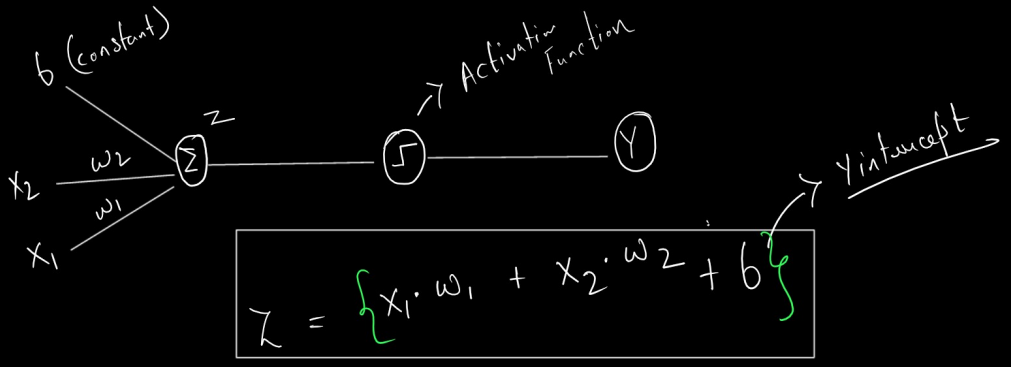
# Todays Agenda

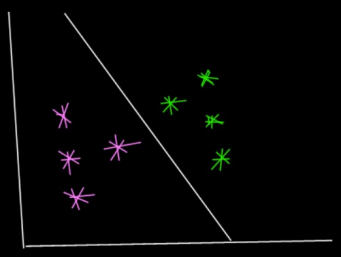
1) Perceptron (Recap)
2) Transformations (lines)
3) Approaches towards loss functions



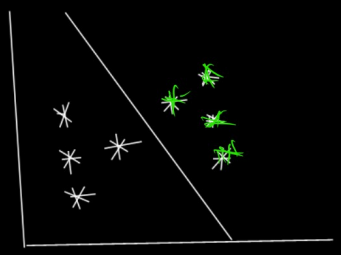

$$z = x_1 \cdot w_1 + x_2 \cdot w_2 + b$$

$$f(z) = \begin{cases} 1 & z \geq 0 \\ 0 & z < 0 \end{cases}$$

| $(x_1)$ 12 | $(x_2)$ CGPA | $(y)$ Placed |
|---|---|---|
| 60 | 6.5 | 0 |
| 70 | 7.6 | 1 |
| 80 | 8.4 | 1 |



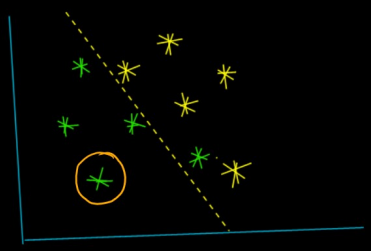
2d - line
3d - plane
4/5/6d - hyperplane



2 different Regions
+ve | -ve

Issues wrt to Misclassification

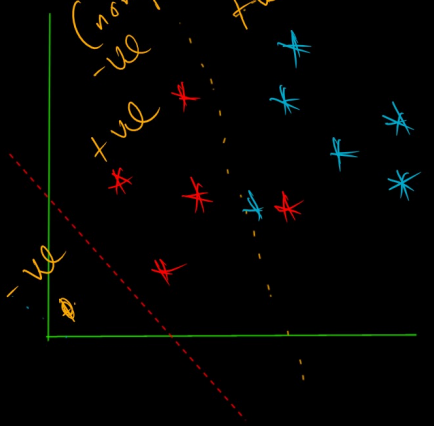
{Errors} -> close to 0



1) How the line {best} will be created to classify $\frac{2}{0}$

## Approach

1) Select a random data point
2) Check for ① classification correct (There will be change)
   ↳ ② mis classification (There will be change)

