Today's Agenda

1) What is Deep Learning?
2) AI vs ML vs DL
3) Why DL is popular?
4) Perceptron

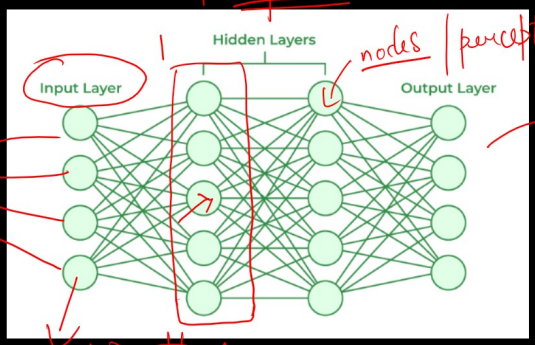
ML -> Stastistical Methods

DL -> Logical Structure (Human Brain)

Transformation

Matrix Multiplications

Blackbox



nodes | perceptron

Output

Neural Network Data

Explainable

ANN

MLP

Interpret

Multi layer Perception

Node | Perceptron

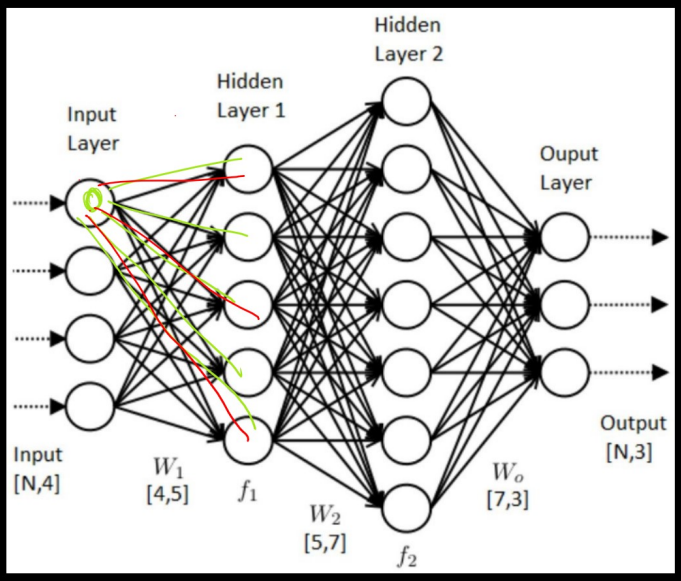
Dog Cat

Neuron

Dog

NN/ANN/MLP

Neuron / Nodes / Perceptron



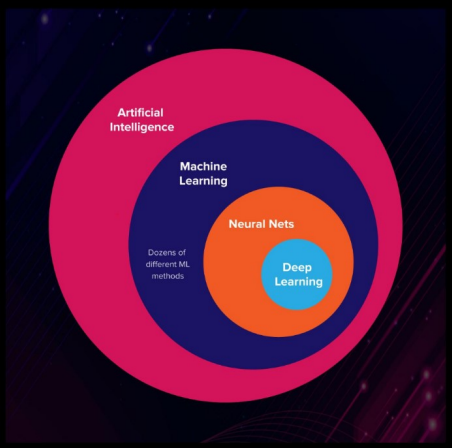
Inter Connected nodes

Libraries

Tensorflow (Keras)
Pytorch

Hidden layer | Fully Connected Layers | Dense Layers | Linear Layers

{ I / H_x / O }



ML { Feature Engineering / Feature Extraction

DL { X / X Automated

Black Box

Explainibility

CNN

10% - 90%

Types of Neural Net

1) ANN / MLP → Structured

2) CNN → Images/Video

3) RNN → Text / Speech

4) LSTM

5) GRU

6) Transformers

4) GAN

↓

Generation (Image / Text)

Why DL popular ? 1% .001

1) Applications → Security, Medical, Fashion, Defence, Banking, Insurance, Agriculture, Content Creation, Automotive, Entertainment, Ecom

Money / Time / Effort → Experiment

2) Performance

↓

Surpassed Human Accuracy

Lesser Human Errors

DRDO → Facial Recognition

Finance → Wall Street

2016 - 14

AlphaGO → 4 - 1

DL

↓ CV → Open

↓ NLP → Open

Unstructured Data

docs, images, text

X GB ... 2015 — 2X GB — 2016

1990

Do I need DL for structure data?

DL → data hungry vs ML

100 - 1000 | 10000

750 MB

1) Data Dependency

2) Hardware → GPU → Amd / Nvidia

CPU

↳ cuda

↳ Parallel Processing

- Video Editing
- Games
- LLMs
- Crypto Mining

Rendering

Xilinx

FPGA → highly customized → Microsoft Bing

C

2018

ASICs

2015

Caltech

Virgi

1050ti

Anira

DL ML

Training / Prediction

minutes / hrs

Hours | Days | Weeks | Months

2024

1 week

2014

OpenAI

chatgpt

10-12

3-4 days

Accuracy Vs Speed

{ Pickel, Feather }

Model Size

40 MB

100 MB

200 MB

1 TB

100 MB

500 MB

750 MB

Loading Time

3 minutes

API

Response Time

3-5 Sec

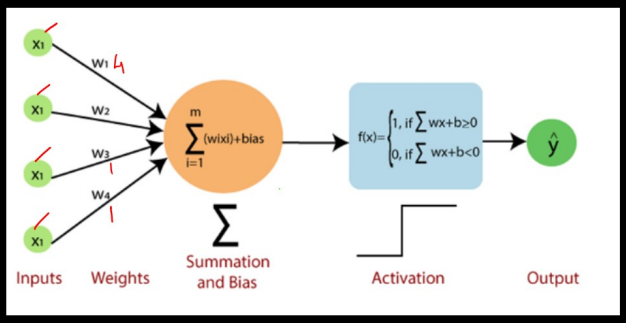
DL vs ML

1) Data
2) Training
3) Feature Selection
4) Hardware
5) Explain / Interpret

X → O → Y

(0, 1)
(-1, 1)

