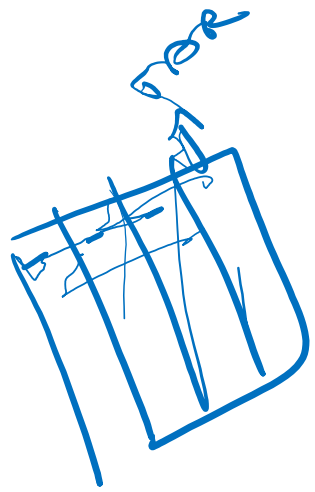
AGENDA – DAY 1 – 10-JAN-2026 (SAT)

- OVERALL INTRODUCTION
  - COURSE PROGRAM STRUCTURE, INTRODUCTION
  - LEARNING PATH ETC
  - INTRODUCTION TO DL
    - AI
    - HISTORY
    - WHAT IS DL?, VARIANTS OF DL …
    - HOW IS IT DIFFERENT FROM MACHINE LEARNING
    - USE CASES
  - PRE-REQUISITES – VIDEOS ON LMS; ML TECHNIQUES, PYTHON, MATHS & STATISTICS FOUNDATION, Curiosity, LOADS OF PATIENCE;
  - LMS WALKTHROUGH – VIDEOS, ARTEFACTS, LAB ENVIRONMENT
  - DL LIBRARIES
  - TECHNOLOGY STACK – PYTHON, JUPYTER NOTEBOOK
  - ENVIRONMENT - SIMPLILEARN LAB, LOCAL ENVIRONMENT, GOOGLE COLAB
  - ANN
- KEY TAKEAWAYS
- Q & A
- SUMMARY, HEADS-UP FOR DAY 2 &
- 2 SESSIONS
  - SESSION 1 – 9 AM IST TO 11 AM IST;
  - SESSION 2 – 11.20 AM IST – 01:00 PM IST
  - BREAK FOR 20 MINUTES
  - BEFORE THE BREAK – PARTICIPATE IN THE POLL
- END OF THE SESSION SURVEY, CLOSURE



