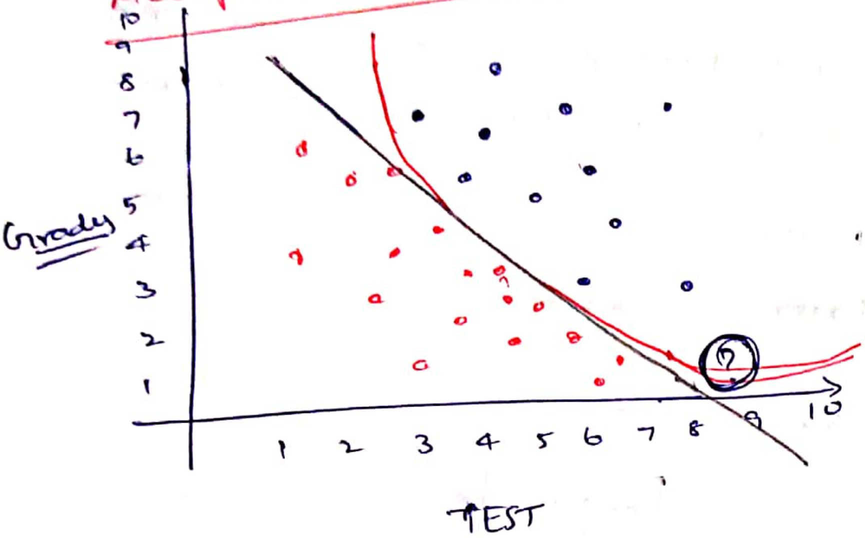
Day-3

Non-linear regions

Acceptance at a uni

• → Accepted.
• → not accepted.



Suppose if you're given a pt (9, 1) ⇒ Yes | It is accepted
Test grades

BUT

LOGICALLY SPEAKING OUR GRADE IS $\boxed{1}$ terrible so we wanna discard that.

⇒ The perceptron algo doesn't work in this case

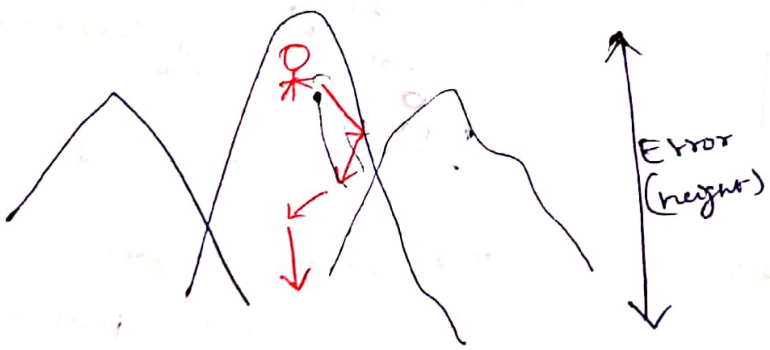
This Exclaims that perceptron algo doesn't work in this case

we need to redefine the curve to make this happen

well a curve would do the whole process.

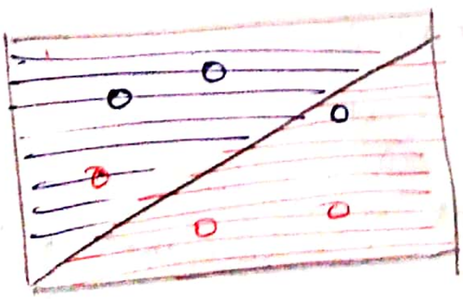
Error function:

goal
distance in which way it is minimum & repeat the process until you reach the goal



Error → how badly we're doing at the moment & how far we are from Ideal solution

we are descending to make the error relatively less.

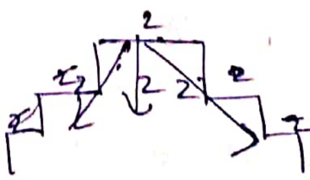


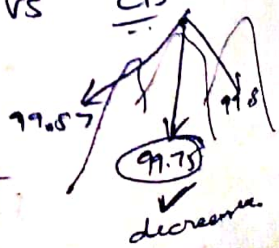
no of errors

$\boxed{2}$

whatever we do in perceptron the error persist bcoz of Discrete fn

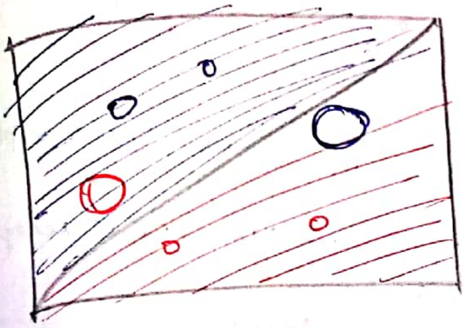
Discrete vs cts





Error fn is continous ⇒ differentiate

LOG-LOSS ERROR FN:



→ going to penalize the 2 incorrect pts.

