Google Developer Student Clubs

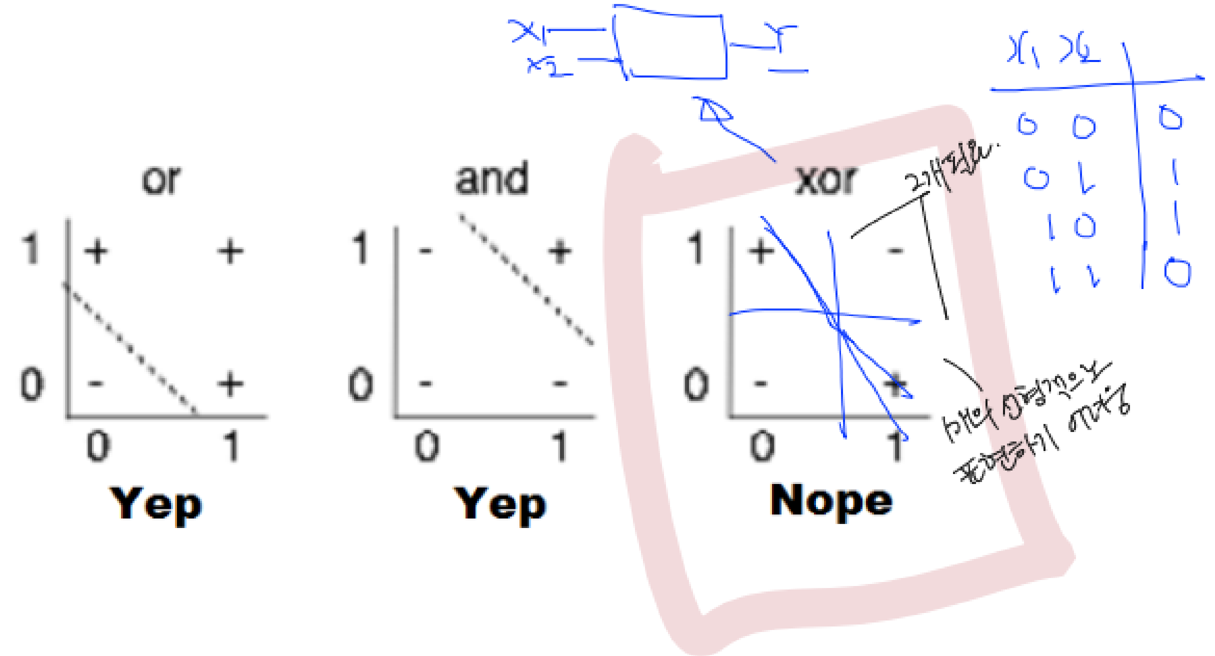
ML/DL Study W02

- XOR – Neural Networks
- Forward/Back Propagation
- Sigmoid VS Relu
- Xavier VS He
- Drop out
- Batch Normalization

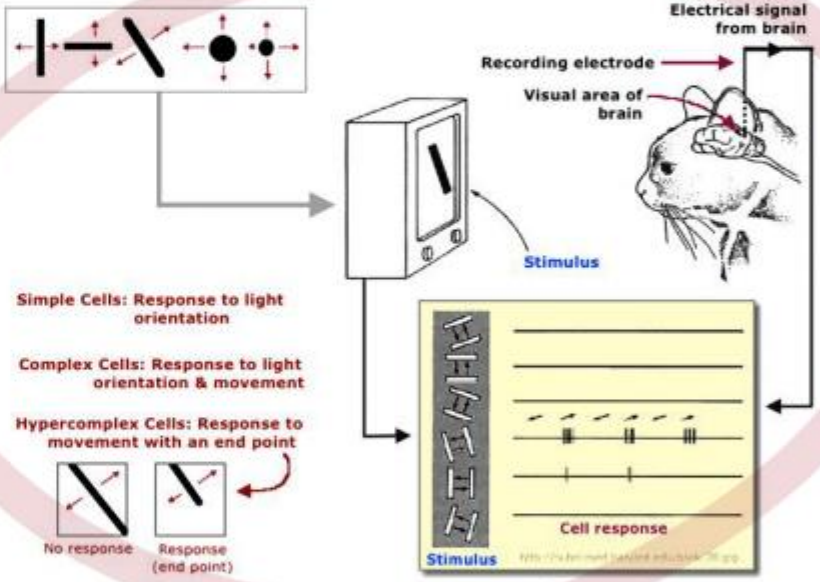
XOR – NN

XOR

(Simple) XOR problem: linearly separable?



