Linear Algebra 1

Overview

- Length : 10 Lectures + 2
- Topics : Linear Algebra
  Calculus
  Co-ordinate Geometry
  Optimisation (G.D)

Flow

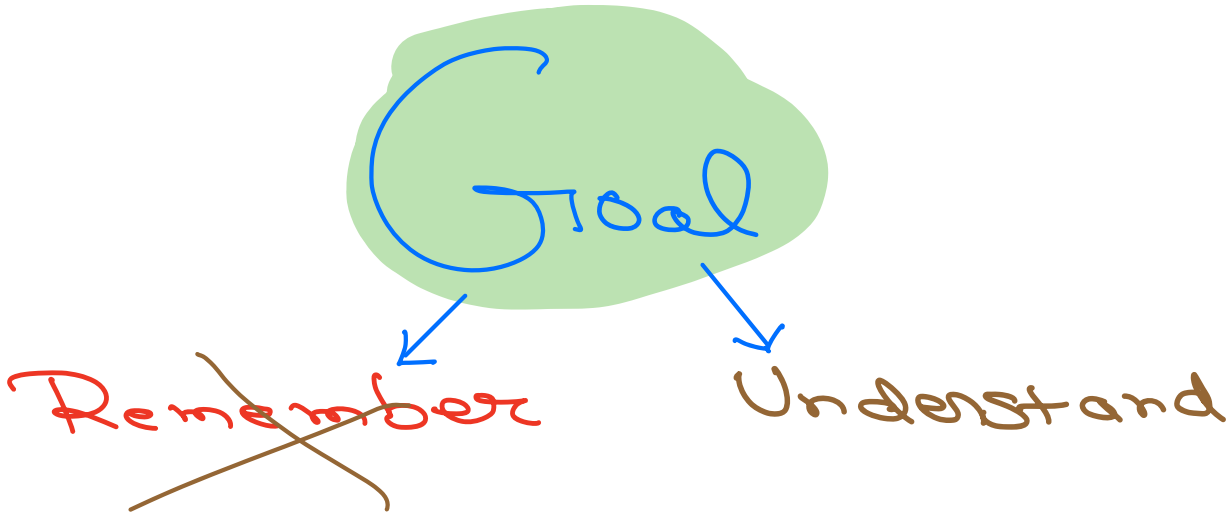
Concept → Visualization → Maths → Code

Where to find Notes and Code?

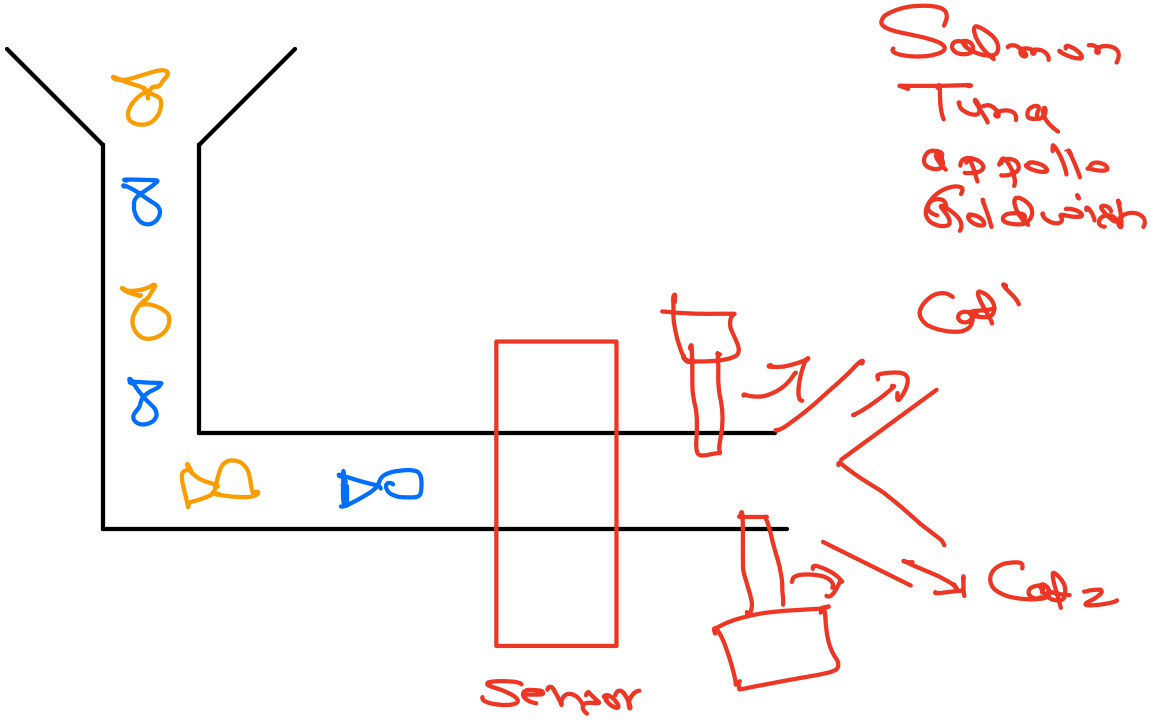
- github.com/SachinScaler/Nov23_MathsforML
- Lecture Attachments

