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IV Transfer Learning

V Restricted Boltzmann Machine & Autoencoders

DEEP LEARNING

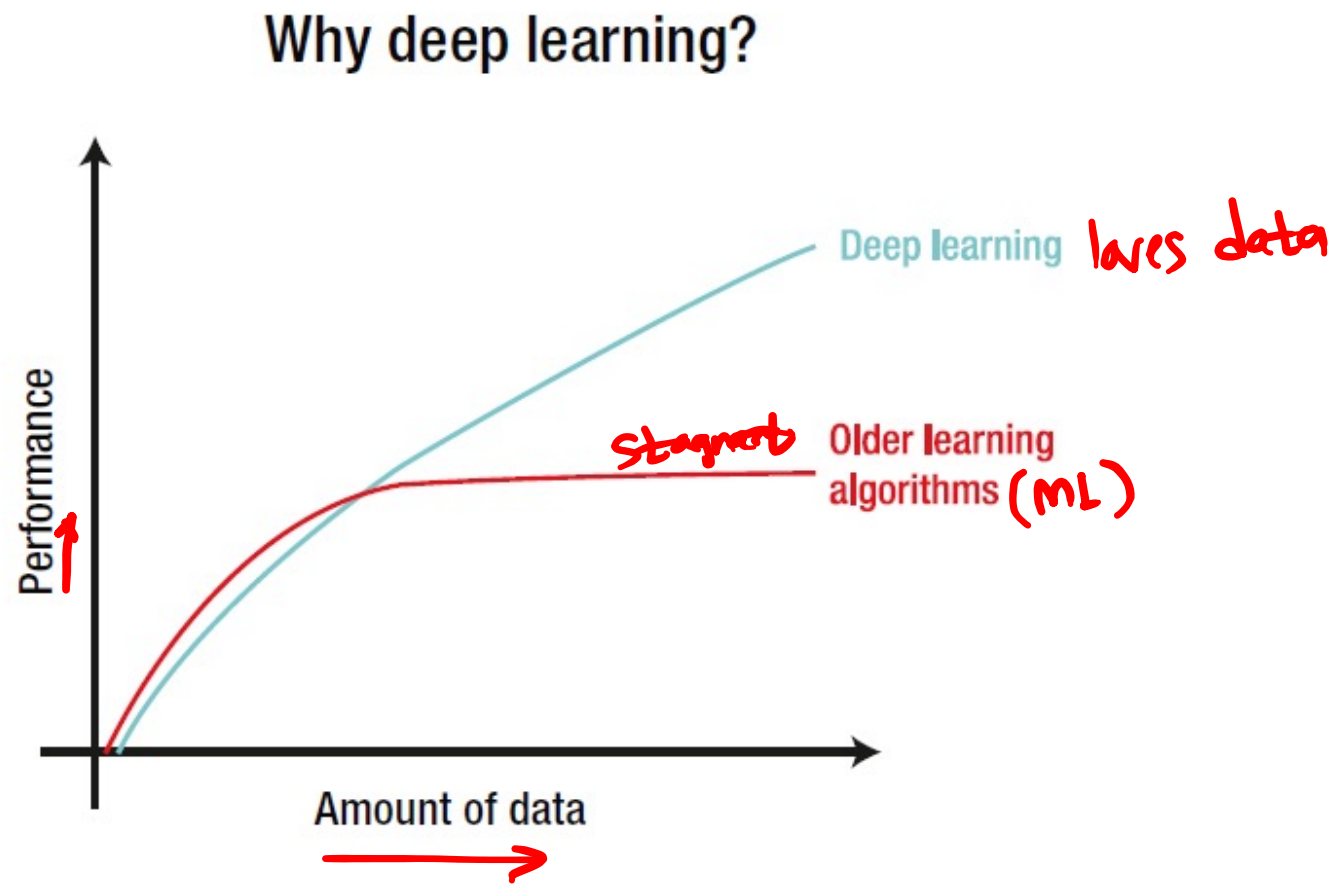
Trainer : Dr. Darshan Ingle

Introduction

- Deep learning is an extended field of machine learning that has proven to be highly useful in the domains of text, image, and speech, primarily.
- The collection of algorithms implemented under deep learning have similarities with the relationship between stimuli and neurons in the human brain.
- Deep learning has extensive applications in computer vision, language translation, speech recognition, image generation, and so forth. These sets of algorithms are simple enough to learn in both a supervised and unsupervised fashion.

