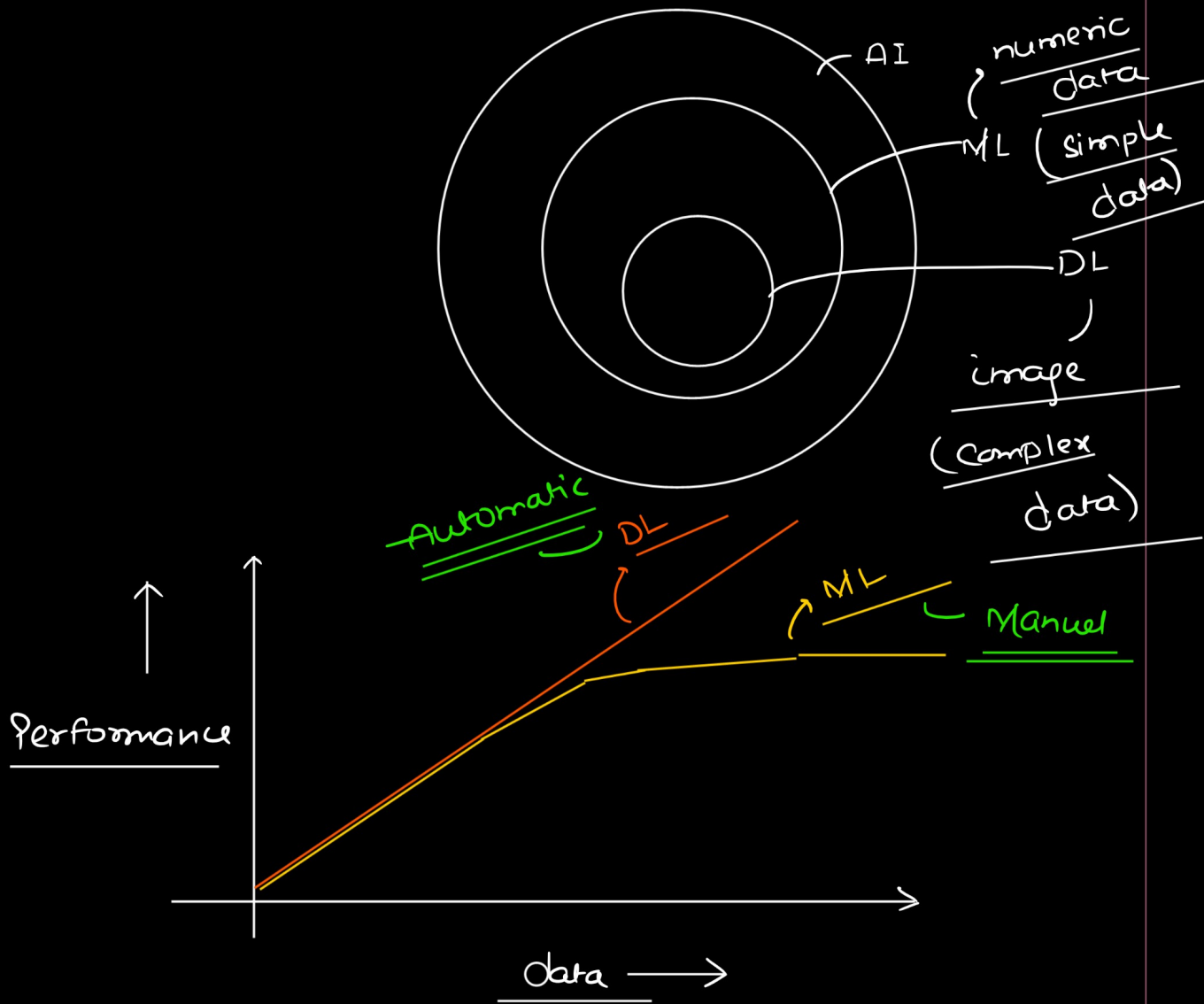


# Deep Learning

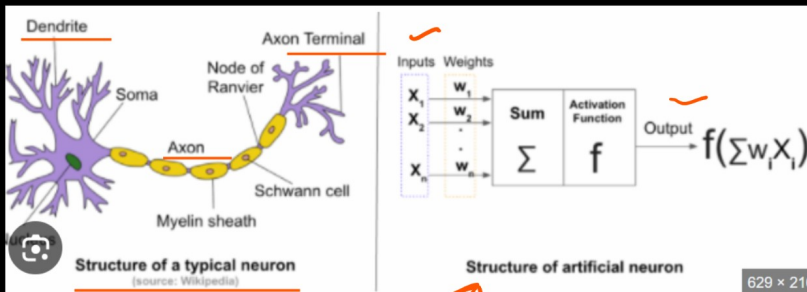


## Foundations of Deep Learning

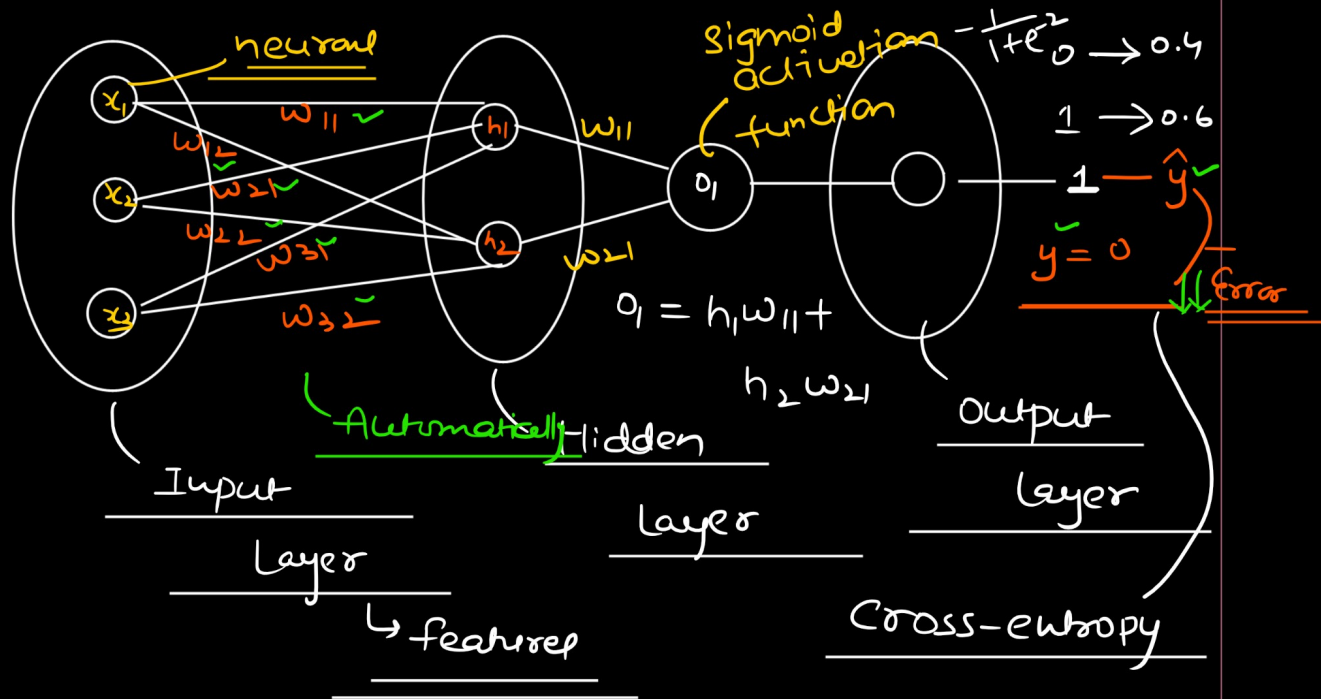
↳ Artificial

Neural

Network



backpropagation



feedforward

$N \rightarrow \# \text{ feature}$

$n \rightarrow \# \text{ hidden neurons}$

$$h_i = \sum_{j=1}^n w_{ji} x_j$$

Linear equation

$$\begin{cases} h_1 = x_1 w_{11} + x_2 w_{21} + x_3 w_{31} \\ h_2 = x_1 w_{12} + x_2 w_{22} + x_3 w_{32} \end{cases}$$

backpropagation

optimizers

Gradient Descent

$$w_{\text{new}} = w_{\text{old}} - \eta \left[ \frac{\partial L}{\partial w} \right] \quad \text{Derivation}$$

Learning Rate  $\approx 0.01$

## Regression

↳ Loss function → MSE

## Classification

↳ Loss function → Cross entropy

## Activation function

↳ to introduce  
non-linearity

10 epochs α Epoch, Iteration, Batch of DL Model

seen the entire dataset  
once during training  
→ 1000 samples

Training p

Smaller subset of your data  
Batch size = 100

10 times/iteration

Iterations per epoch =  $\frac{\text{Total Sample}}{\text{Batch Size}} = \frac{1000}{100}$