Convolutional Neural Networks



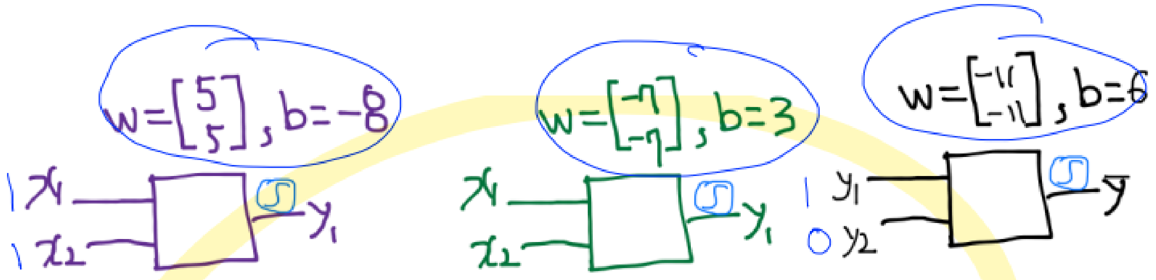
그림전체 X

부분

↓

나중에 조합

Hubel & Wiesel, 1959



$[1\ \ 1]\begin{bmatrix}5\\5\end{bmatrix}-8=5+5-8=2$, sigmoid$(2)=1$

$[1\ \ 1]\begin{bmatrix}-7\\-7\end{bmatrix}+3=-7+-7+3=-11$, sigmoid$(-11)=0$

$[1\ \ 0]\begin{bmatrix}-11\\-11\end{bmatrix}+6=-11+0+6=\boxed{-5}$

sigmoid$(-5)=0$

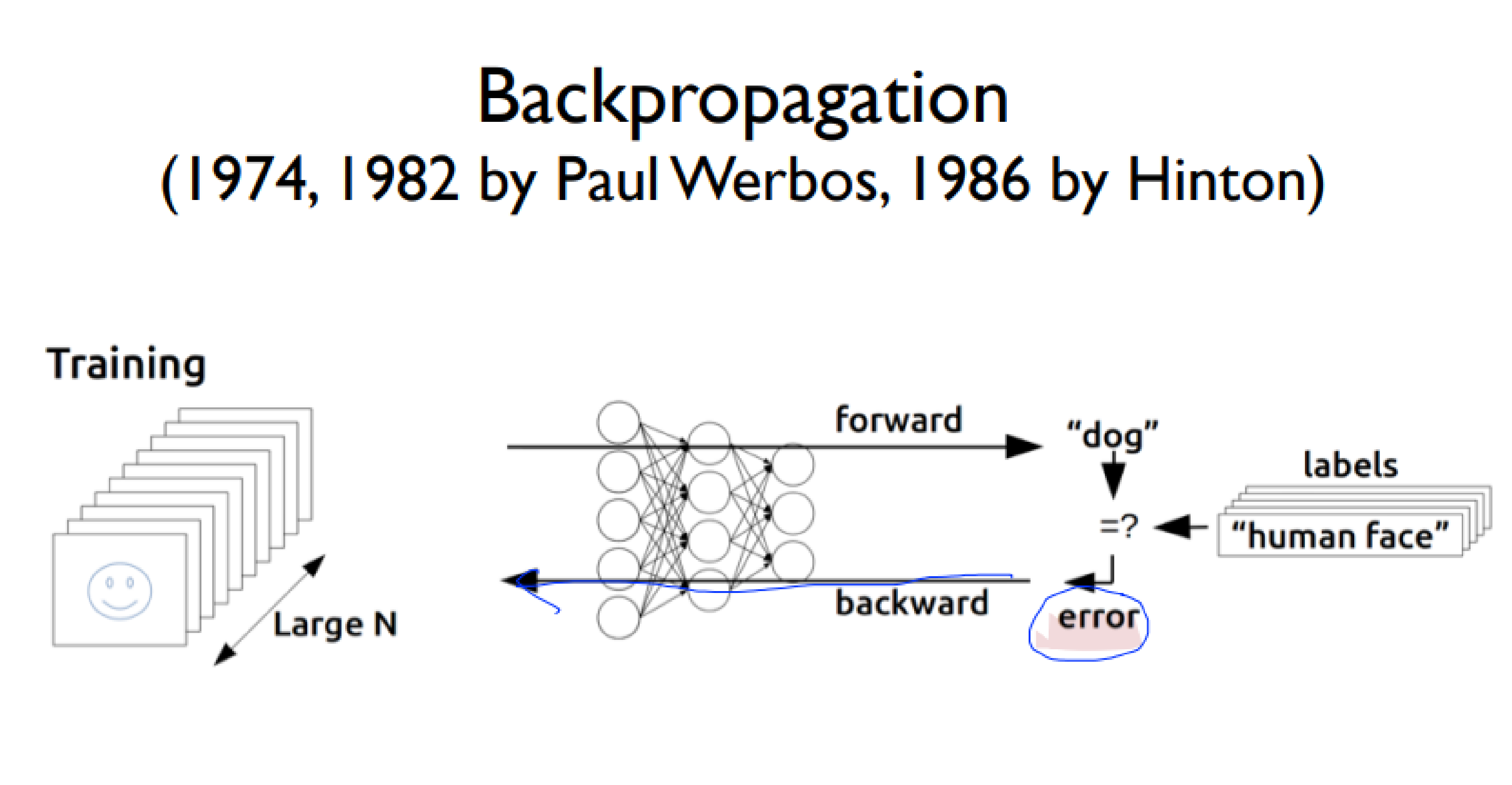
x_1	x_2	y_1	y_2	$\bar{y}$	XOR
0	0	0	1	0	0
0	1	0	0	1	1
1	0	0	0	1	1
1	1	1	0	0	0