Scaling data science techniques to amount of data

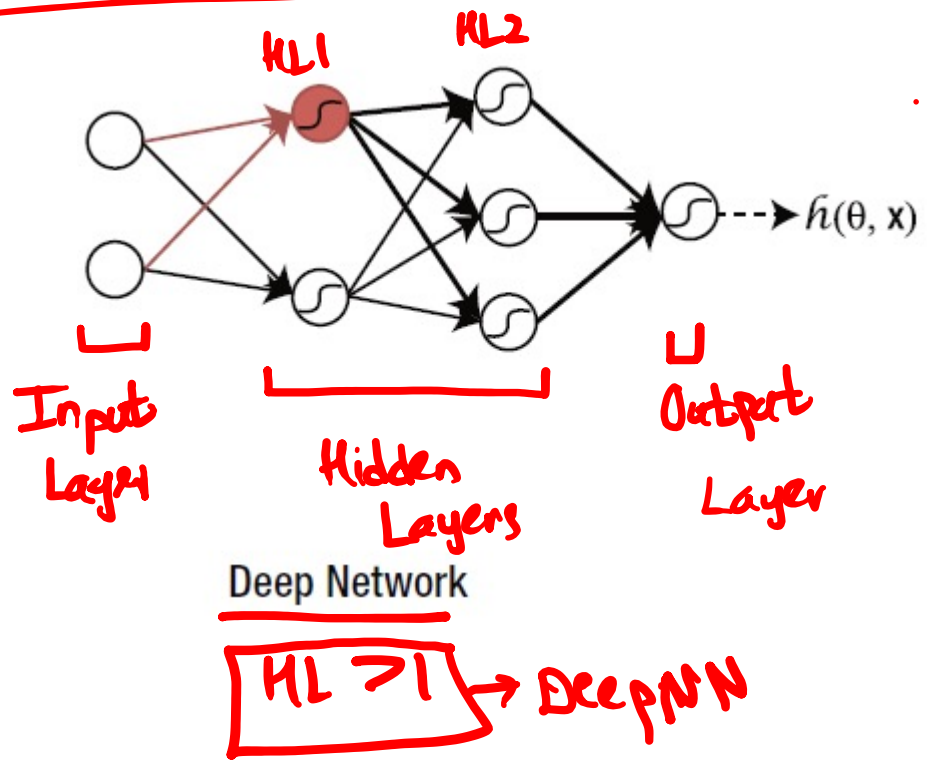
Introduction

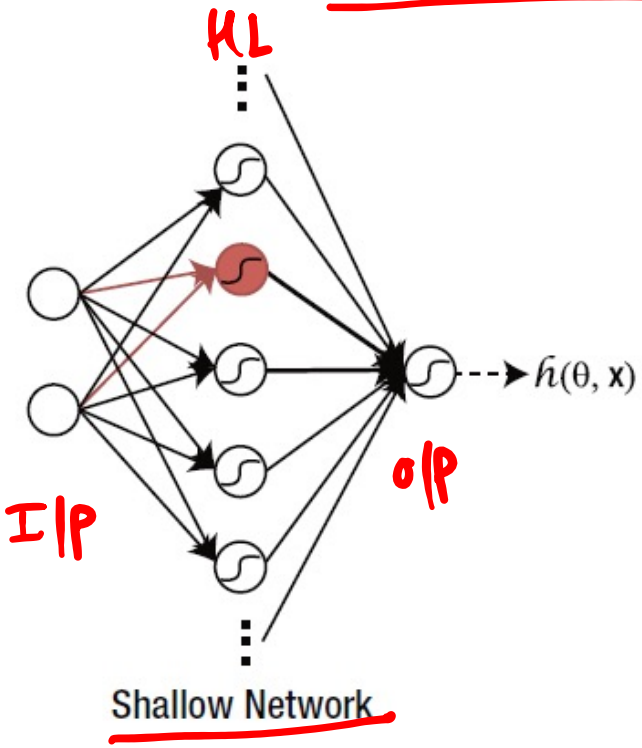


Scaling data science techniques to amount of data

Introduction

- The term *deep* in deep learning refers to the depth of the artificial neural network architecture, and *learning* stands for learning through the artificial neural network itself.