DATA

STR

UNSTR

IMAGES

CNN

SEQUENTIAL

RNN / LSTM

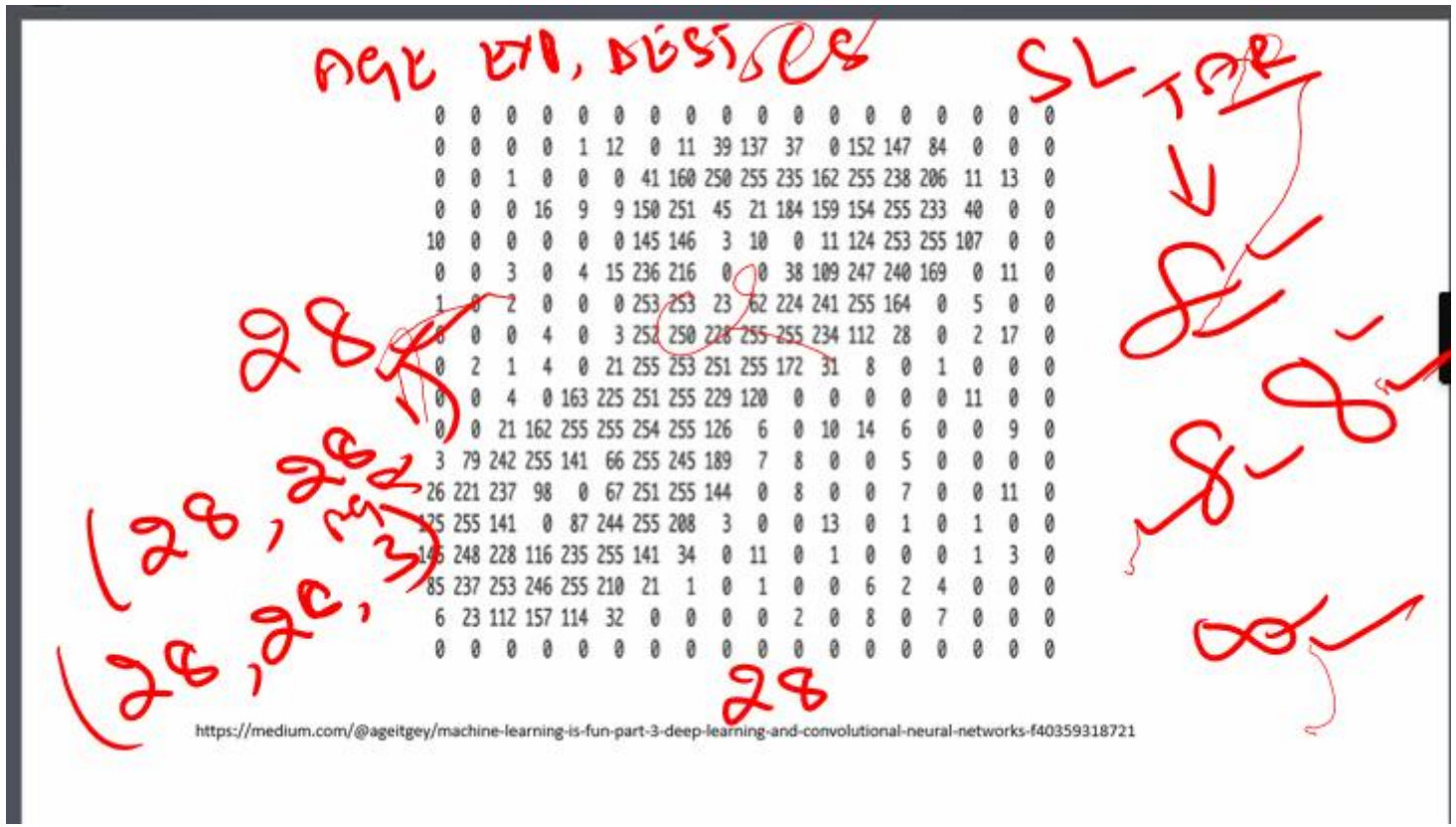
GRU

CAT

MAN

WOMAN

SIGNAL



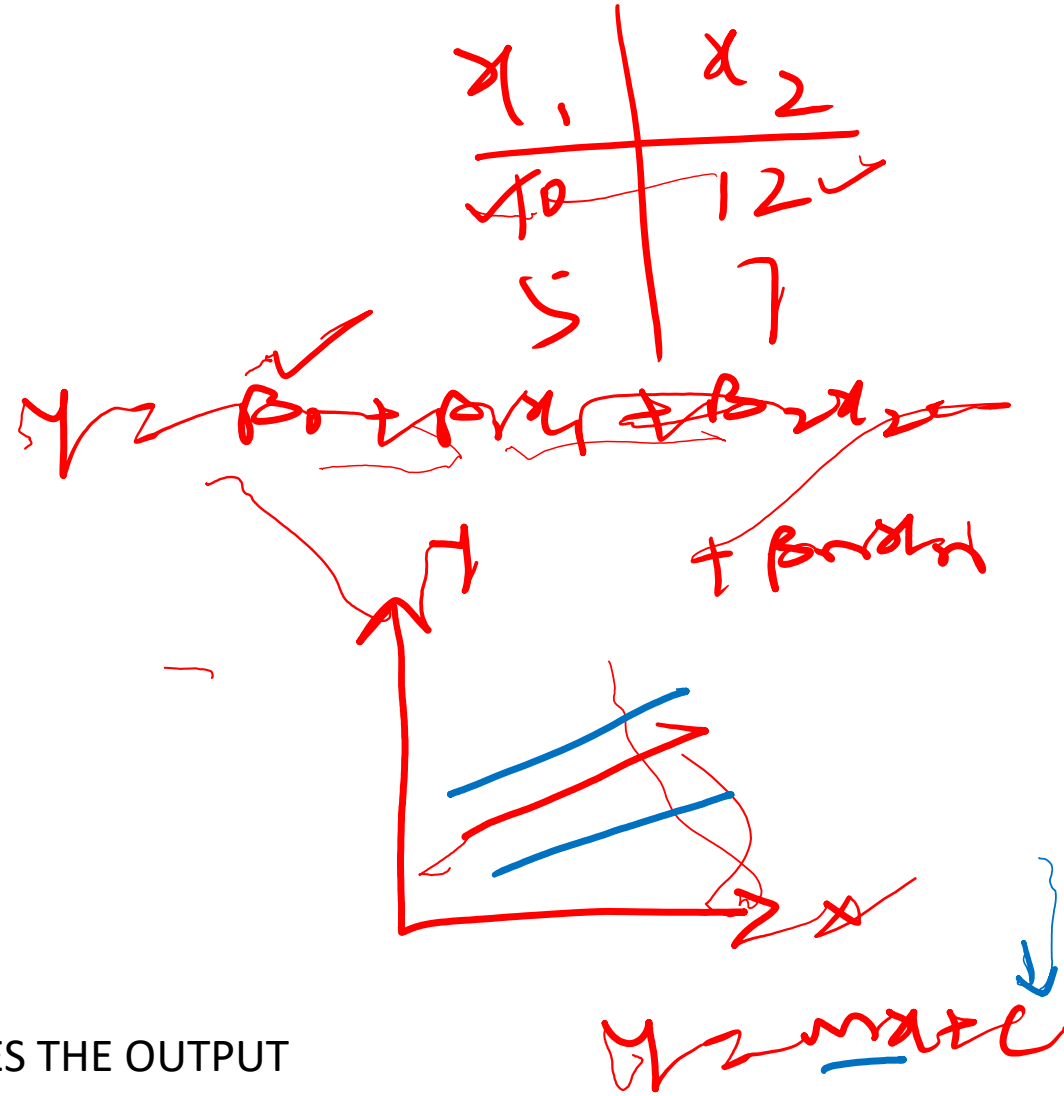
https://medium.com/@ageitgey/machine-learning-is-fun-part-3-deep-learning-and-convolutional-neural-networks-f40359318721

HOW DOES A MACHINE LEARN AT ALL?

NEURON: GENERAL CONCEPT

- **COMPUTATIONAL UNIT**
  - **TAKES A NUMERIC INPUT**
  - **MULTIPLIES THEM BY WEIGHTS (SYNOPTIC WEIGHTS)**
  - **ADDS A BIAS**
  - **PRODUCES THE NUMERICAL OUTPUT**

  - **Score = w1x1 + w2x2+….+b (**weighted sum + bias)



PERCEPTRON:

- SPECIFIC TYPE OF NEURON
- USED **FOR BINARY CLASSIFICATION**
- WITH A HARD **DECISION RULE**

INPUT:
A NUMERIC FEATURE REPRESENTED AS x1, x2, x3,….

WEIGHT:
A NUMBER THAT CONTROLS HOW STRONGLY AN INPUT INFLUENCES THE OUTPUT

BIAS: A CONSTANT ADDED TO THE WEIGHTED SUM
SHIFTS THE DECISION BOUNDARY

LOSS FUNCTION:

A LF MEASURES HOW WRONG A PREDICTION IS

CORRECTION PREDICTION → **LOW LOSS**
WRONG PREDICTION → HIGH LOSS

COST FUNCTION:
AVERAGE LOSS ACROSS MANY EXMPLES OR CUSTOMERS

GRADINET DESCENT:

THRESHOLD:
IT IS A CUTOFF VALUE THAT IS USED TO CONVERT A SCORE INTO A PREDICTION (DECISION)

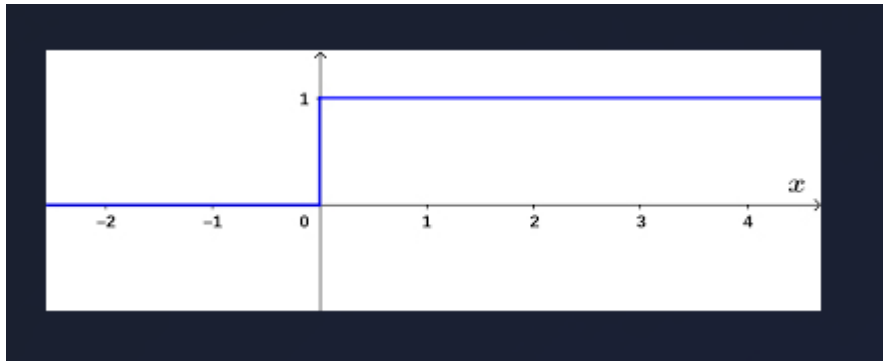
Score >= TH → CLASS → 1
Score C TH → CLASS → 0

