

DEEP LEARNING

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ANN — CNN — RNN

- Deep learning is a technique which mimics the human brain

Neural Networks (ANN)

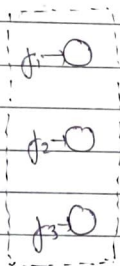
- First neural net was perceptron
It wasn't too successful & efficient so back propagation came into play by Geoffrey Hinton

Basic Neural Net Arch.

INPUT LAYER (features are provided in this first layer)

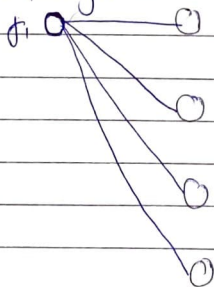
LAYER 1

3 features
(Nodes)



Hidden LAYER (there can be many hidden layers)

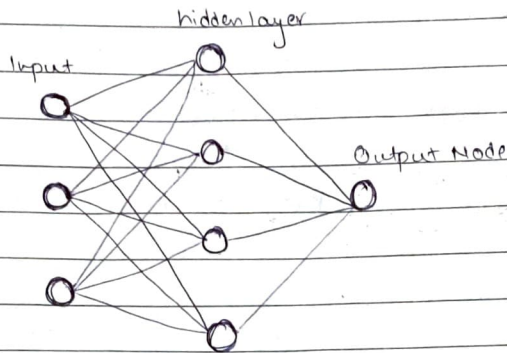
Input layer



LAYER 2

there are four neuron in this hidden layer
now all inputs from Layer 1 gets to Layer 2 (hidden layer)

OUTPUT/FINAL LAYER



Every output from input layer gets through all the neurons where it is processed and given to output neuron

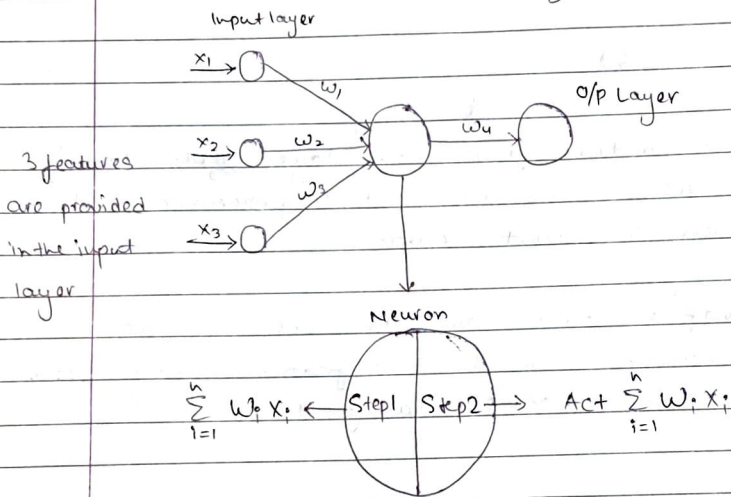
Output neuron can be one or more

- 1 neuron + Singal classification (binary classification)
- 2/3 neuron + Multi classification

VIDEO 2 - How neural net works

- Forward propagation
- Activation Function
- Backward propagation

Basic working



Step1: Passing features to input layer
We've passed 3 features here x_1, x_2, x_3

Step2: Some weight is assigned to each neuron
as passed to the hidden neuron where processing will occur.

There are two types of operations which will happen in the hidden neuron stated above

Step3: Output is passed to third layer.

STEP 2 Elaborated

- In the hidden neuron there are operations taking place first being sum of $w_i x_i$ & second being activation function

When weights and features are passed to hidden neuron this function activates

$$\left(\sum_{i=1}^n w_i x_i \right)$$

$$y = w_1 x_1 + w_2 x_2 + w_3 x_3 + \text{bias}$$

here some bias is added externally

then this y is passed to the activation function

$$Z = \text{Act}(y) \quad \text{or} \quad Z = \text{Act}\left(\sum_{i=1}^n w_i x_i\right)$$

Sigmoid Activation Function

Equation: $\frac{1}{1+e^{-y}}$ where $y = w_1 x_1 + w_2 x_2 + w_3 x_3 + \text{bias}$

this activation function will produce a value b/w 0-1 if it is less than 0.5 then the neuron will not get activated if more than 0.5 it will get activated.

$$Z = \text{Act}(y)$$

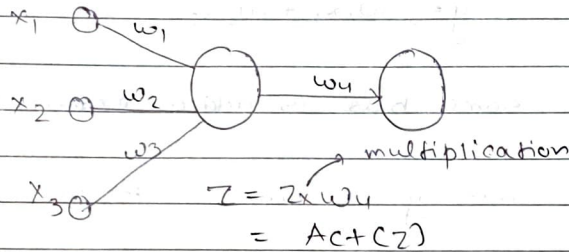
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One type of Act is Sigmoid Act function

$$Z = \frac{1}{1+e^{-y}}$$

STEP 3 (Elaborated)

After hidden neuron processes the info it gives the output z which again is assigned some weight & passed to output layer where again activation function is applied and result is given acc. like if it is a classification problem 0 or 1 will be the output.



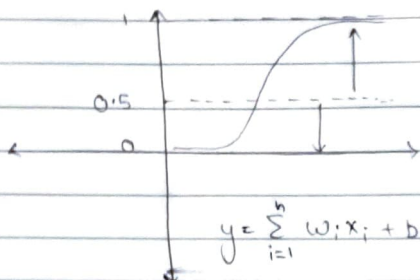
This was an example of forward propagation

VIDEO 3 (Activation Function)

① SIGMOID AF

② RELU AF

SIGMOID FUNCTION



mostly used in
classification prob

$$\bullet \text{Act}(y)$$

$$\rightarrow \frac{1}{1+e^{-y}}$$

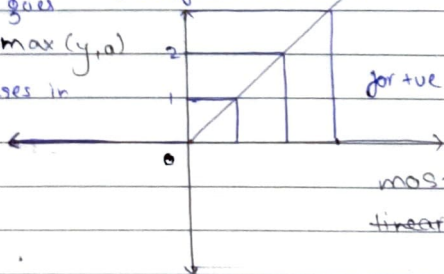
whatever be the value
of y , it will be always
(means taking max of zero) under 0-1.

RELU AF

(Rectified Linear Unit)

Relu never goes
negative $\max(y, 0)$

like prices of houses in
a house prediction
model



most used in
linear regression prob.

relu works in simple way, it takes the max of
 y and zero. So if $y = -ve$, max of $-ve$ &
zero is ofc zero so it transforms it to zero

If $y = +ve$, max of a +ve number & 0 is +ve
number