3개 layer learning

```
K = tf.sigmoid(tf.matmul(X, W1) + b1)
Hypothesis = tf.sigmoid(tf.matmul(K, W2) + b2)
```

Forward/Back Propagation

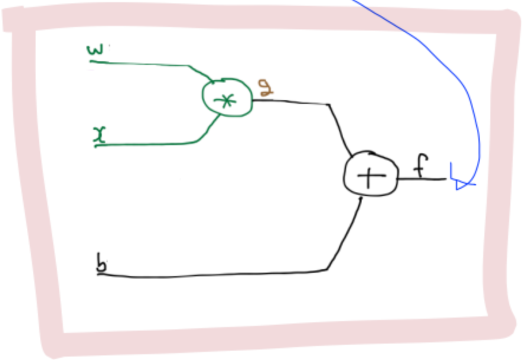
Forward/Back Propagation



Forward/Back Propagation

Back propagation (chain rule)

$f = wx + b, \quad g = wx, \quad f = g + b$



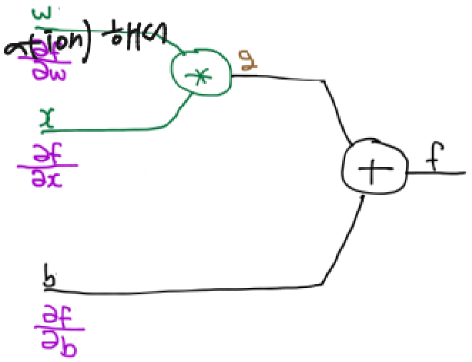
Back propagation (chain rule)

⇓

역전파.

$f = wx + b, \quad g = wx, \quad f = g + b$

내 target이랑 실제 model이 계산한 output 사이
cost를 구하고 이거를
뒤로(back) 전파(propagation)해서
각 node가 갖는
변수를 갱신해내는 AI.



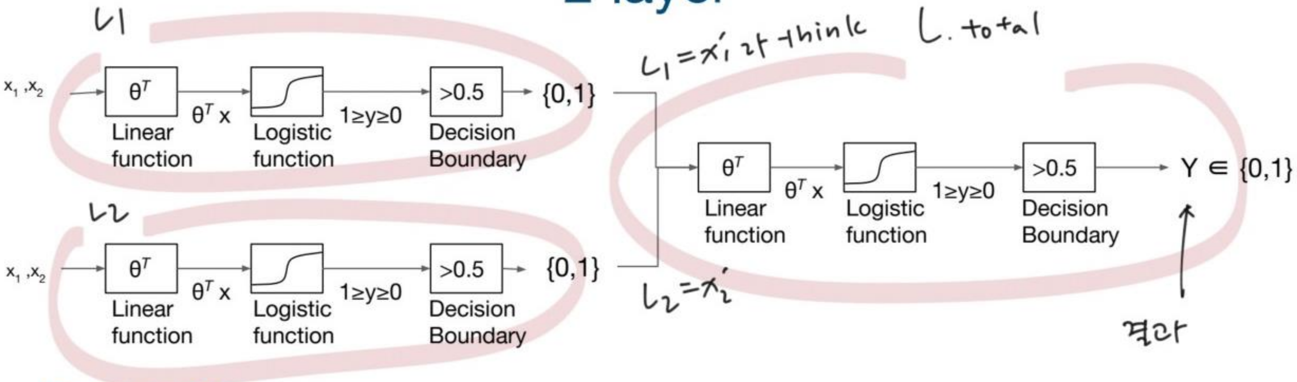
http://cs231n.