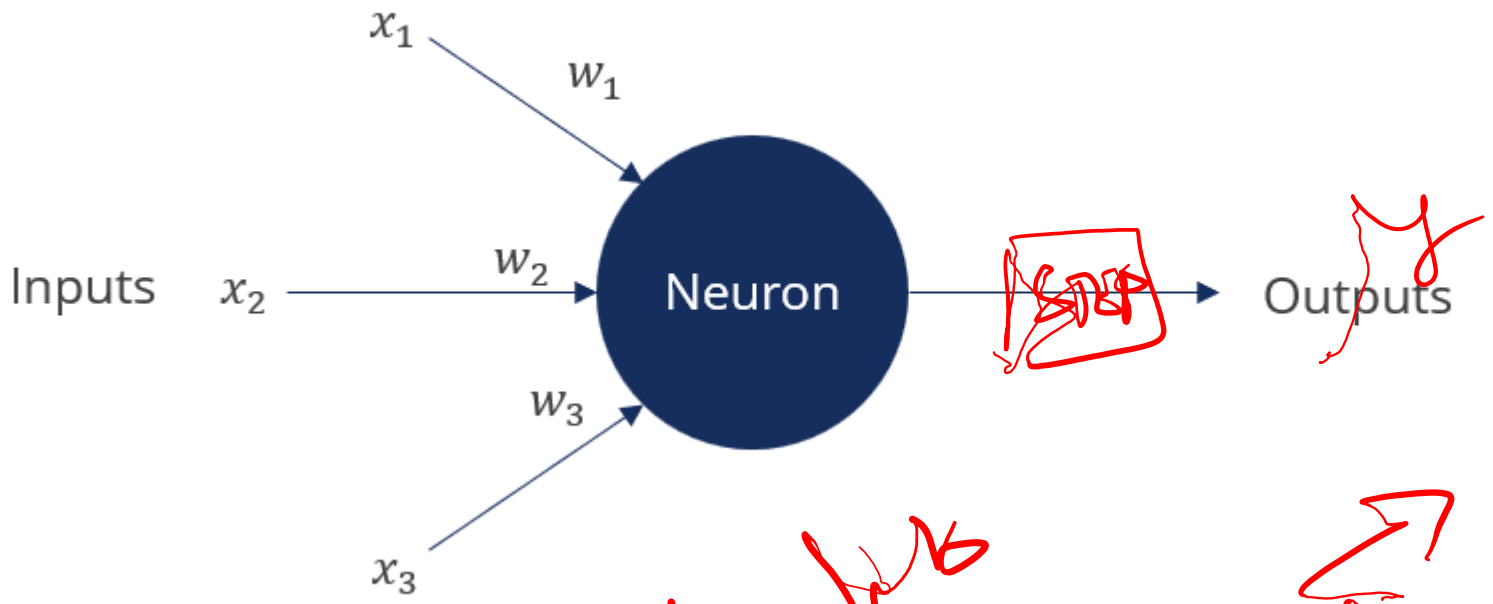
ACTIVATION FUNCTION:
THIS TRANSFORMS THE SCORE INTO AN OUTPUT

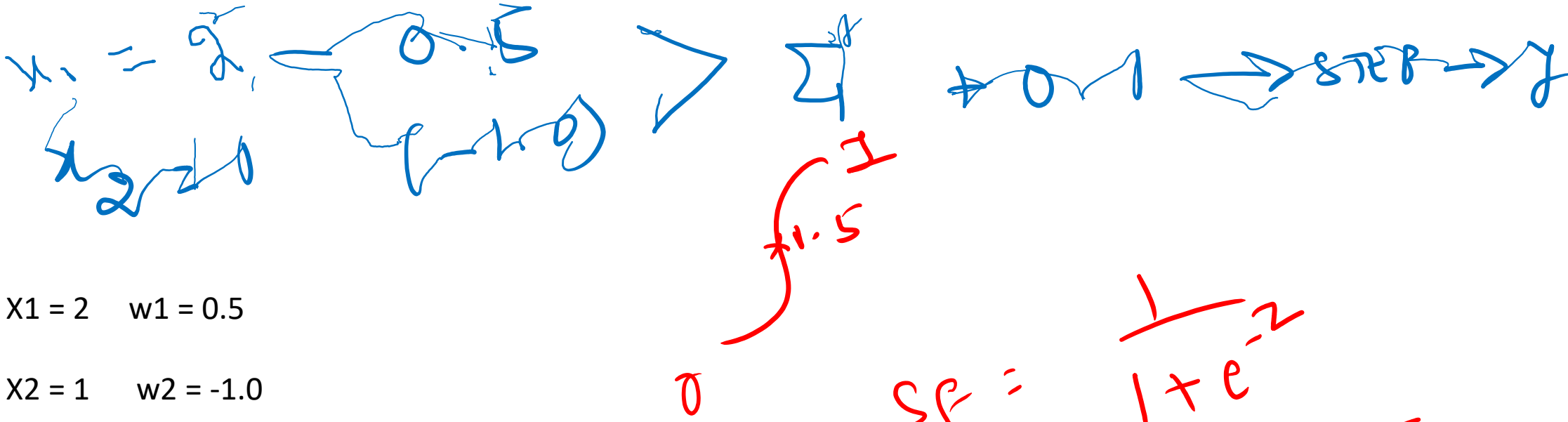
Step(z) = 1 if z >= 0
0 Otherwise

Perceptron equation

$$f(x) = \begin{cases} 1 \; if \; w.x + b > 0, \\ 0 \; Otherwise \end{cases}$$




x_1
w_1
Inputs
x_2
w_2
Neuron
Outputs
w_3
x_3



X1 = 2 w1 = 0.5

X2 = 1 w2 = -1.0

B = 0.1

Score =z = ((2 * 0.5) + (1 * -1.0)) + 0.1
Score = 0.1

Step(z) = step(0.1) = 1 (ORANGE)