1 epoch → 10 iterations

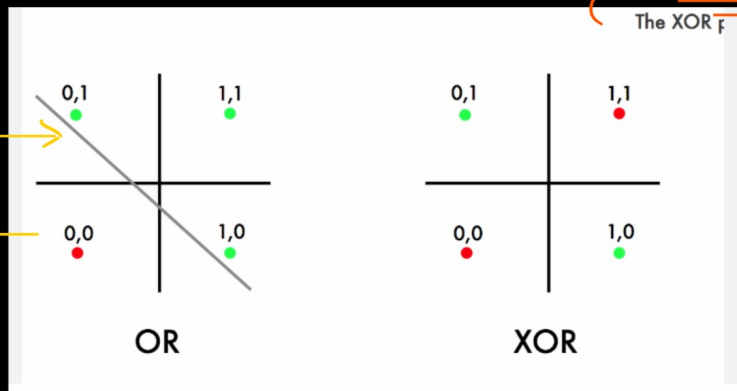
## OR, AND

$f_1$	$f_2$	$o/p$
0	0	0
0	1	1
1	0	1
1	1	1

$f_1$	$f_2$	$o/p$
0	0	0
0	1	0
1	0	0
1	1	1

## XOR Problem

Linear  
Classification  
task



1 → green  
0 → red

XOR

$f_1$	$f_2$	$o/p$
1	1	0
0	0	0
0	1	1
1	0	1

## Popular Deep Learning Architectures

- \* ① MultiLayer Perceptron → Basic  
feedforward  
networks, good for  
structured/tabular data

Core of DL  
Deep  
Learning

2

Convolutional Neural Network (CNN)

↳ specialized for  
image, video &

Audio

(AlexNet, VGGNet, PerNet, UNet,

UNet++,

MobileNet)

Textual  
data

3

Recurrent Neural Network (RNNs)

↳ Good for sequence

like language, speech or

time series

LSTM & Autoencoders

↳ Deal with long memory

RLHF

Transformers, BERT,

GPTs

LLM

## Real time use cases

- ① face recognition → DL
  - ② Google translation → NLP
  - ③ Glance AI → install
  - ④ Lowekast
  - ⑤ Healthcare → Cancer detection
- Image  
↓  
Segmentation

xx

CNN based Architecture  
↓  
Activation functions  
optimizers

ML → sklearn

DL → tensorflow, Pytorch

Research