Sigmoid VS Relu

Sigmoid

Neural Net

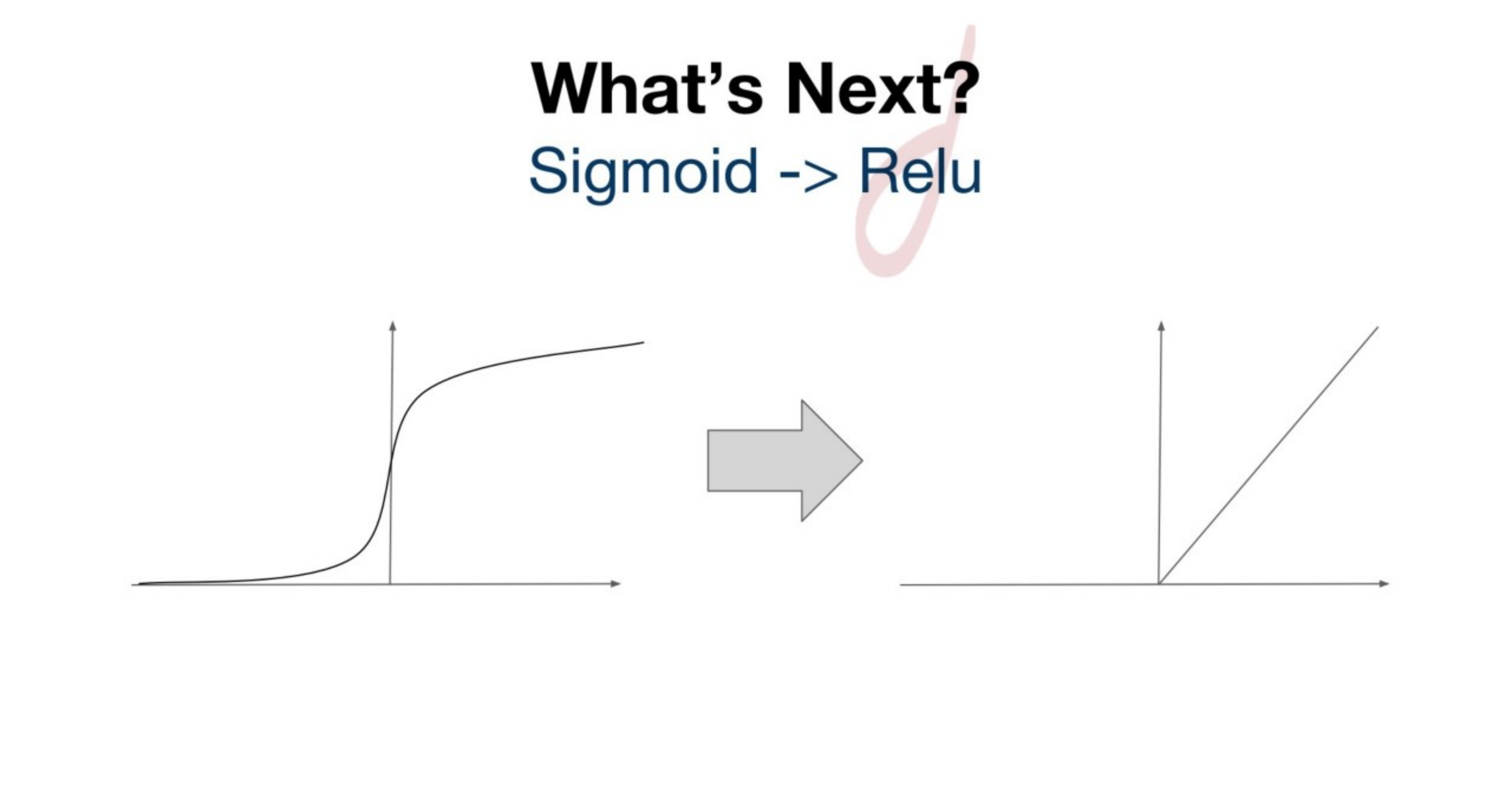
2 layer



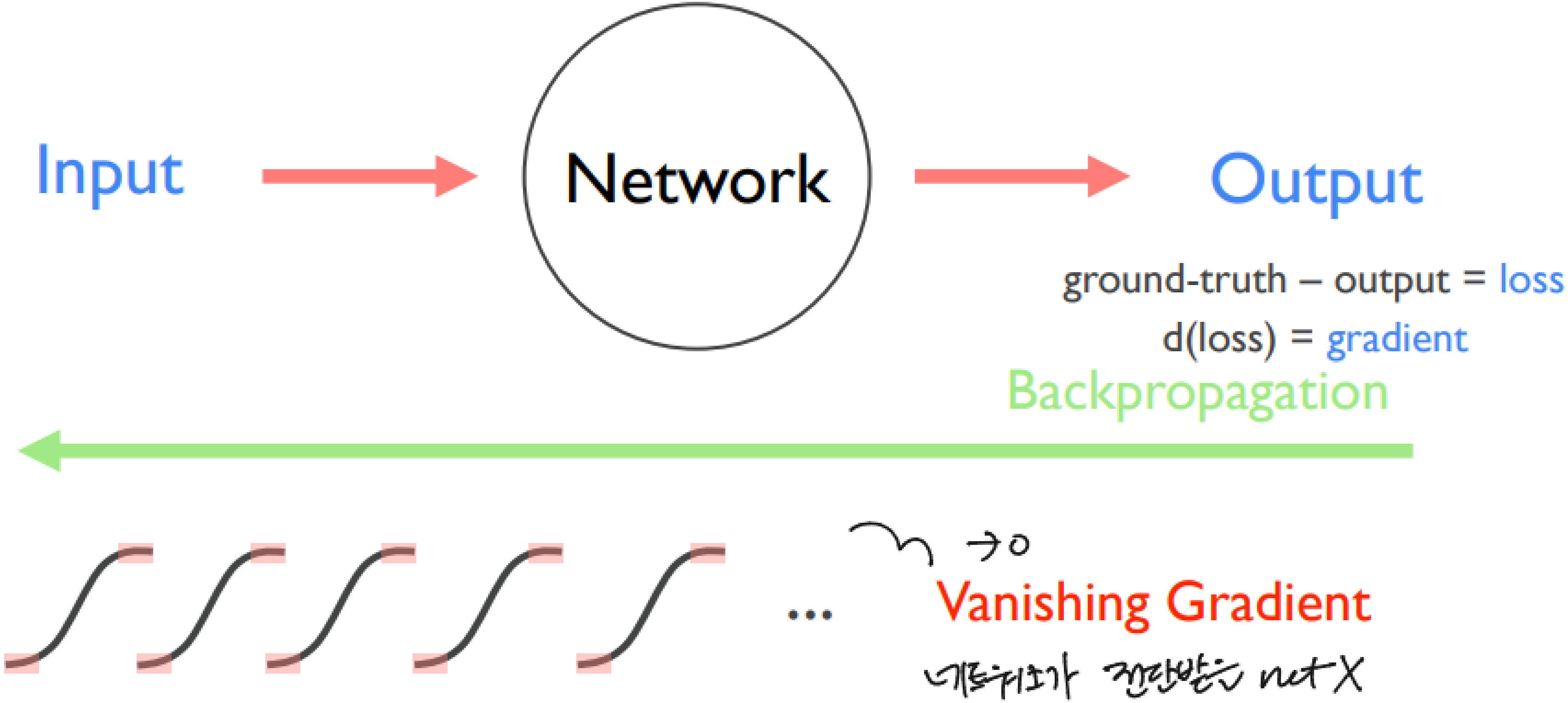
[Tensorflow Code]

```
def neural_net(features):
    layer1 = tf.sigmoid(tf.matmul(features, W1) + b1) # W1=[2,1], b1=[1]
    layer2 = tf.sigmoid(tf.matmul(features, W2) + b2) # W2=[2,1], b2=[1]
    hypothesis = tf.sigmoid(tf.matmul(tf.concat([layer1, layer2],-1), W3) + b3) # W3=[2,1], b3=[1]
    return hypothesis
```