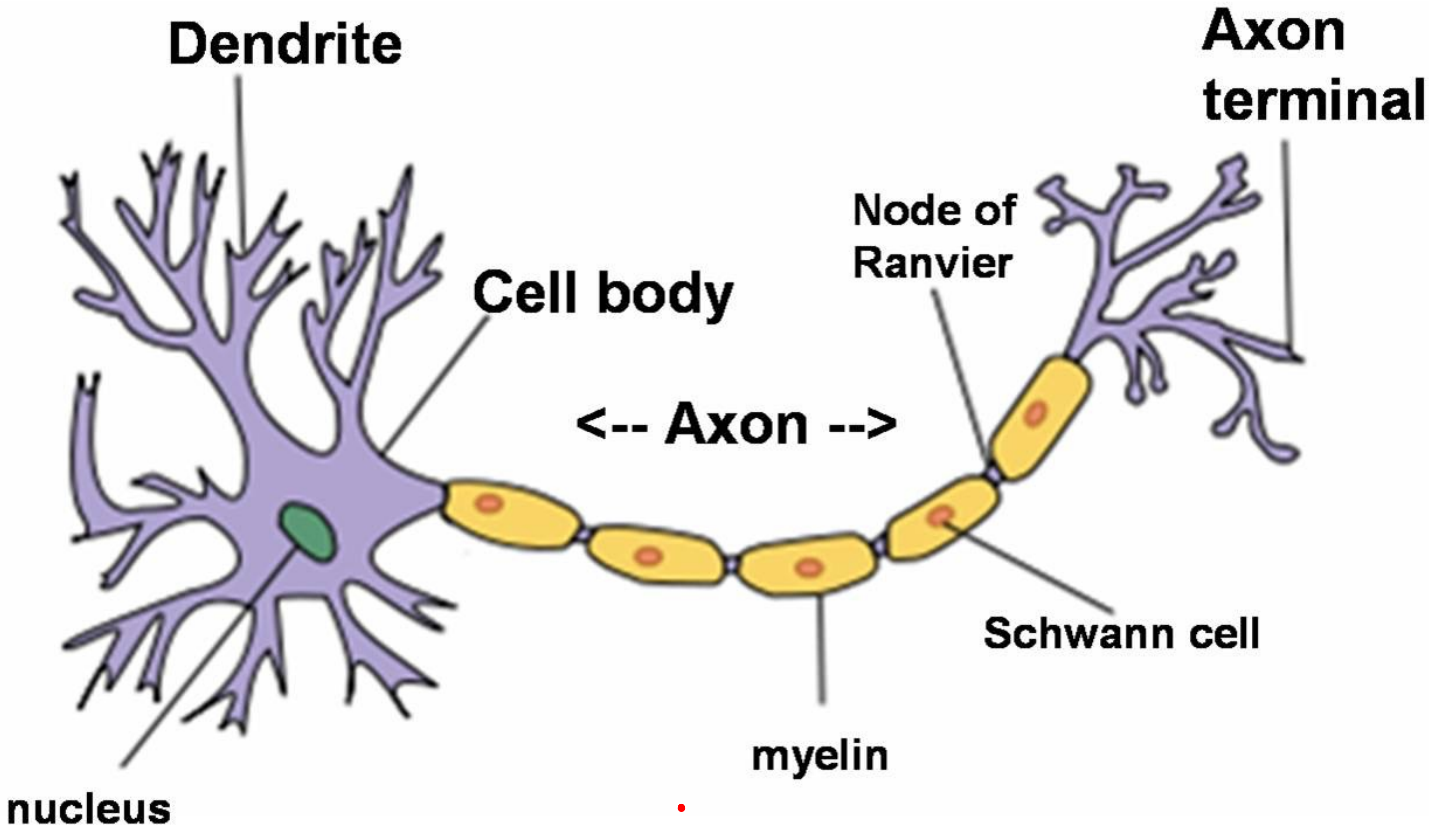




Introduction

- Deep neural networks are capable of what? discovering latent structures (or feature learning) from unlabeled & unstructured data such as images (pixel data), documents (text data), or files (audio, video data)
- How Deep Is "Deep"? HL>1
- A deep neural network is simply a feed forward neural network with multiple hidden layers.