	x (KMS)	y (MILES)
1	0	0
2	80	50
3 →	100	62

1.61 KM = 1 M

$y = Wx$

$M = W * KMS$

$62 = (0.62) * 100$

GUESSWORK → $W = 0.5$

$M = 0.5 * 100$

$M = 50$ →

TRY → $(W + \partial W) * KMS$

$M = (W + \partial W) * KMS.$

$E = A - PRED$

$= 62 - 50$

$E = 12$

$$\hat{y} = w \cdot x \longrightarrow \langle 1 \rangle \quad \text{PRED}$$

$$\hat{y} = (w + \partial w)\, x$$

$$= w \cdot x + \partial w \cdot x$$

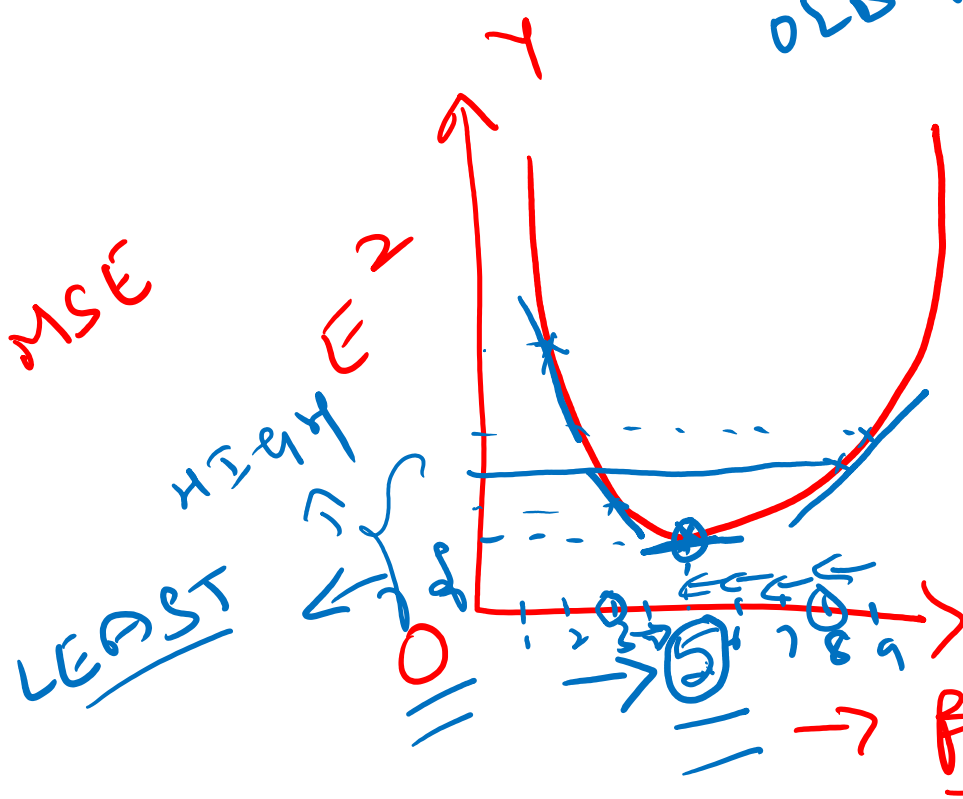
$$\partial w \cdot x = y - \hat{y} \quad \langle 2 \rangle$$