→ Small penalties for 4 correct pts

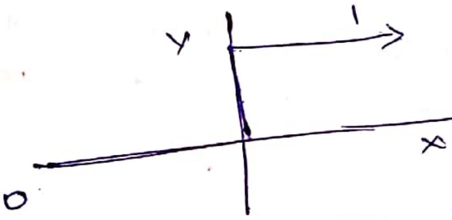
Error = 0 + 0 + O + O + 0 + 0

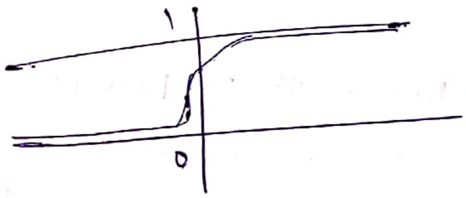
~~Error = 0 + 0~~

DIScrete vs Continous.

Yes	1
No	0

$\boxed{63.8\ \%}$ likely

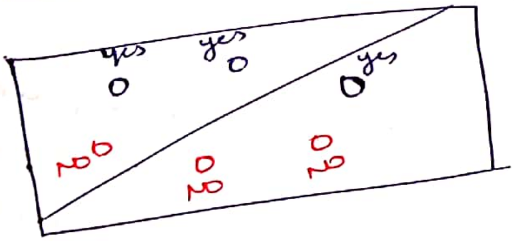


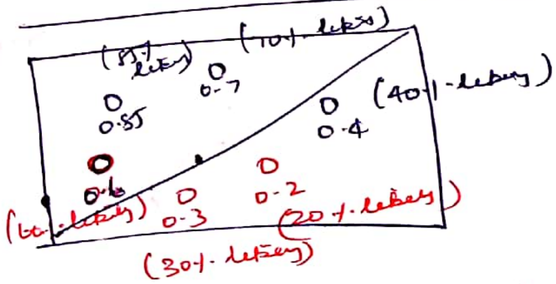


SIGMOID FN:

$$y = \begin{cases} 1 & \text{if } x > 0 \\ 0 & \text{if } x < 0 \end{cases}$$

large +ve number ≃ 1
−ve number ≃ 0
number = 0 ⇒ ≃ 0.5





whether the person is accepted or not?

The person is accepted with x % probability

WHAT IF WE HAVE MORE CLASSES?

Say you are receiving an gift

duck beaver walrus.

Based on the features of animals such that if the animal has beaker, feathers, hair / no-hair linear scores are p(duck) = 2 p(beaver) = 1 p(walrus) = 0

$$P(\text{duck}) = 2 \quad = \frac{2}{2+1+0} = 0.67$$

$$P(\text{beaver}) = 1 \quad = \frac{1}{2+1+0} = 0.24$$

$$P(\text{walrus}) = 0 \quad = \frac{0}{2+1+0} = 0.9$$

How do we turn these scores into probabilities?

Good Idea!

but what happens if we have a negative number -1, 0, +1

$\Rightarrow \frac{x}{-1+0+1} = \frac{x}{0}$ (Exp

There is a Exponential function

$(e^x) \Rightarrow$ turns to +ve no ← SOLN

$$\boxed{e^2 \Rightarrow \frac{e^2}{e^2+e^1+e^0} = 0.67}$$

ONE-HOT ENCODING :

The data always may not be numerical at a time. we need to transfer at a time.

Say P(gift/no gift) = 1/0

P(gift) = 1

P(no gift) = 0

if gift classes are this	Duck?	beaver?	walrus?
P(duck)	1	0	0
P(beaver)	0	1	0
P(walrus)	0	0	1

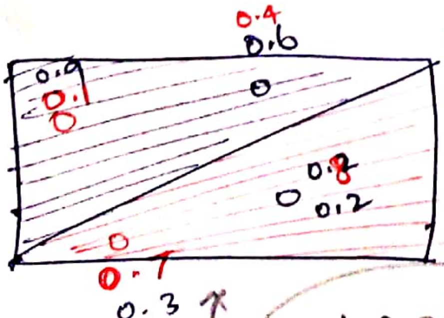
MAX LIKELIHOOD. ⇒ PICK THE MODELS THAT GIVES EXISTING LABELS WITH HIGH PROBABILITY!