Sigmoid



Problem of Sigmoid

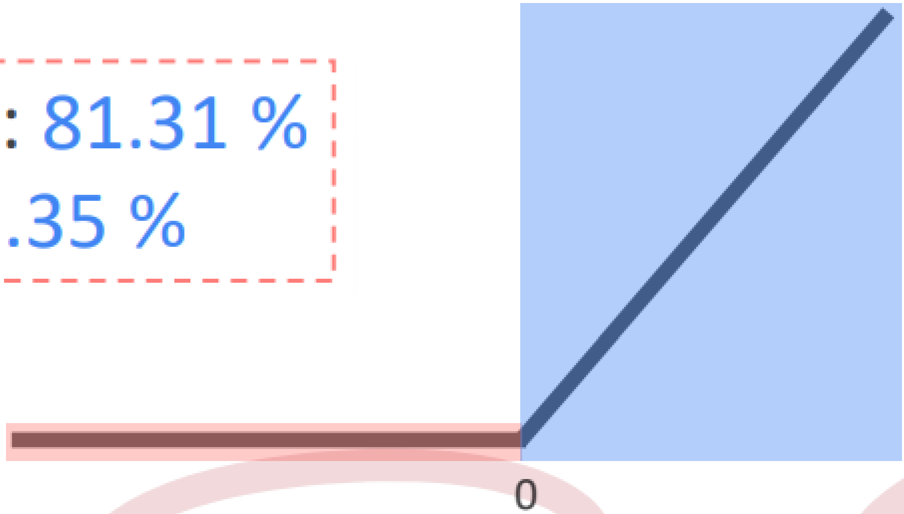


Why Relu?

$$f(x) = \max(0, x)$$

Sigmoid : 81.31 %

Relu : 85.35 %

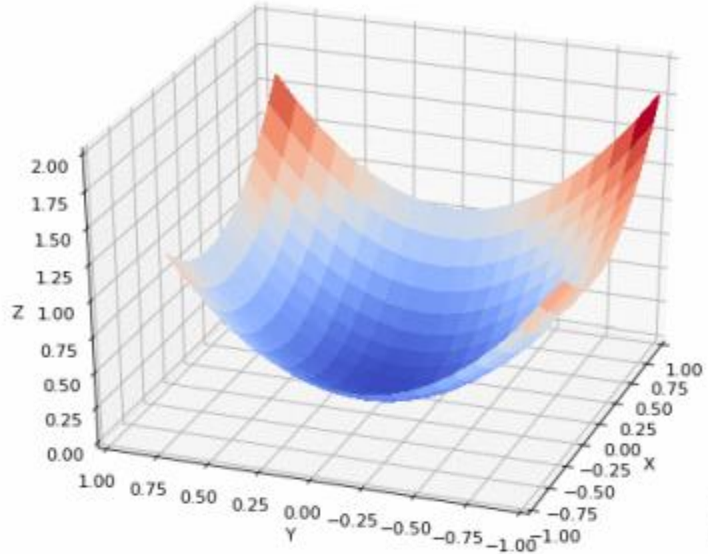


tf.keras.activations → sigmoid, tanh relu, elu, selu

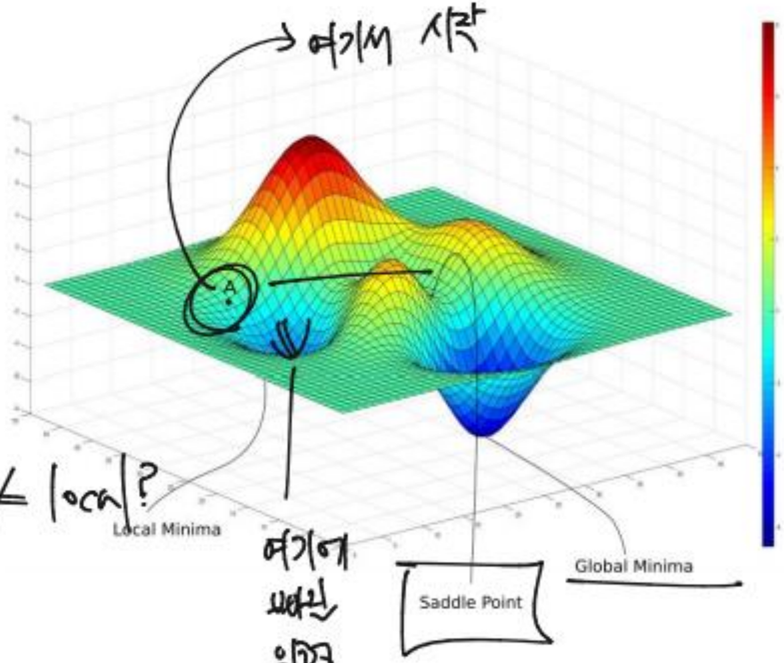
function에서 바꿔가면서 성능차이 O

Weight Initialization

Xavier VS He



global min.



global ≠ local?