$$\partial w = \frac{y - \hat{y}}{x} = \frac{12}{100} = 0.12$$

$$w = 0.5$$

$$w + \partial w = 0.5 + 0.12$$

$$= 0.62$$



$y = \beta_0 + \beta_1 x_1 + \epsilon$

$y = b + w_1 x_1$

$y = 8x + 5$ $\quad y = x^2 + 2$

β_1

$\Delta \to 0$

$5 \to 5$

$y = \text{OPT } \beta_0 +$

$\text{OPT } \beta_1$

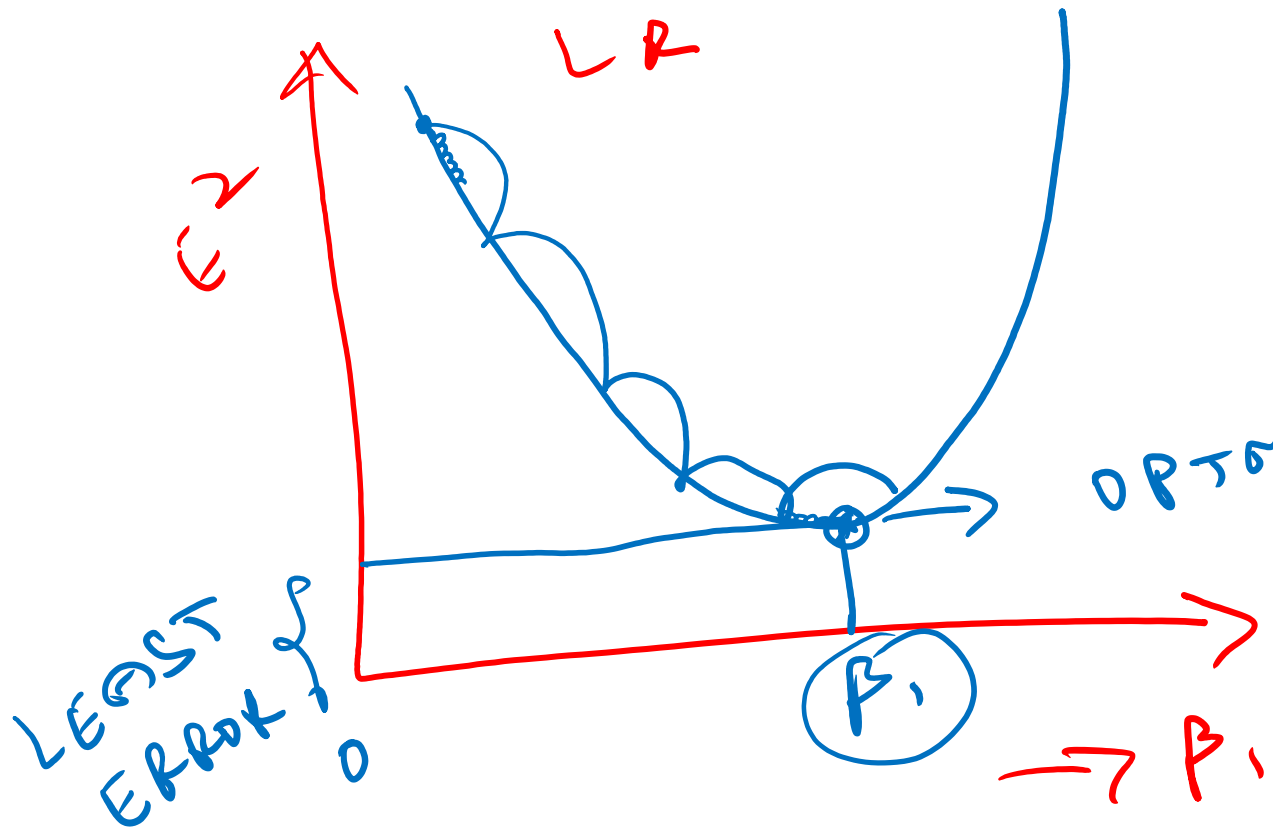
$\frac{\partial E^2}{\partial \alpha}$

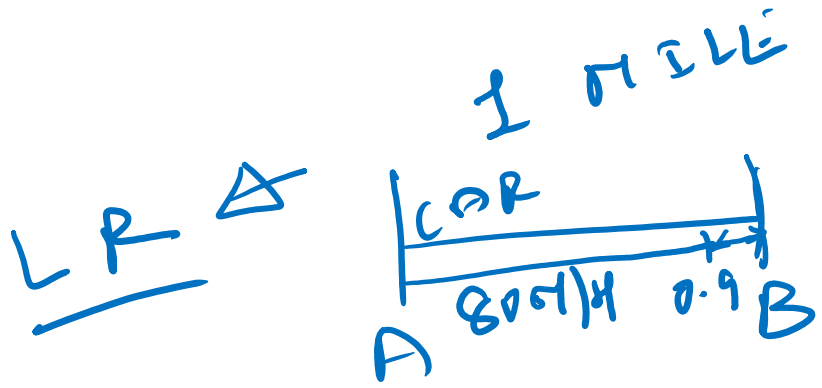
NEW β_1 = OLD β_1 − (-7)