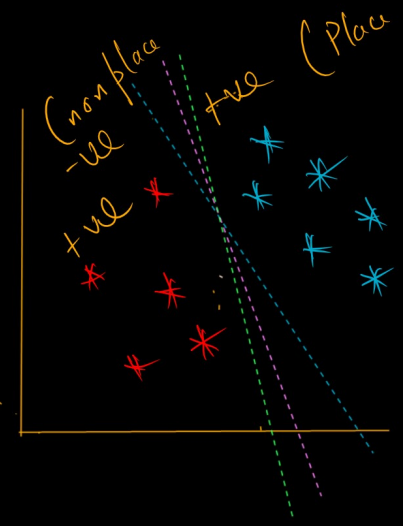



{Random Line}

$Ax + By + C = 0$

(-ve) I·C → C (+ve)

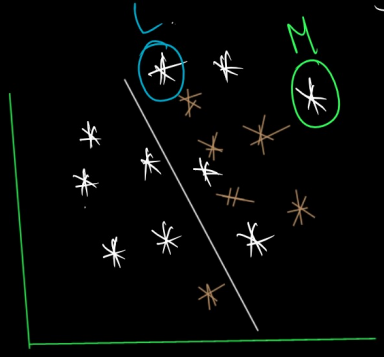
MAE ↓ LE ↓ LEE ↓ 0




1) Points → correct / incorrect } 10 times

{Best ?} 10000K

$f(\text{data}) = \frac{\text{+ve}}{\text{mis class}} = 5$




quantity + magnitude (distance)

$X_i = AX_1 + BX_2 + C \cdot X_3$

$= X_i (A + B + C)$

• X

{ Algorithm }

| $x_0$ | cgpa | iq | placed |
|---|---|---|---|
| 1 | 7.5 | 81 | 1 |
| 1 | 7.9 | 91 | 1 |
| 1 | 5.6 | 60 | 0 |

$Ax + By + C = 0$

$w_0 + w_1 x_1 + w_2 x_2 = 0$

$w_0 = C,\ w_1 = A,\ w_2 = B$

$w_0 x_0 + w_1 x_1 + w_2 x_2 = 0$

$w_0 \times 1 + w_1 \times 7.5 + w_2\, 81 = z$

$$f(z) = \begin{cases} z \geq 0 \rightarrow 1 \\ z < 0 \rightarrow 0 \end{cases} \rightarrow \boxed{\sum_{i=0}^{2} w_i x_i = 0}$$

$Ax + bx + C$

Transformations

{ Co-efficients }

$C \rightsquigarrow$ +ve → down, −ve → up

$A \rightsquigarrow$ +ve → C, −ve → A

$B \rightsquigarrow$ +ve → A, −ve → C

Y axis (fixed)

X axis (fixed)

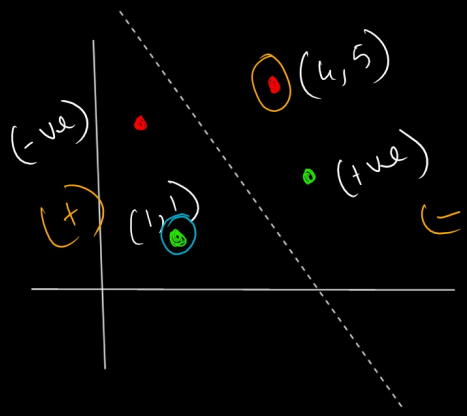
100000 K

{ Inference }

{A, B, C} → together change

# Perceptron

$$\underset{A}{2}x + \underset{B}{3}y + \underset{C}{5} = 0$$




Misclassified (=)

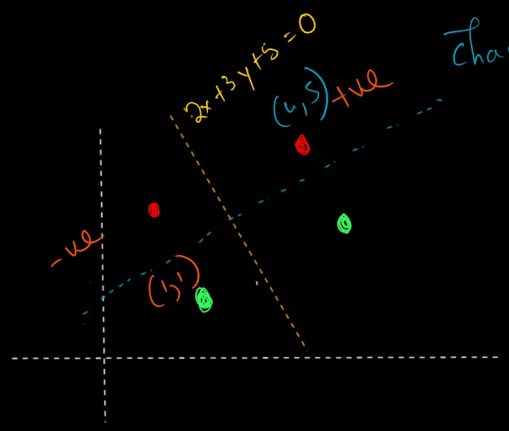
$$\begin{array}{r} 2\ \ 3\ \ 5 \\ +\ 4\ \ 5\ \ 1 \\ \hline 6x + 8y + 6 = 0 \end{array}$$

