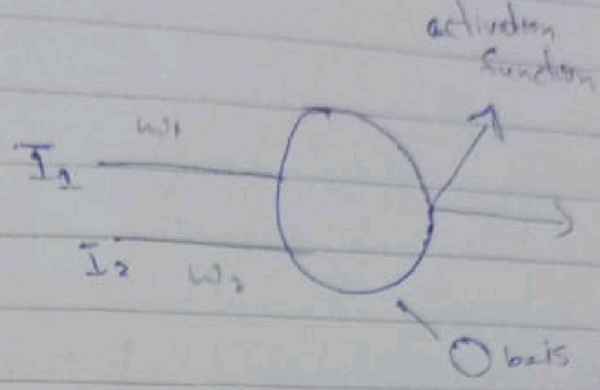
→ data should be numeric
→ data should be normalize (-1, 1)
→ other then these data neutral network will not work

ANN



→ give weights to every input.
→ multiple value of input and weights and then sum all values
→ weight is given by connectors.
→ Activation function is non-linear regression
(Activation function do this)
→ data should be normalize between (-1 to 1) to (0 to 1)

Simplest Neuron/Single Perceptron

→ only one neuron is use.
→ It has capability to give some output.

→ input layer:

→ internal layer/hidden layer:

→ output layer:

Deep learning:
no. of hidden layer use.
→ increase time complexity
→ computing
→ no of hidden layer is the dept of deep learning.

Drawback:

→ interpertation ~~is~~ of working ~~[illegible]~~ is not understandable.

Advantage:
→ How to ~~[illegible]~~ give input to model should be known
→ And interpertation of output is needed

→ These iteration will run until ~~we give an~~ the model give error less the decide threshold.

<u>threshold:-</u>

Any decide value, the error rate which we can bear in our model.

→ because nothing is 100% efficient.

→ when comparing threshold with error (we neglect negative sign) but we send actual value of negative sign for back porpagation

$$Err_j = O_j (1-O_j)(T_j - O_j)$$

<u>according to our example:-</u>

$$Err_6 = O_6 (1-O_6)(T_6 - O_6)$$

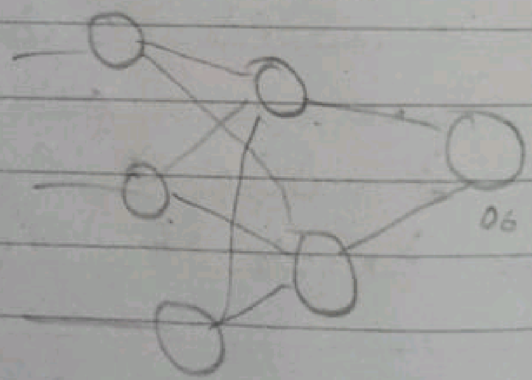
$I_4 =$	-0.4083	$O_4 =$	0.399
$I_5 =$	0.4077	$O_5 =$	0.6005
$I_6 =$	0.5805	$O_6 =$	0.6411

$$Err_6 = |-0.0246|$$

then model take the difference of O_6 & T_6

→ this is actually calculating error according to difference.

↳ weight & bais ~~are~~ now updated according to error.
This is known as <u>back porpagation</u> (learning is done on basis of this)



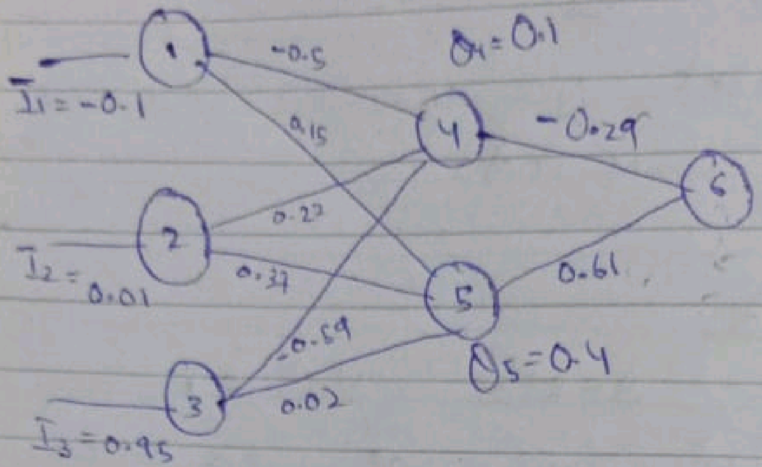
The steps taken from actual starting point of inputs to the final output.

← Back porpagation

→ feed forward.

→ Every time when back porgation occur, weights and bais will updated.