⇒ $\boxed{\text{max - probability} \cong \text{Best model}}$

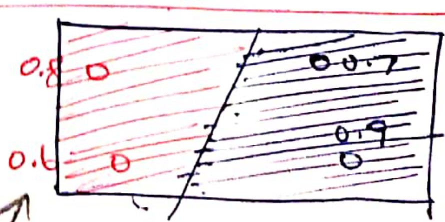
Calculate for actual colors

0.6 *
0.1 *
0.2 *
0.7

0.0084



Bad model



good

0.7 * 0.9 * 0.6 * 0.8

= 0.3024

= 30%

MAX PROBABILITY :

max prob ↑ min Error fn

$0.6 * 0.2 * 0.1 * 0.7$

$\Rightarrow 0.0084$

$0.7 * 0.9 * 0.8 * 0.6$

$\Rightarrow 0.3024$

what happens if we are given a 1000's of datas of all comprising $\boxed{0 < x < 1}$

① when we perform ~~sum~~ product $\Rightarrow$ it would be very tiny

② what happens if I change one of those values? It would be a drastic change.

so $\Rightarrow$ Products $\Rightarrow$ Bad
Sums $\Rightarrow$ Good

prod $\rightarrow$ log $\rightarrow$ sums

CROSS ENTROPY

$\ln(0.6) + \ln(0.2) + \ln(0.1) + \ln(0.7)$

$-0.51 \quad -1.61 \quad -2.3 \quad -0.36$

$\ln(0.7) + \ln(0.9) + \ln(0.8) + \ln(0.6)$

$-0.36 \quad -0.1 \quad -0.22 \quad -0.51$

Note all are -ve

since $\boxed{\ln(1) = 0}$

so take - log

$-\ln(0.6) + (-\ln(0.2)) - \ln(0.1) - \ln(0.7)$

$0.51 + 1.61 + 2.3 + 0.36$

$-\ln(0.7) - \ln(0.9) - \ln(0.8) - \ln(0.6)$

$0.36 + 0.1 + 0.22 + 0.51$

SUM OF NEGATIVE LOGARITHMS OF PROBABILITIES

Sum OF NEGATIVE LOGARITHMS OF PROBABILITIES
CROSS ENTROPY

4.8

Bad model

1.2

Good model
low CE

CROSS ENTROPY :

DOOR 1	DOOR 2	DOOR 3
P(gift) = 0.8 ✓	P(gift) = 0.7 ✓	P(gift) = 0.1 ✗
P(no-gift) = 0.2	P(no-gift) = 0.3	P(no-gift) = 0.9

Independent events
Pick large value from each column

Prob = 0.504

Door 1	Door 2	Door 3	Prob	CE
✓ 0.8	✓ 0.7	✓ 0.1	0.056	2.88
✓ 0.8	✓ 0.7	✗ 0.9	0.504	0.69
✓ 0.8	✗ 0.3	✓ 0.1	0.204	3.73
✗ 0.2	✓ 0.7	✓ 0.1	0.014	4.27
✓ 0.8	✗ 0.3	✗ 0.9	0.216	1.53
✗ 0.2	✓ 0.7	✗ 0.9	0.126	2.07
✗ 0.2	✗ 0.3	✓ 0.1	0.006	5.12
✗ 0.2	✗ 0.3	✗ 0.9	0.054	2.32

Low CE ⇓ likely to happen

$p_1(\text{gift}) = 0.8$
$p_2(\text{gift}) = 0.7$
$p_3(\text{gift}) = 0.1$

✓	✓	✗	CE
0.8	0.7	0.9	$-\ln(0.8) - \ln(0.7) - \ln(0.9)$
P1	P2	1-P3	
$y_1 = 1$	$y_2 = 1$	$y_3 = 0$	

y=1 if gift present

$$\boxed{CE = -\sum_{i=1}^{m} y_i \log p_i + (1-y_i)\log(p_i)}$$

$CE[(1,1,0), (0.8, 0.7, 0.1)] = 0.69$ ✓