$$\begin{array}{r} 2\ \ 3\ \ 5 \\ -\ 1\ \ 1\ \ 1 \\ \hline 1x + 2 + 4 = 0 \end{array}$$

$$2x + 3y + 5 = 0$$

Change the values of A, B, C

Perceptron Trick



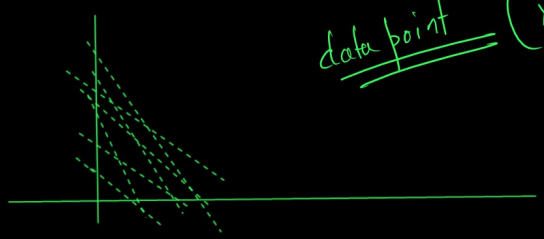

* Notes

+ve → Substraction

-ve → addition

$$\begin{array}{r} 2\ \ 3\ \ 5 \\ -\ 1\ \ 1\ \ 1 \\ \hline 1x + 3y + 4 = 0 \end{array}$$

$$\begin{array}{r} 2\ \ 3\ \ 5 \\ +\ 4\ \ 5\ \ 1 \\ \hline 6x + 8y + 6 = 0 \end{array}$$



data point (x, y)

Best fit line

dataset

Dataset
Scatter Plot

1) Random Line Equation (ABC)

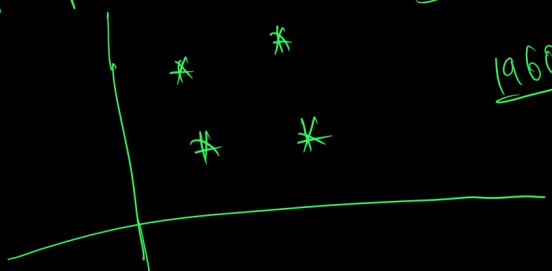
2) datapoint
true | -ve

Change the region

3) Classification

60+

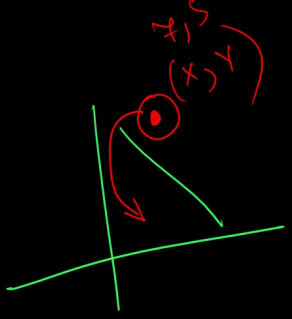
cgpa | 12 marks



1960 - 1990
①

Assumption

Bias




Line Equation

$2x + 3y + 5$

$(+) \neq 5$ !

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Algorithm

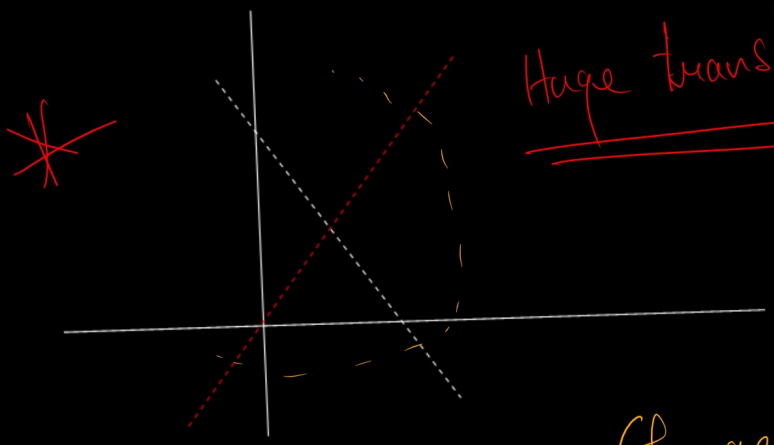
$$\sum_{i=0}^{2} w_i x_i = 0$$

[ ]
[[ ]] datatype

$$w_0 x_0 + w_1 x_1 + w_2 x_2 = 0$$

[Weight Matrix] $[w_0 \quad w_1 \quad w_2]$ $\begin{bmatrix} x_0 \\ x_1 \\ x_2 \end{bmatrix}$

