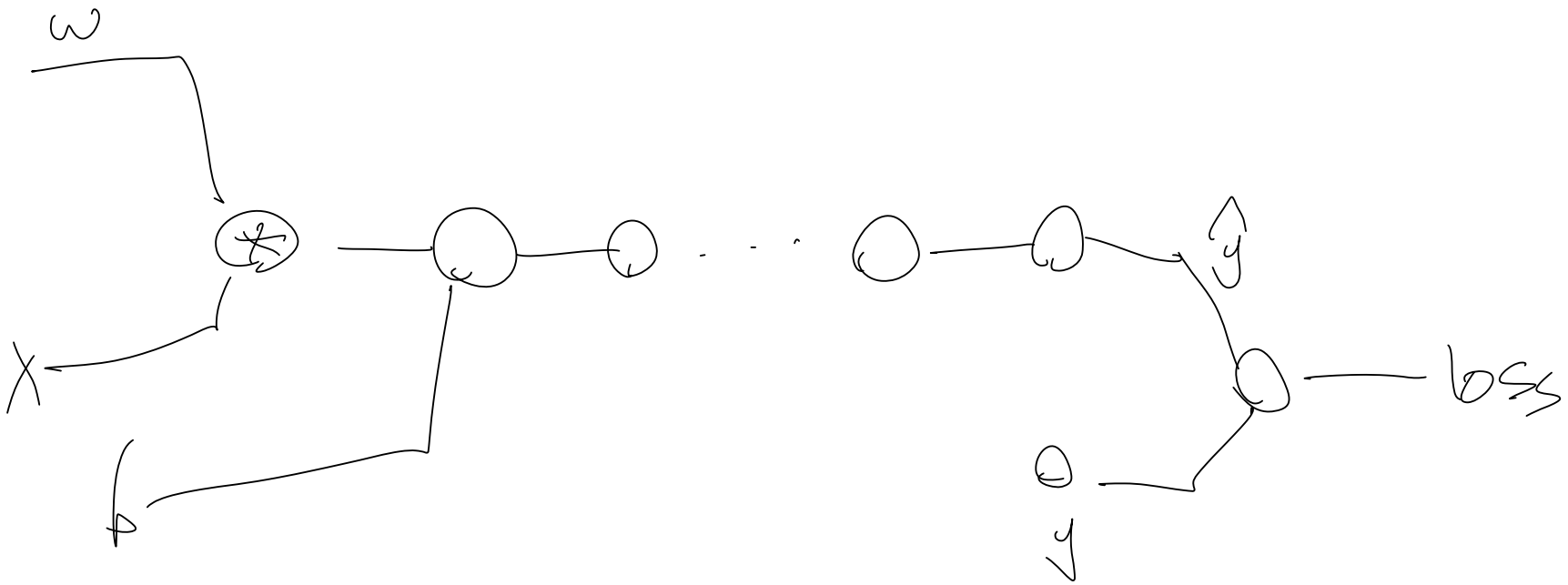
$\frac{\partial f}{\partial g}=1 \quad \frac{\partial f}{\partial b}=1$

$\frac{\partial g}{\partial w}=x \quad \frac{\partial g}{\partial x}=w$

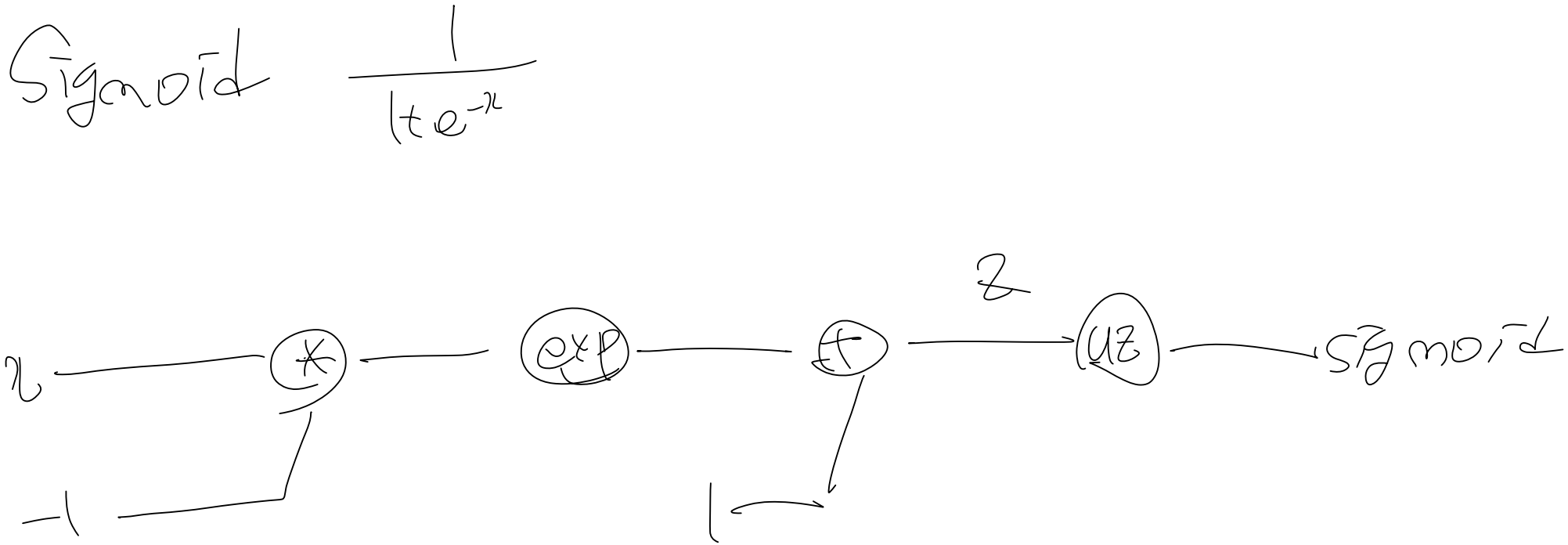
$\frac{\partial f}{\partial w}=\frac{\partial f}{\partial g}\times\frac{\partial g}{\partial w}=x$

$\frac{}{\partial b}$

Backpropagation with Chain Rule



Backpropagation with Chain Rule



Topics to learn today

1. **Review from last lecture**
   - Problems of ML / Linear Regression
   - Linear Regression with Pytorch
2. **Binary/Multinomial Classification Problem**
   - with Logistic Regression
   - Multinomial Classification with Pytorch
3. **History of Deep Learning**
   - from simple perceptron to CNN
4. **Solving XOR Problem with MLP**
   - Feed forward / Backpropagation
   - Solving Regression and Classification Problem with MLP