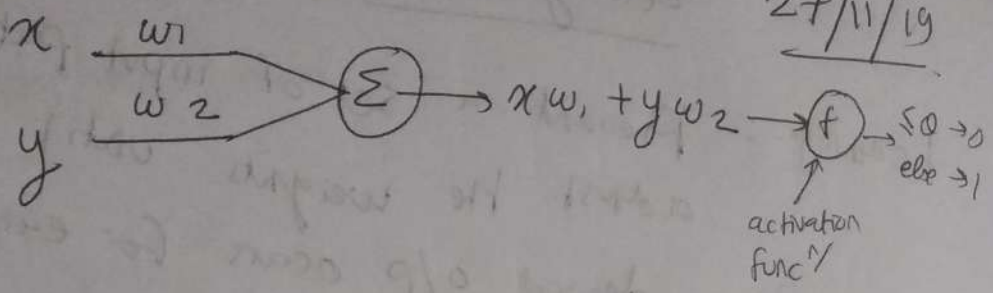
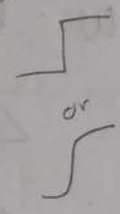


27/11/19



activation func<sup>n</sup>

Eg: can be a threshold



So, a single neuron

$$xw_1 + yw_2 \leq c \rightarrow \text{o/p} = 0$$

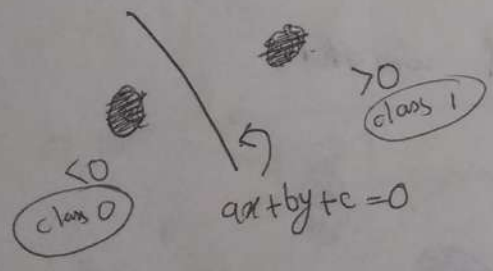
$$\text{else } \text{o/p} = 1$$

i.e.

$$ax + by + c \geq 0 \rightarrow \text{o/p} = 1$$

$$\text{else } \rightarrow \text{o/p} = 0$$

So, a <sup>single</sup> neuron provides a line  
 $\Downarrow$   
 act as discriminator bet<sup>n</sup> 2 patterns.



So, classification  $\rightarrow$  find suitable value of  $a, b, c$   
 which can discriminate patterns of 2 diff. classes.

Given a training set, I'll choose an optimal line so that misclassification is reduced.

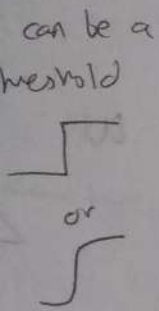
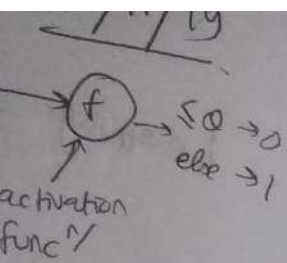
Here, the o/p is acting

T.S.S.

Unsupervised

A set of

Similarly calc for OR gate



= 1  
= 0  
line  
↓  
or bet<sup>n</sup>  
patterns.

the value of  
c  
terminate  
of 2  
asses.  
an optimal

Here, the o/p label / class label of the dataset is acting as the supervisor.

TS.S. → target sum squared error

x	y	class
2	3	0
3	8	1
⋮	⋮	⋮
a'	b'	?

given

→ Predict.

Unsupervised Learning - finding similarity / dis... among pattern

A set of similar patterns grouped together.

similarity found by diff. kind of distance measures  
An eg. is Euclidean distance

$$w_1 x + w_2 y \geq 0 \rightarrow \text{class 1}$$

$$\begin{matrix} \swarrow & \searrow \\ 0.5 & 0.5 \end{matrix}$$

So if we want AND gate,

$$w_1 = w_2 = 0.5 \quad 0 = 1$$

Similarity  
calc for  
OR  
gate

$$1.w_1 + 1.w_2 \geq 1 \rightarrow \text{class 1}$$

$$1.w_1 + 0.w_2 = 0.5 < 1 \rightarrow \text{class 0}$$

$$0.w_1 + 1.w_2 = 0.5 < 1 \rightarrow \text{class 0}$$

$$0.w_1 + 0.w_2 = 0 < 1 \rightarrow \text{class 0}$$

I can  
also have  
infinite  
other  
lines.