Changes to the best fit line



Huge transformation

Change → Learning Rate

$\eta, \epsilon$, lr

.01

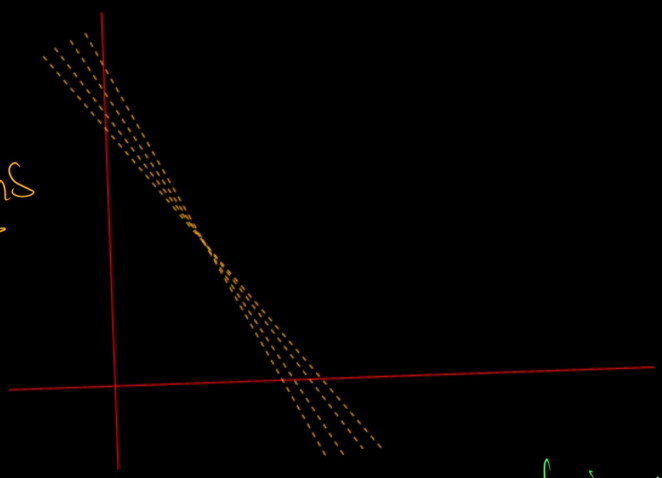
.001

.1

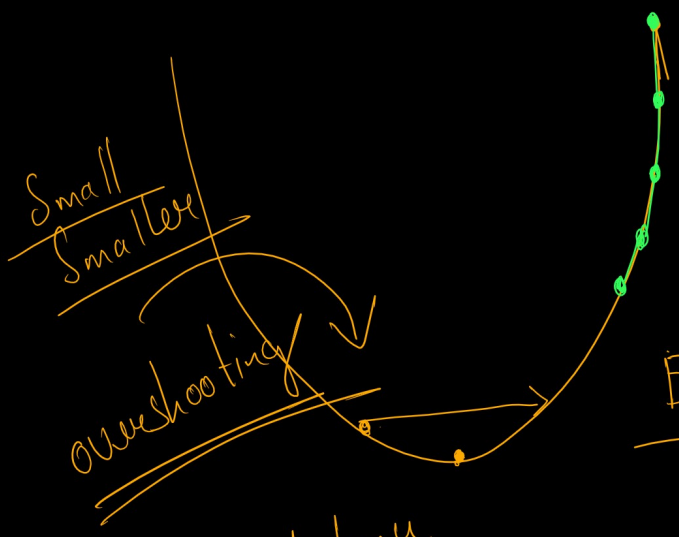
.0001

Why?

1000 iterations



Big → Reducing → Fixed



Small

Smaller

overshooting

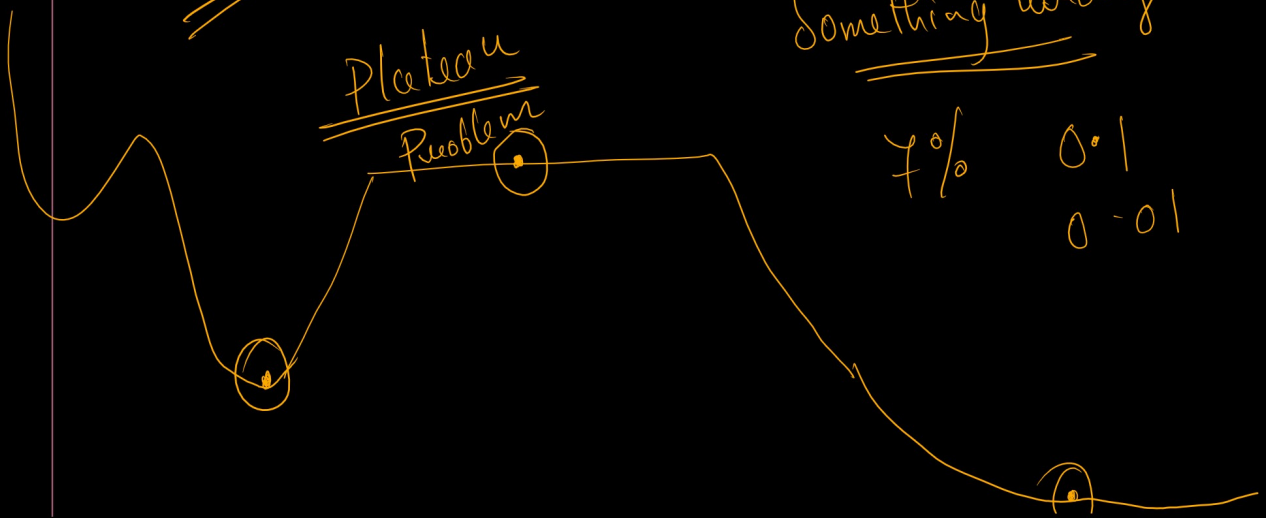
to reach here

moving close towards local minima

Error = 0

Something among

Plateau Problem



1% 0.1

0.01

Momentum

1000

Initial Few itmals

W70 300 - Big (learning = 0.9) 30 → 5/6

W10 300 - Small (learning = 0.001)