Take Home

- Assessments (mandatory)
- Homework (optional)
- In class reads and Questions (optional)



Ex-1 Fish Sorting Machine



- Length
- Width
- Colour
- Weight

Terminologies

Attribute/Feature

Target variable / label

Width	Length	Weight	Type
30	50	80	1
11	23	28	2
27	43	29	1
16	31	36	2
20	57	28	1

record / datapoint

(W, L, W)

* Independent Var

vs

Dependent Var (Type)

Data + Label → model → Rules and threshold To Classify

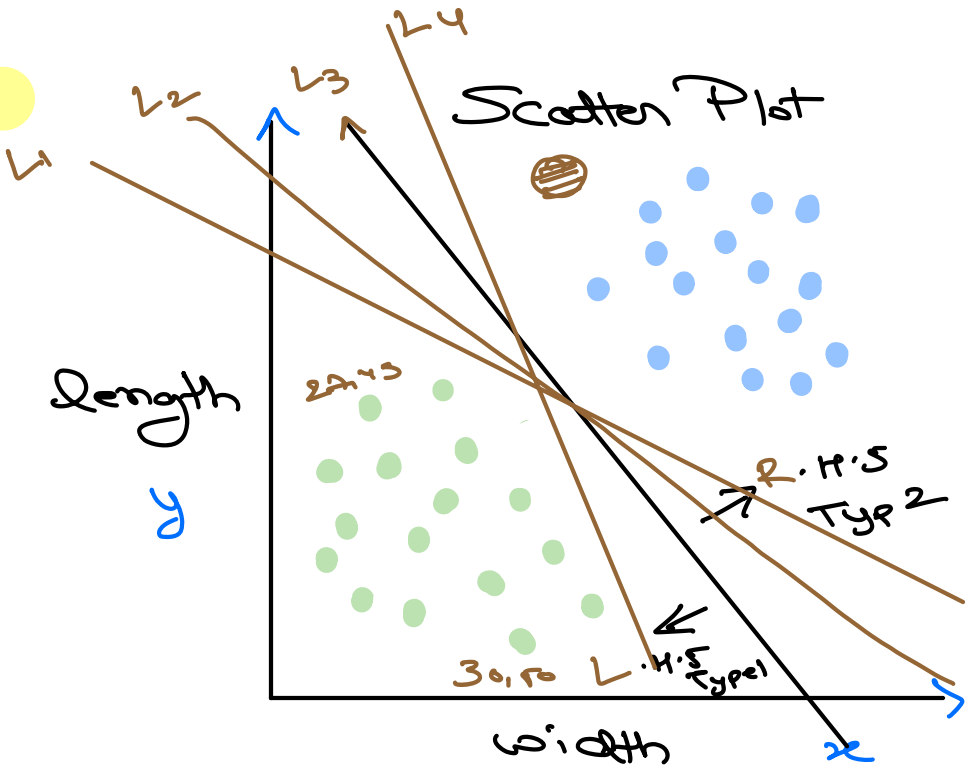
1 : Tuna

2 : Salmon

Visualization

Width	Length	Weight	Type
30	50	80	1
11	23	28	2
27	43	29	1
16	31	36	2
20	57	28	1

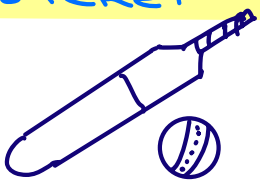
x y



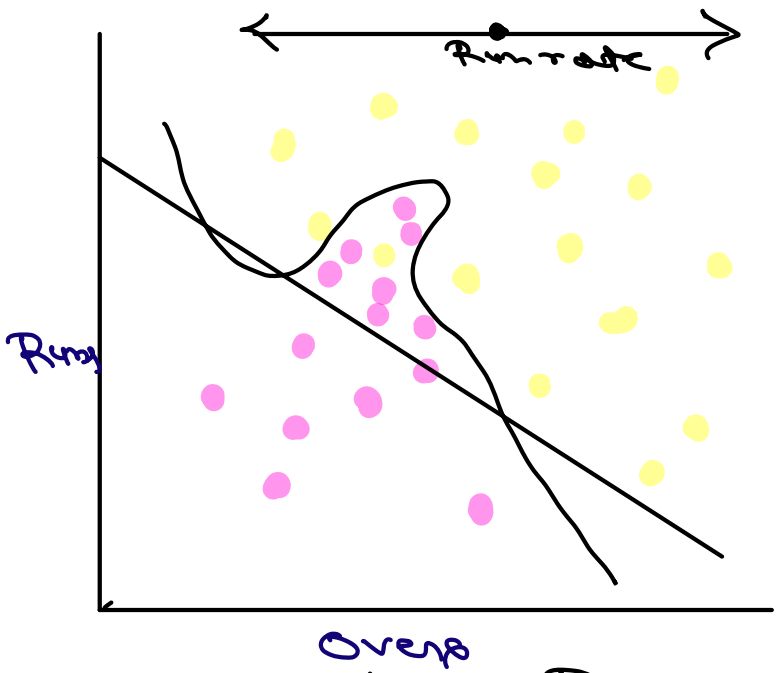
$$y = mx + c$$

(w_1, L_1)

Ex-2 : Cricket win prediction



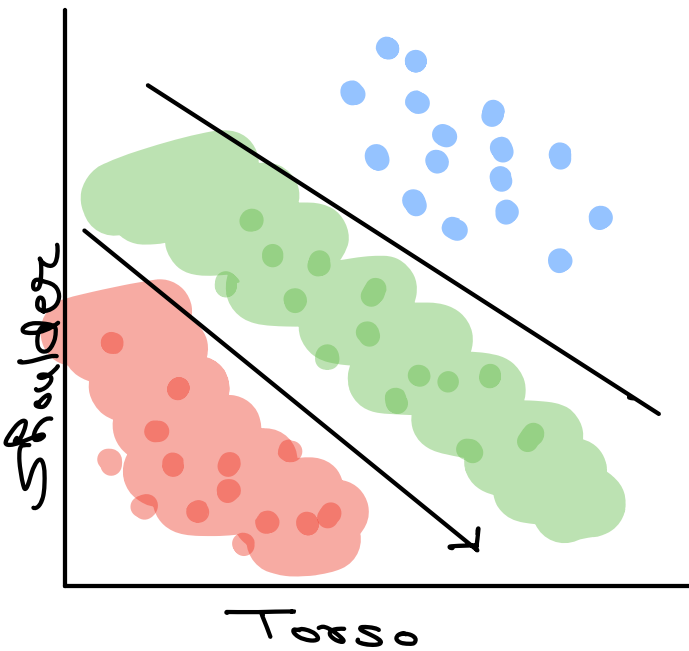
Runs	Overs	Outcome
90	20	Lose
90	10	Win
30	8	Lose
88	12	Win