NEW β_1 = $2 - (-7) = 2 + 7$

> 2 OR < 2

↓ LOSS


LR
ϵ^2
OPTIMAL VALUE
LEAST ERROR
0
β_1
$\rightarrow \beta_1$


1 MILE
LR
LR
CAR
BOTH
0.9
A
B

I/P → x = 1

Y = 10 → ACT

MODEL: $\hat{Y} = W \cdot x$

LOSS: $(Y - \hat{Y})^2 = 64$ ↓

W = 2 ✓

LR = 0.1

W_NEW = 2 + 0.1 ✓ = 2.1

LOSS = $(10 - 2.1)^2 = 62.\ldots$ ↓

LR = 1

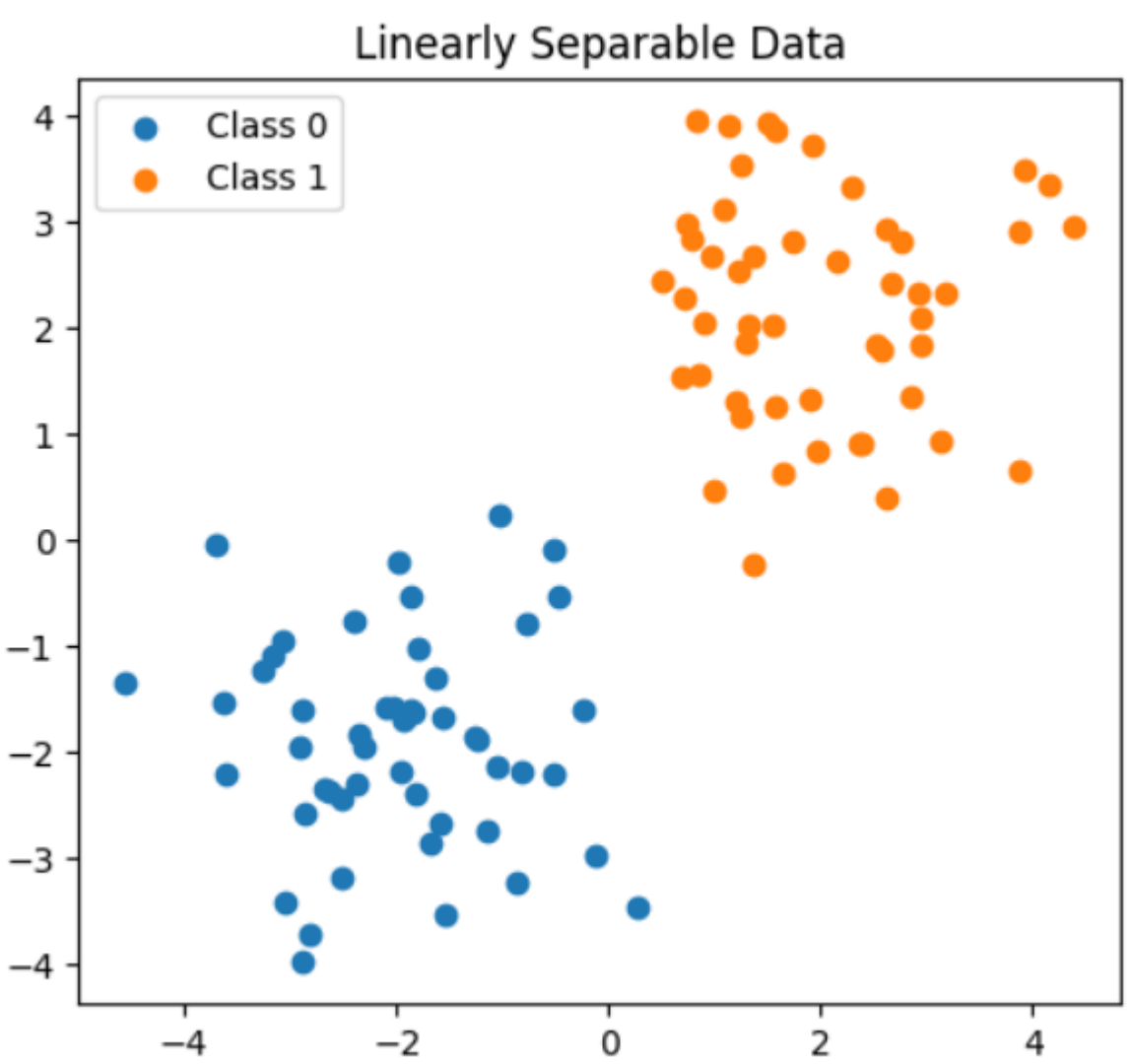
W_NEW = 2 + 1 = 3 ✓

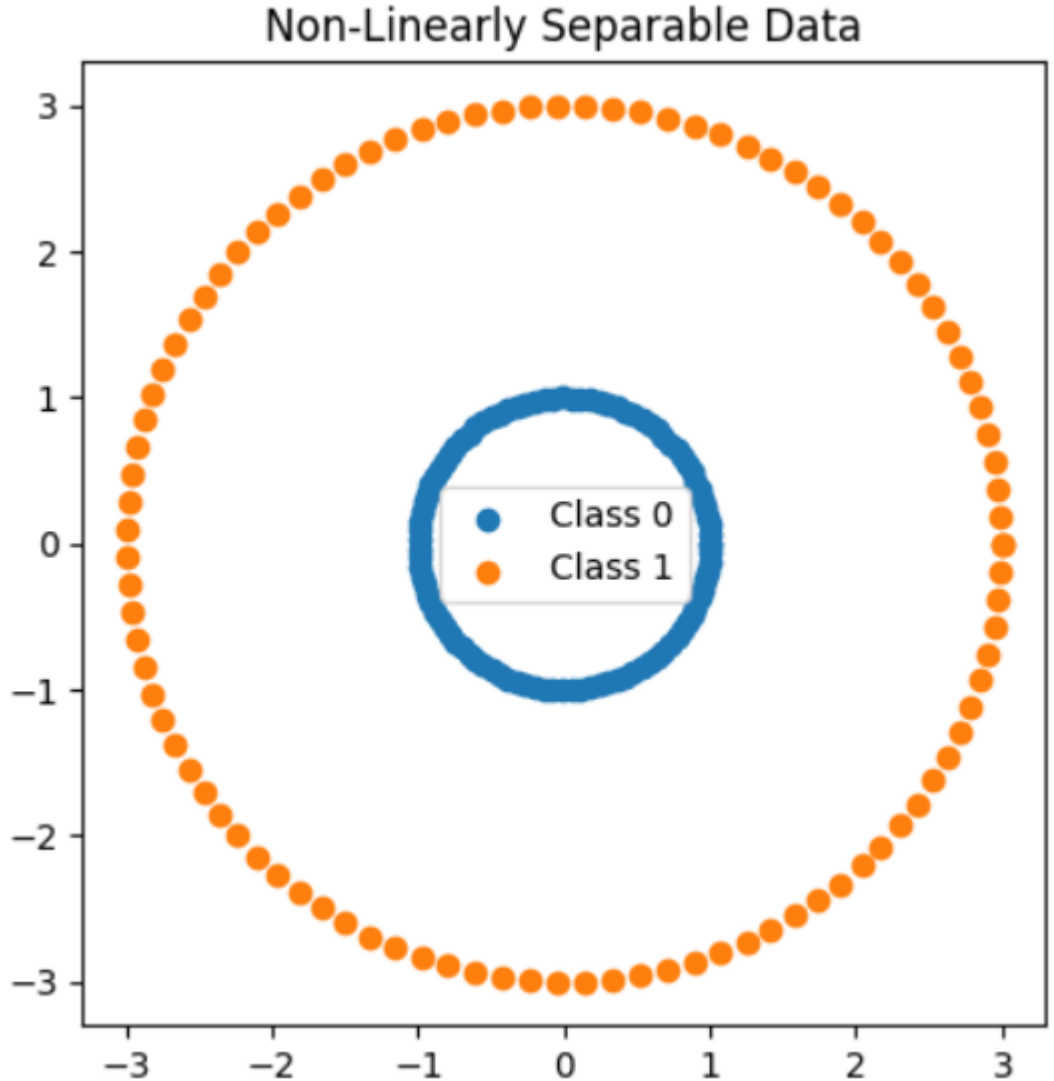
LOSS = $(10 - 3)^2 = 49$ ↓