여기에 빠질 위험

Xavier VS He

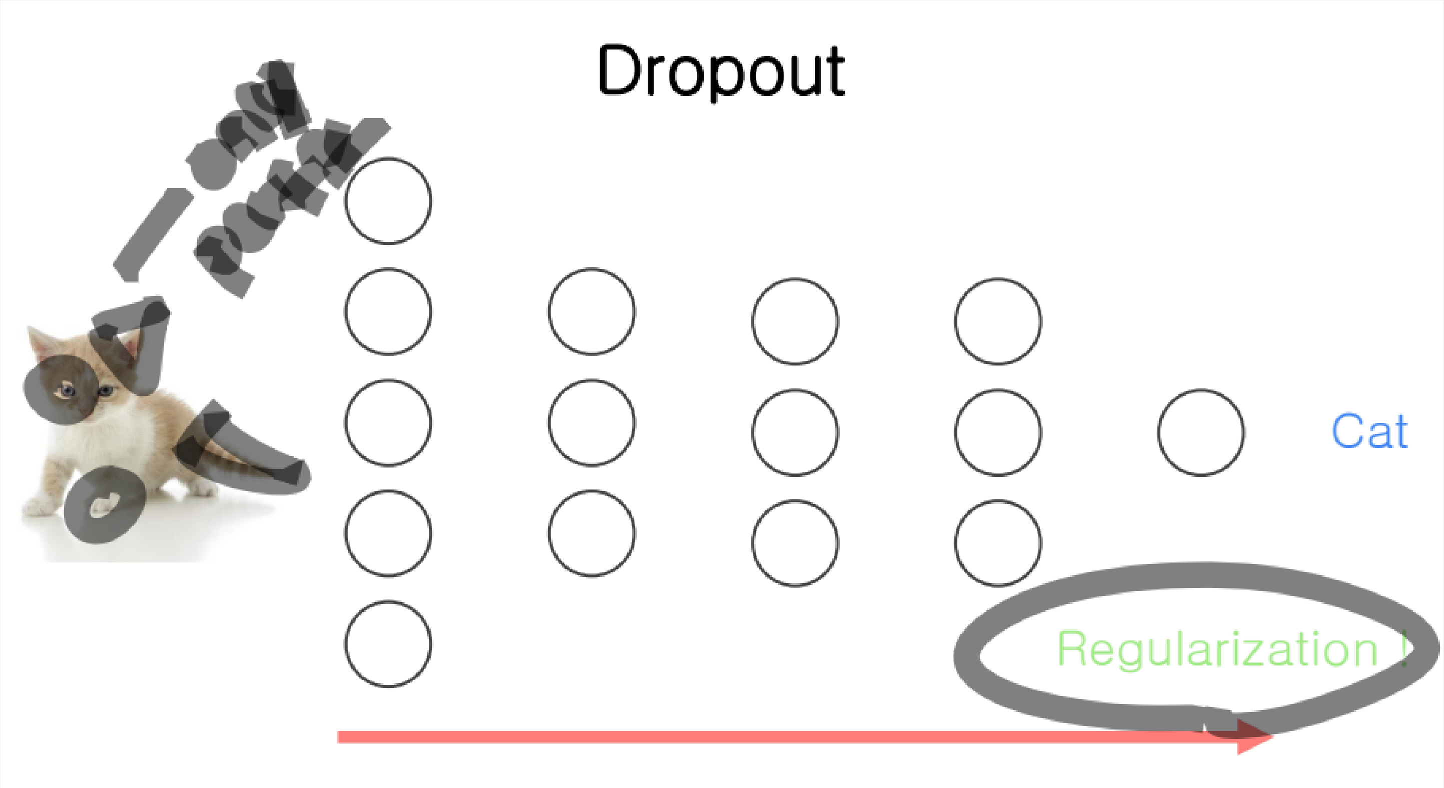
```
# Create network

weight_init = tf.keras.initializaers.RandomNormal()

weight_init = tf.keras.initializaers.glorot_uniform()

weight_init = tf.keras.initializaers.he_uniform()
```