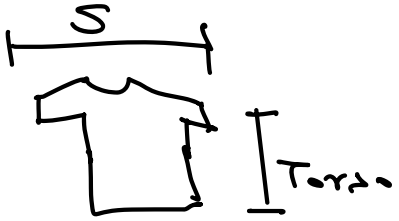


* Sometimes a line is not the Best option

Ex-3 : Tshirt Size Prediction

Torso	Shoulder	Size
45	32	S
52	44	M
60	52	L
65	48	L
48	36	S
55	43	M





(45, 33) → S, M, L

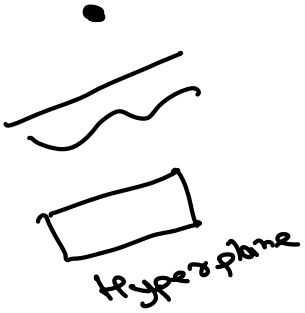
One Vs Rest

Process of building a ML Solution

a) Data Collection and Cleaning

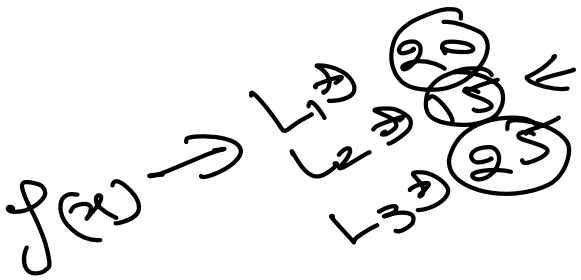
b) EDA and Visualization ←

c) Choosing an appropriate Geometric Structure to separate Classes



d) Choosing a LOSS function which helps in finding the Best Fit Structure

e) Training and Optimization



↓

5 lectures

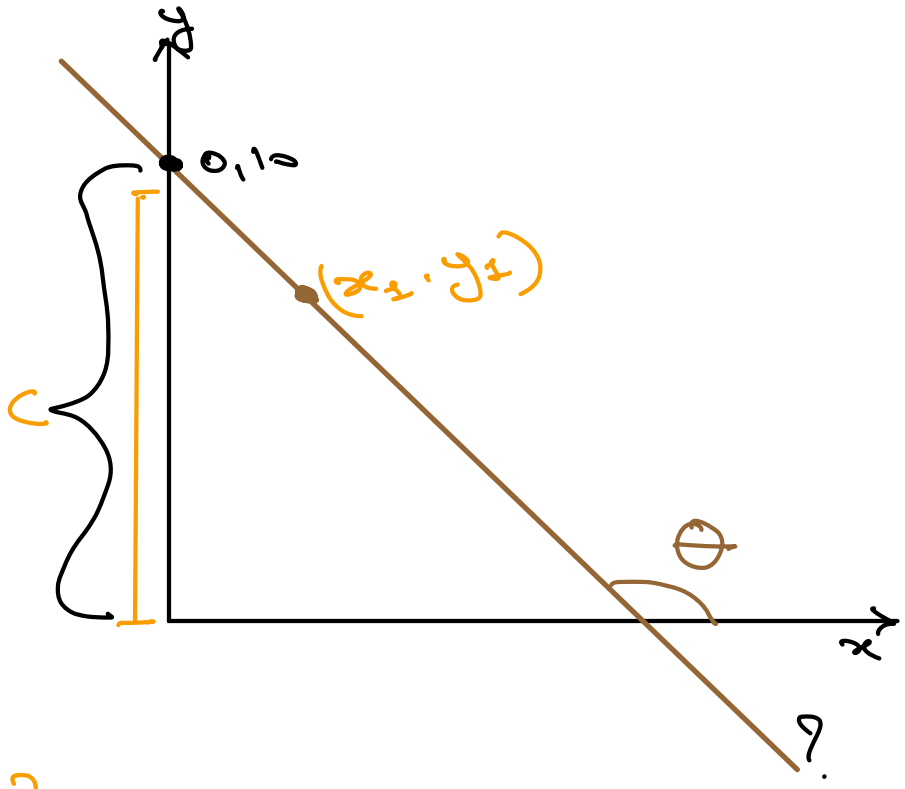
Goal of optimization is to reduce LOSS / Error / misclassification