LR = 20 ✓

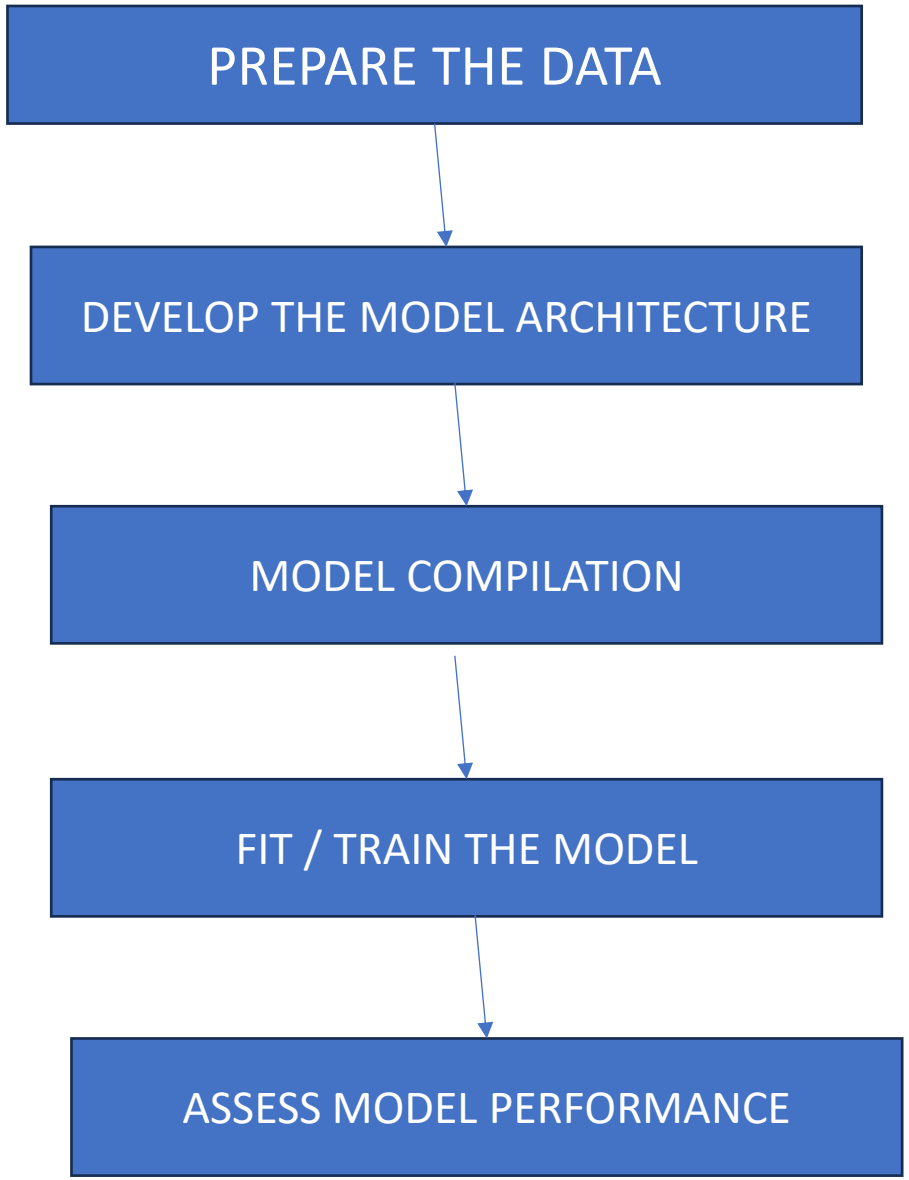
W-NEW = 2 + 20 = 22

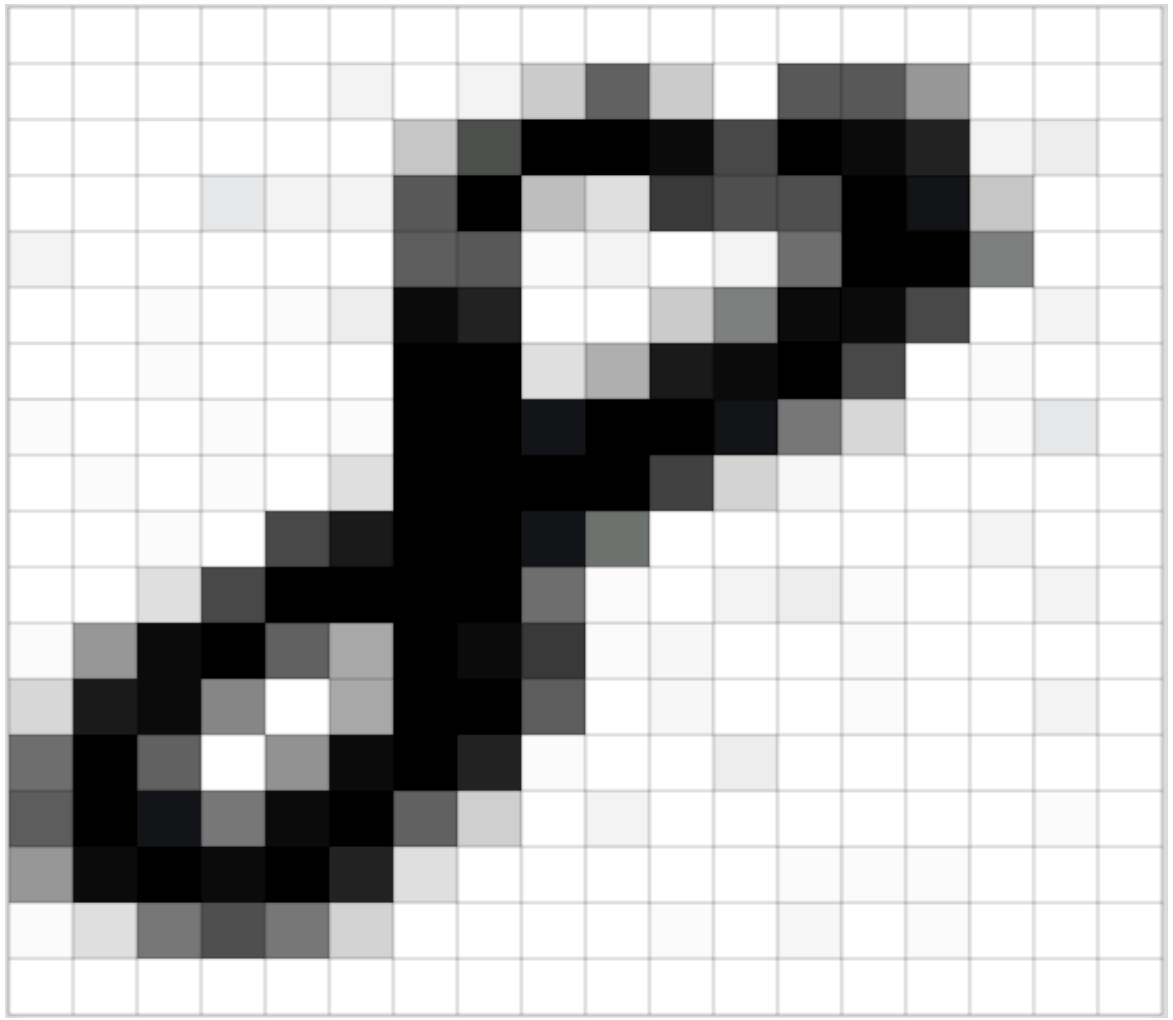
LOSS = $(10 - 22)^2$ = 144 ↑


Linearly Separable Data
Class 0
Class 1
4
3
2
1
0
−1
−2
−3
−4
−4
−2
0
2
4


Non-Linearly Separable Data
Class 0
Class 1
3
2
1
0
−1
−2
−3
−3
−2
−1
0
1
2
3

PROCESS FOR DEVELOPING A DEEP NETWORK MODEL





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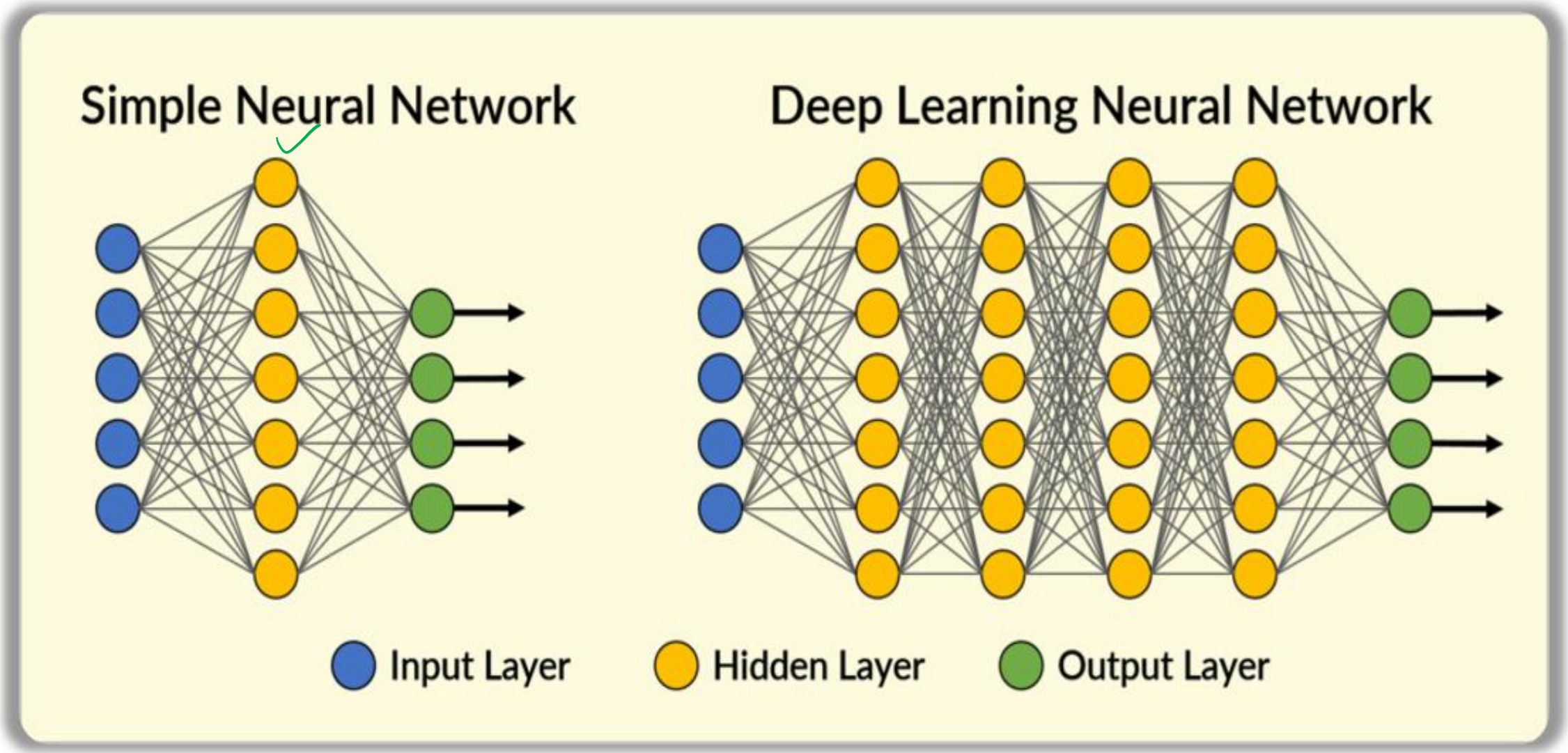