Perceptron → Basic Building Block of NN



(0, 1)
(0, 10)

Weights & Bias (1)

$w_1 = 4$
$w_2 = 2$
$w_3 = 1$
$w_4 = 1$

Y Output

X_1 CGPA	X_2 12th Marks	X_3 10th Marks	X_4 Internship	Placed or Not
8	70	80	1	1

Input

DL → Model

Network Arc + (Weights + Bias)

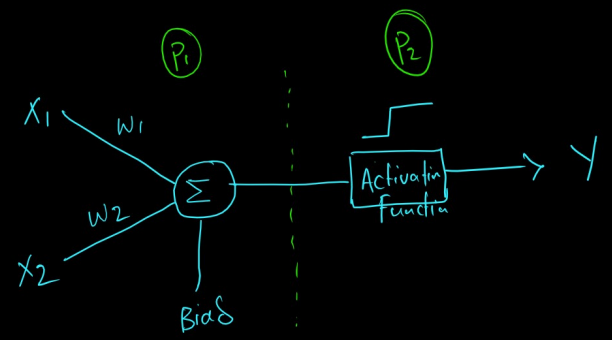
model.h5

What is model?

Model consists of numbers

(Weights) + (Bias)

X



A·F

Compress with a range

(0, 1)

(-1, 1)

Step function

Linear Regression

$\{Y = mx + c\}$

P_1 $\quad Z = x_1 \cdot w_1 + x_2 \cdot w_2 + b$

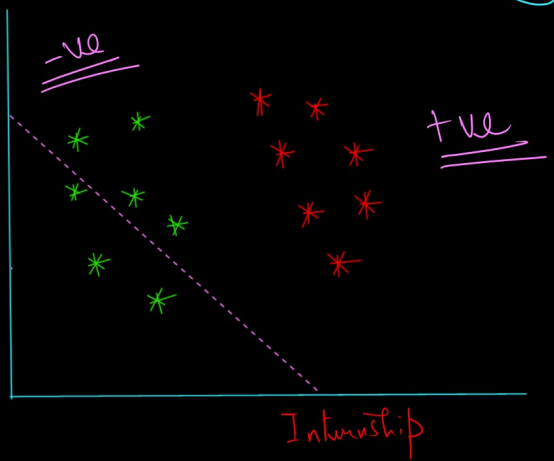
P_2 $\quad f(z) = y$

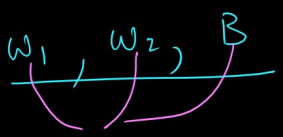
Logistic Regression

$\{A_1 x_1 + B_1 x_2 + c = 0\}$

Random

$x_1 w_1 + x_2 w_2 + B = 0$





convergence

CGPA

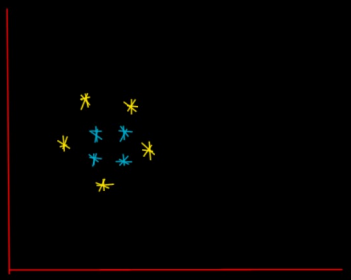
0 -> mis classifications

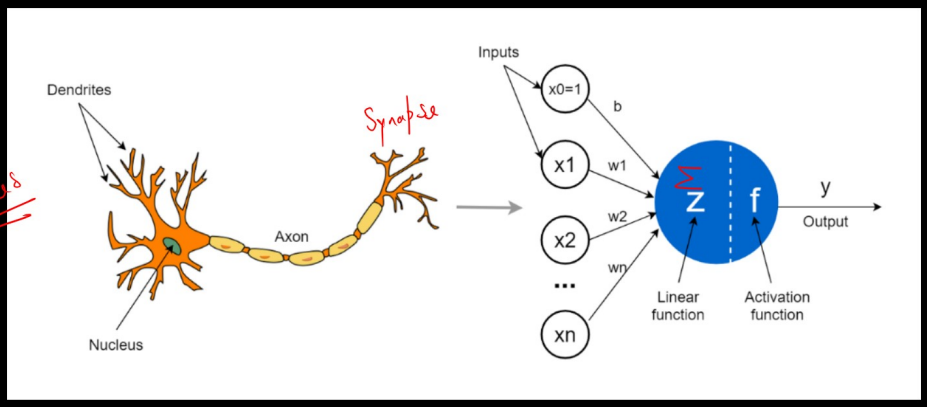
Best fit line

linear data

Sort of linear data

X Non linear data





Impulses

1960s

80

2012

70%

90%

* Electrochemical
* Neuroplasticity
* Complex

Neuron → Neuron

Perceptron → Perceptron