Co-ordinate Geometry

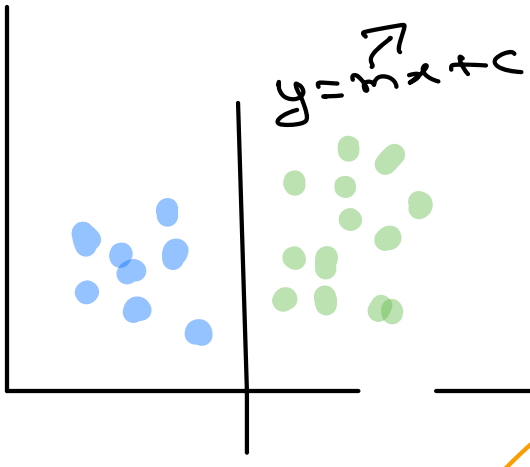
Eqn of line

$y = mx + c$

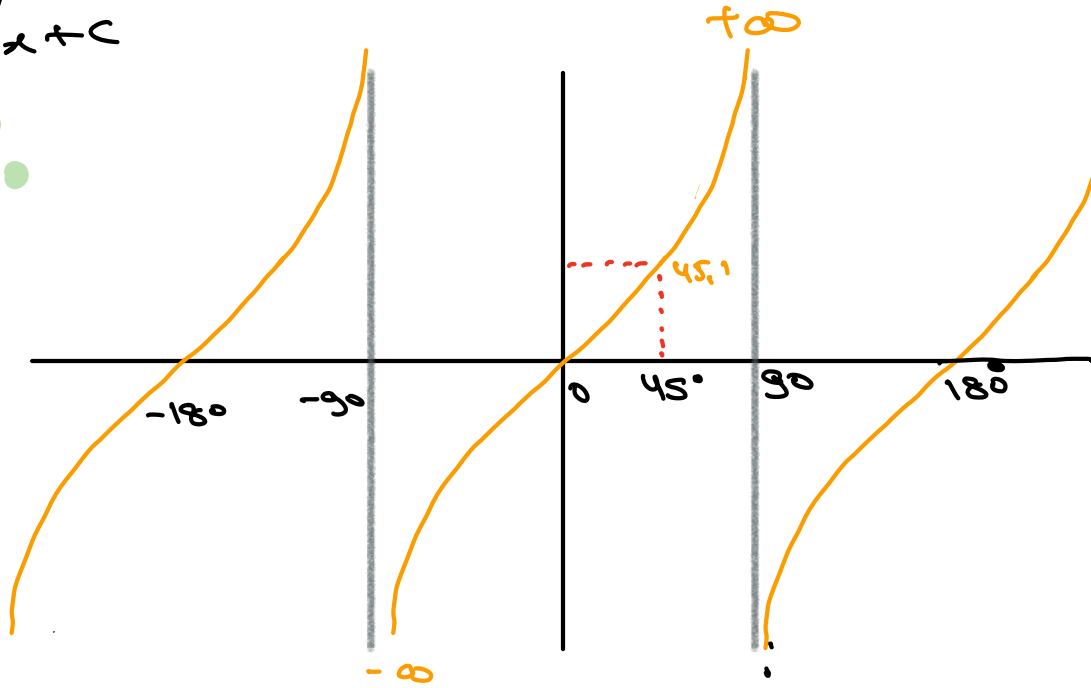
$m \rightarrow$ slope $\rightarrow \tan\theta$