Q1:-



$T = 0.533$

$O_1 = -0.1$
$O_2 = 0.01$
$O_3 = 0.95$

$I_4 = -0.1 \times -0.5 + 0.01 \times 0.22 + 0.95 \times -0.59$
$+ 0.1$
$= 0.05 + 0.0022 + (-0.5605) + 0.1$
$= -0.4082$

$O_4 = \dfrac{1}{1 + e^{-I_4}} = \dfrac{}{0.664845}$

$I_5 = -0.1 \times 0.15 + 0.01 \times 0.37 + 0.95 \times 0.02$
$+ 0.4$
$I_5 = 0.4077$

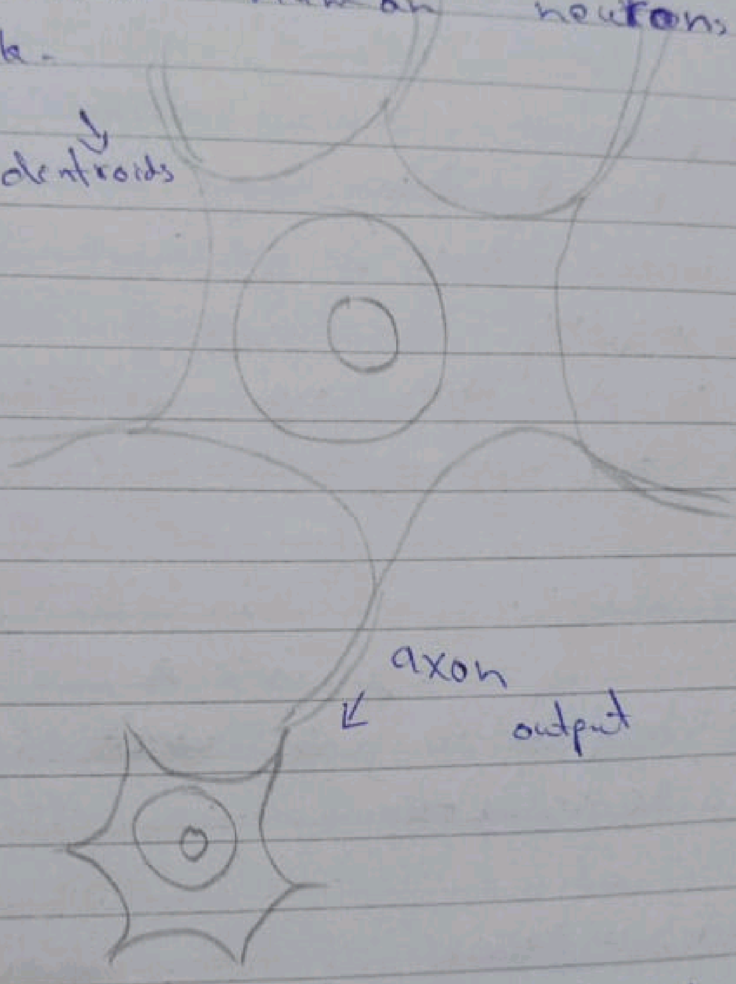
8/11/21

Artifical Neural Network (ANN)

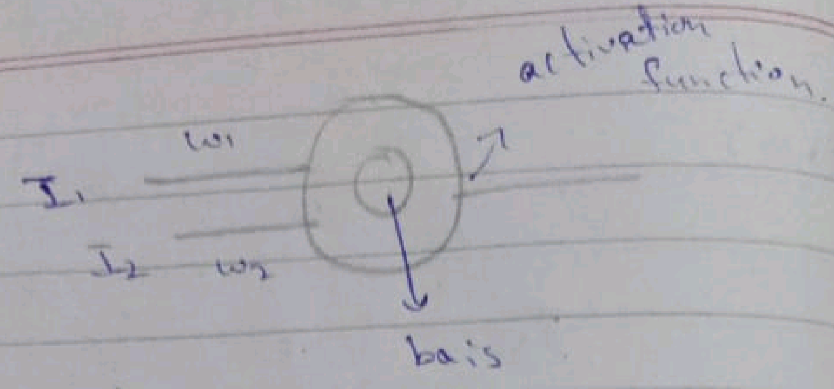
Neural Network

mimic human neurons network.

input ↓ dentroids



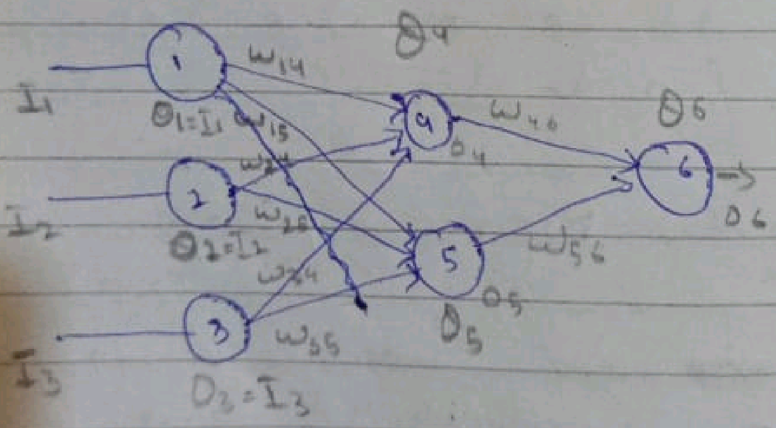
→ Take inputs from sensors (input may be multiple) process it and give output (output may be give to multiple neuron).



→ weight is given according to neuron.

→ initially weight is provided randomly

→ we can only manipulate weights and bais.



O → output

w → weight b/w nodes

θ → bais

MLP

Multi-layer perceptor

if atleast 3 layers are present in model.

---

intially, simple input is forward to output of its node

then weighted sum of every node is sum up and value of bais is added and the pass if through activation function (output) then value is forward to next layer as input.

$$I_4 = I_1 \times W_{14} + I_2 \times W_{24} + I_3 \times W_{34} + \theta_4$$

$$O_4 = \frac{1}{1+e^{-I_4}}$$

suppose O_6 (final output) is 0.33 and T_6 (Target/actual output) is 0.47