Random : 85.35 %

Xavier : 96.50 %

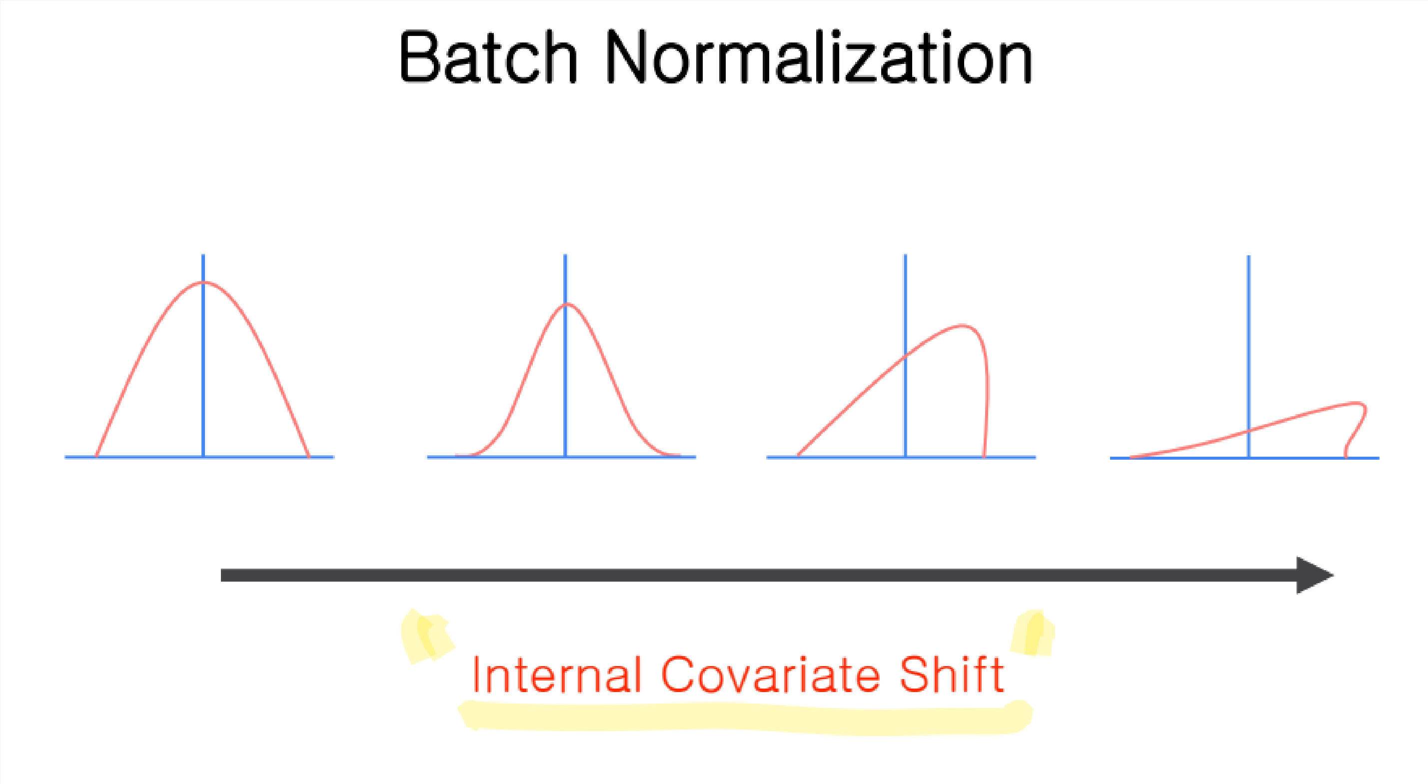
Drop out

Drop out



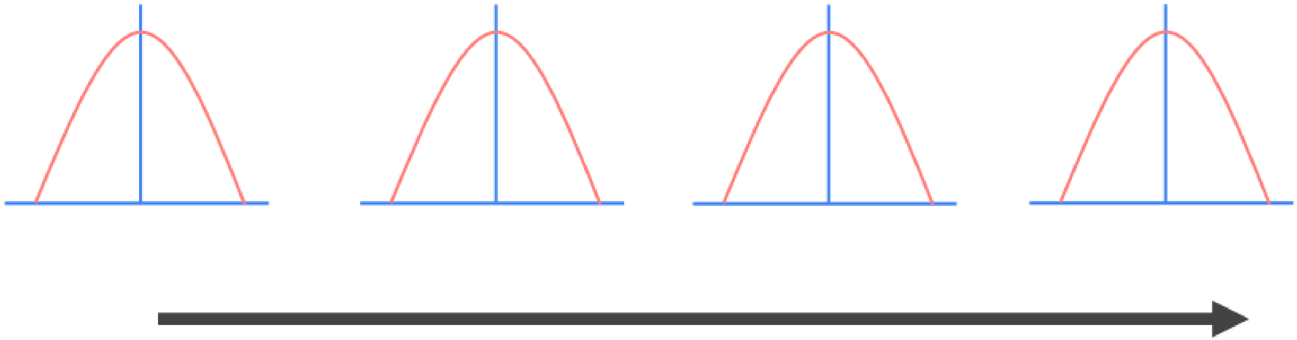
Batch Normalization

Batch Normalization



Batch Normalization

Batch Normalization



$$\overline{x} = \frac{x - \mu_B}{\sqrt{\sigma_B^2 + \epsilon}} \qquad \hat{x} = \gamma \bar{x} + \beta$$