W2 300 - Smaller (base - 0.0001)

Loss is decreasing

.09 100 - (LR - 0.00001)

Loss / Errors

f(z) = 70

Loss is not constant

↓ Decreasing

GAN

→ 14685 2812

100

Imaget

7% 93%

# Dog Cat Classifier

Cat = Dog

Annotation / Labeling

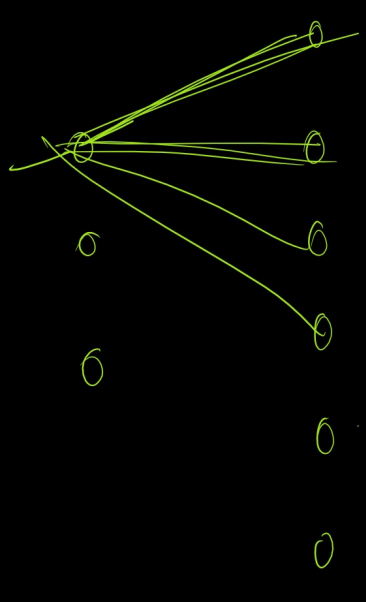
Batch (inspection)

which image

50000

20-30

(1)



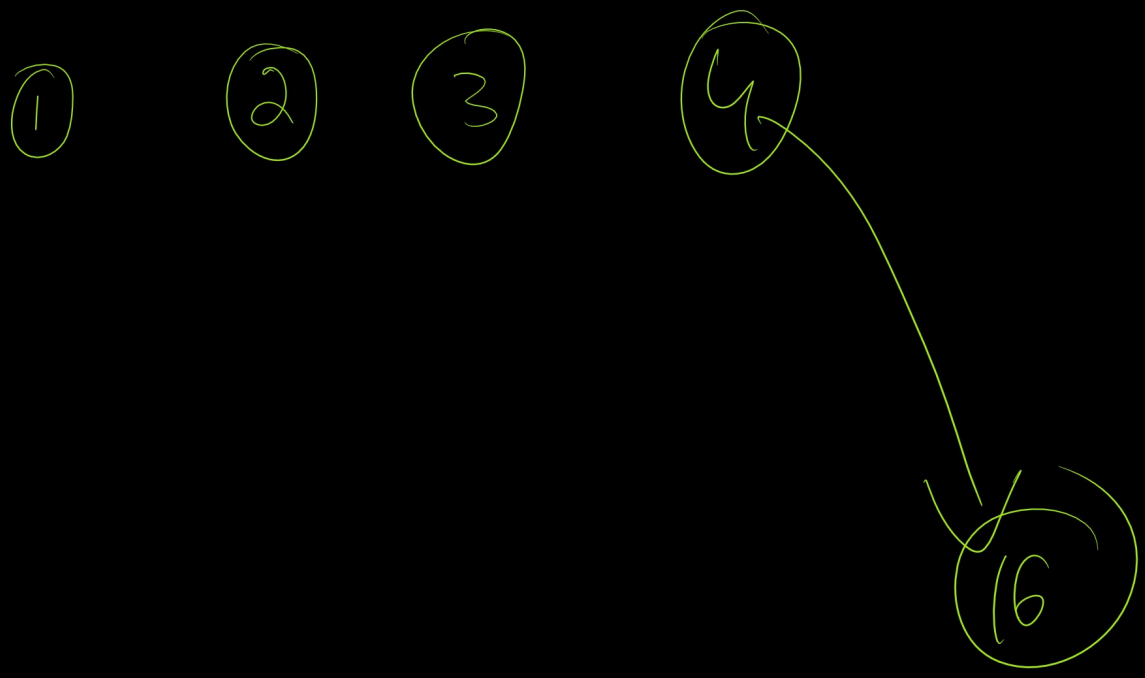
Complexity

Assume

Huge

Stagnant

→ loss function →


1
2
3
4
16