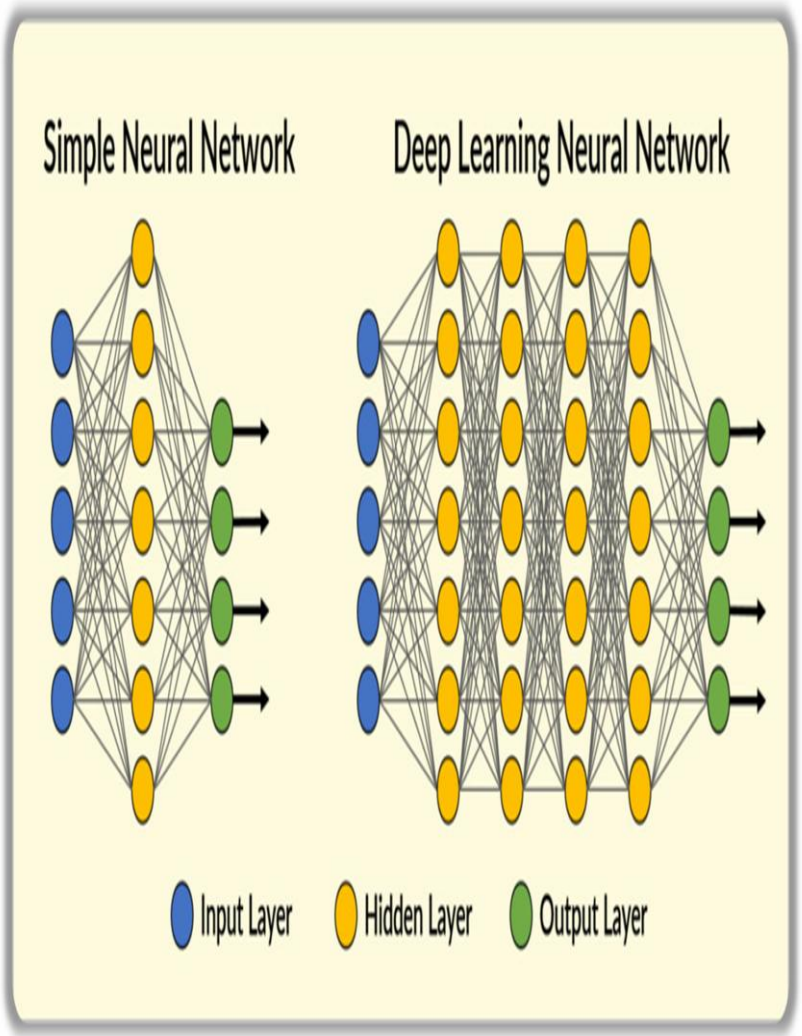

Simple Neural Network
Deep Learning Neural Network
Input Layer
Hidden Layer
Output Layer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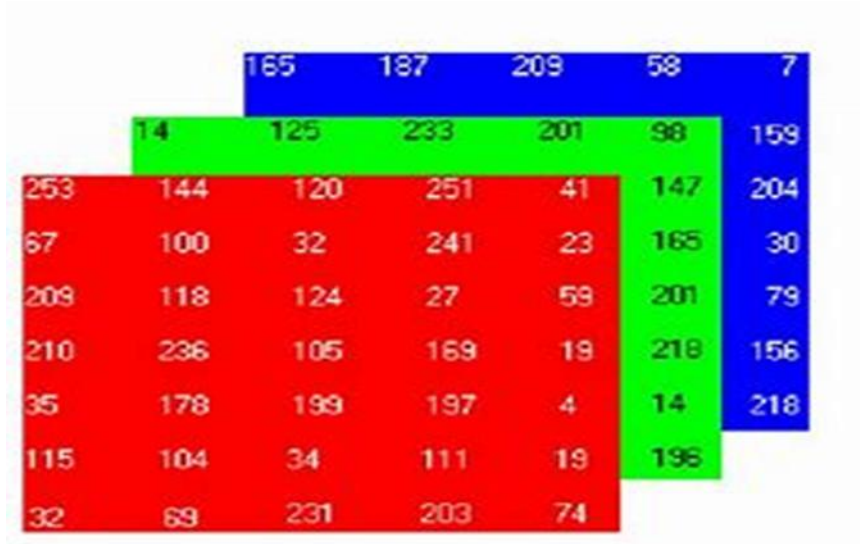
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14 125 233 201 98 159
253 144 120 251 41 147 204
67 100 32 241 23 165 30
209 118 124 27 59 201 79
210 236 105 169 19 218 156
35 178 199 197 4 14 218
115 104 34 111 19 196
32 69 231 203 74