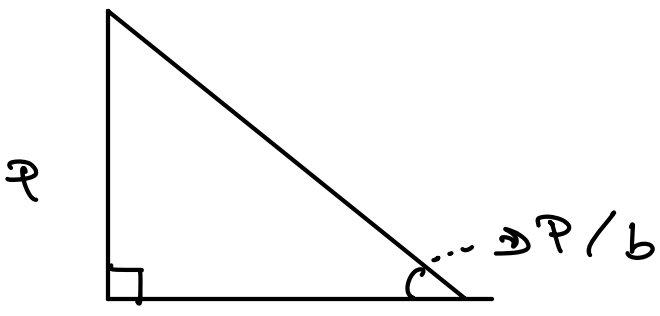
m and c ?



$\tan 45° = 1$



$-\infty < \tan\theta < \infty$



$x_1 \rightarrow x$

$x_2 \rightarrow y$

General Form y Eqn of line

$ax + by + c = 0 \Rightarrow w_1x_1 + w_2x_2 + w_0$

$by = -ax - c$

$y = \left(-\frac{a}{b}\right)x - \left(\frac{c}{b}\right)$

m → slope, c → y intercept

y intercept and Slope?

Weight/parameters ⇒ w_1 and w_2

bias ⇒ w_0

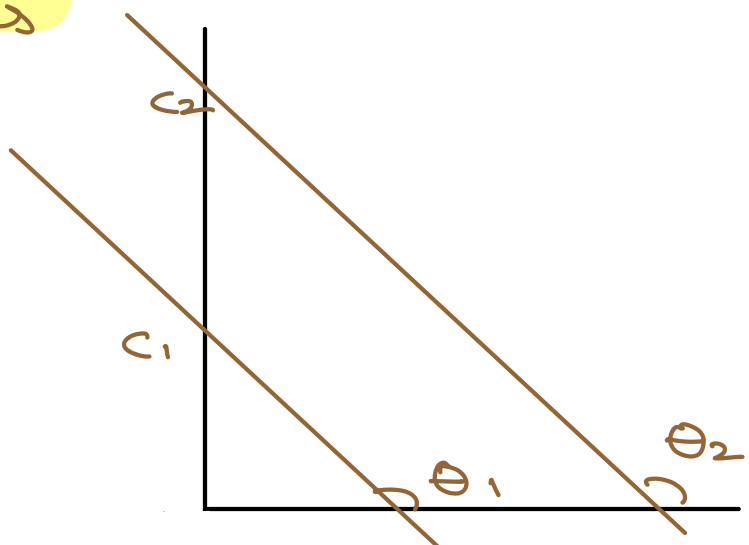
w_1 and w_2 and w_0

Relationship b/w m_1

* Parallel lines

$y = m_1x + c_1$

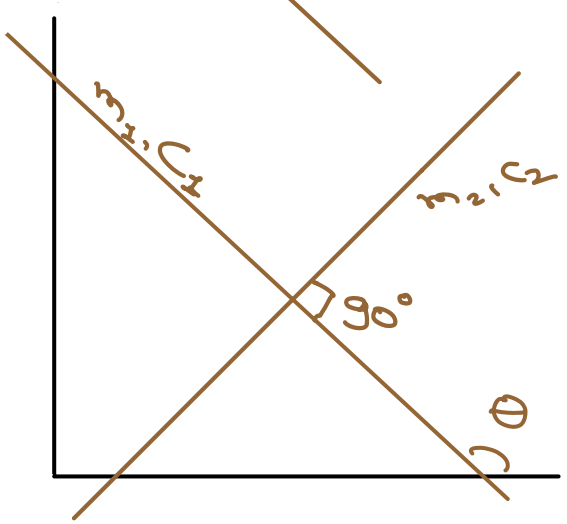
$y = m_2x + c_2$



* Perpendicular lines

$y = m_1x + c_1$

$y = m_2x + c_2$



What Happens with more than 2 Dims

Half-Spaces