Can implement NAND, NOR, AND, NOT, etc.  
any func<sup>n</sup> can be implemented by neurons

Remember — 1 neuron = 1 line

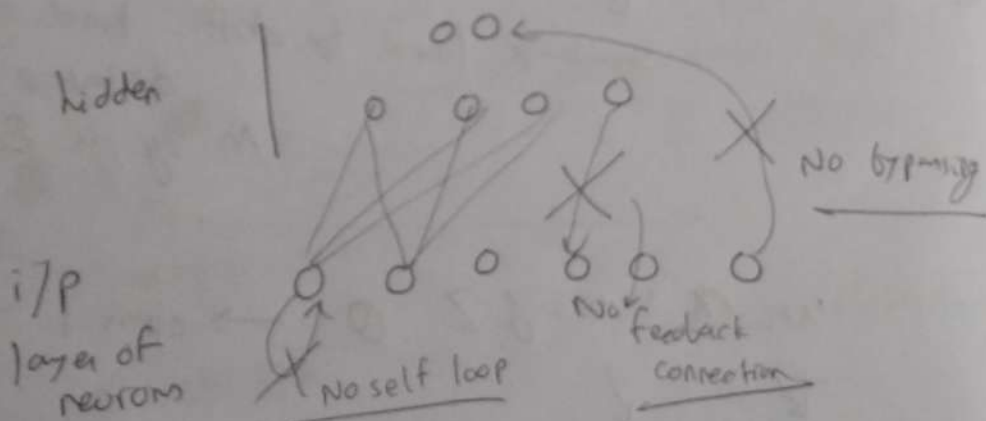
But XOR can't be performed by 1 Neuron

00  
01  
10  
11

XOR is the simplest  
func<sup>n</sup> that is  
not linearly  
separable

So, we hv to go from single layer  
perceptron to multi-layer perceptron.

o/p |     o     o     o



Fully-connected feed fwd ~~layer~~ n/w

So, discriminator in More than 3D  
is hyperplane

2D → discrim → line  
3D → - - - → plane  
> - - - → hyperplane

Correctly  
classified  
but  
still  
→ So  
→ error



OT. etc.  
by neurons  
1 line.

1 Neuron

the simplest  
n/ that is  
linearly  
separable

le layer  
neuron.

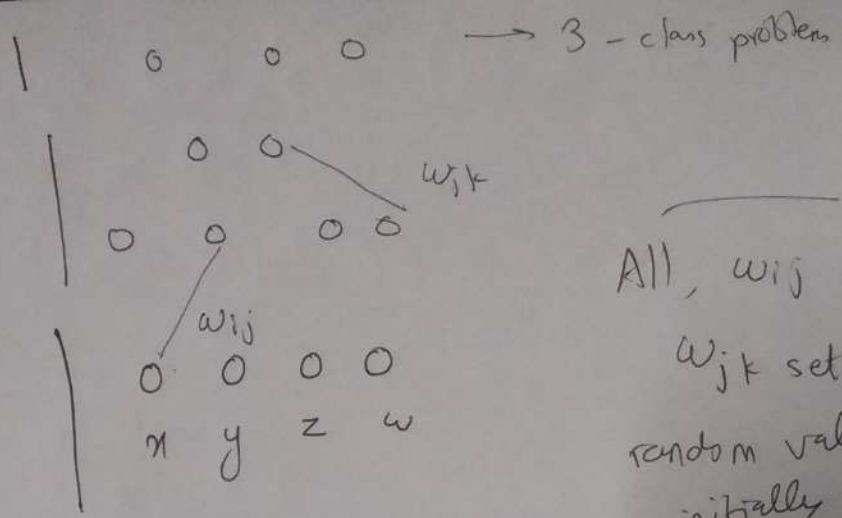
No bypassing

ack  
ection

/w  
More than 3D

plane

re



All,  $w_{ij}$ ,  $w_{jk}$   
 $w_{jk}$  set to  
random values  
initially

Say at o/p node:

	0	0	0
prediction	0.9	0.7	0.2
G.T.	1	0	0

Correctly classified but still error

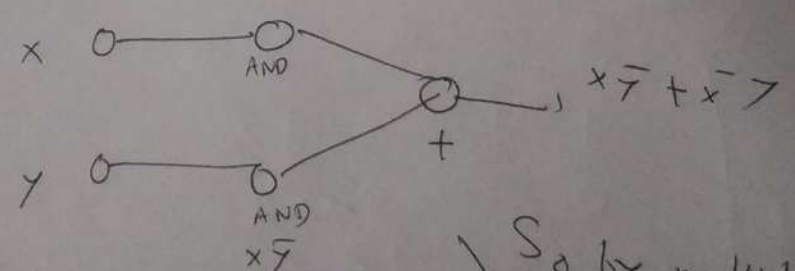
forward pass  
+  
backward pass

So there is error  $(1-0.9)^2 + (0.7-0)^2 + (0.2-0)^2$

even if properly classified still there is error.

train error  
test error

So, in case of XOR



1st layer, we get AND  
then in 2nd layer OR

So by multi layer perceptron we get XOR