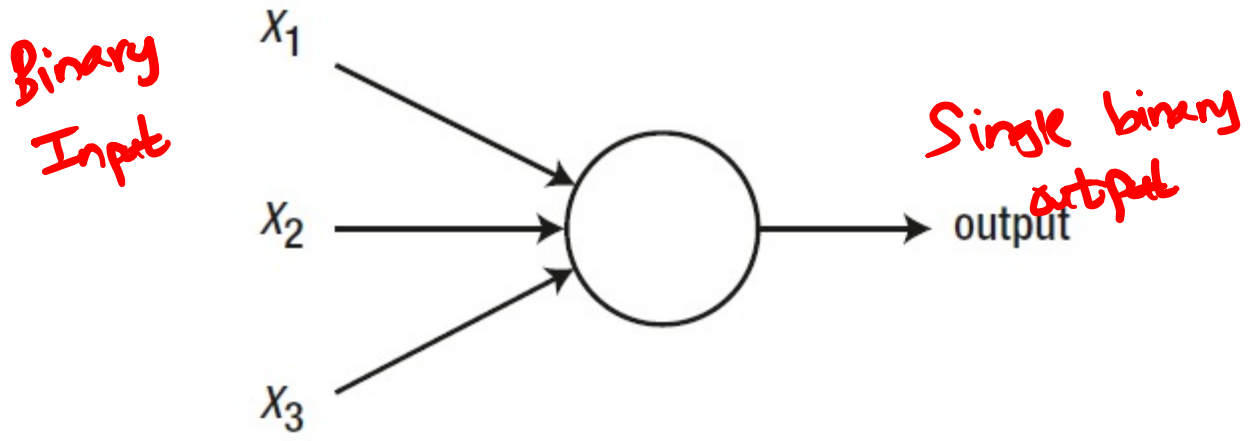
Basic Structure of NN - History



- Simple
- Human brain has 100 billion neurons with 100 trillion connections
- NN is a web of artificial neurons.

Basic Structure of NN - History

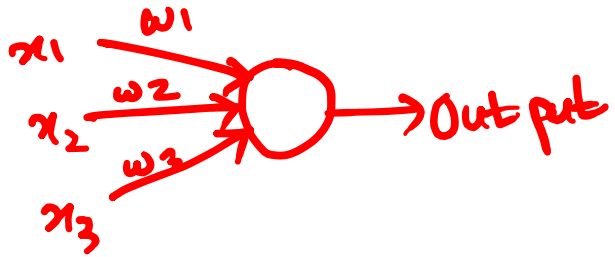
- Artificial neuron or perceptron, first developed in the 1950s by Frank Rosenblatt.



Sample neuron

Basic Structure of NN - History

A perceptron takes several binary i/ps $x_1, x_2, \ldots$ & produces a single binary output.



$$\text{Output} = \begin{cases} 0 & \text{if } \sum_j w_j \cdot x_j \leq \text{threshold} \\ 1 & \text{if } \sum_j w_j \cdot x_j > \text{threshold} \end{cases}$$

Weights and threshold are real nos.

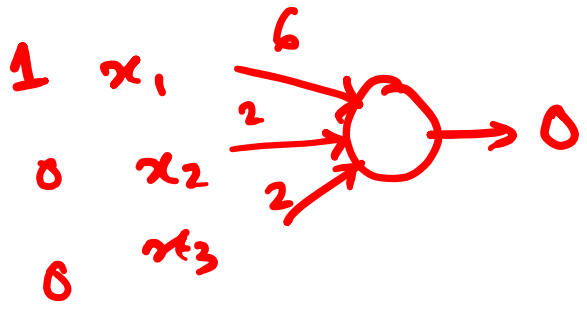
eg: Punjabi food festival in ur city
Your decision to go/not will be made by you by weighing up 3 factors!

w1 (1) Weather Good/Not?

w2 (2) Does ur BF/GF/Husband/wife wants to accompany you?

w3 (3) Is the festival is near some railway stn/Metro?

Basic Structure of NN - History



threshold = 5 3

$$\sum_j w_j \cdot x_j = w_1x_1 + w_2x_2 + w_3x_3$$

$$= 6 \cdot 1 + 2 \cdot 0 + 2 \cdot 0$$

$$= 6 + 0 + 0$$

$$= 6$$

$6 \leq$ threshold $\therefore$ o/p is 1. I will go for the festival.

$$\sum_j w_j \cdot x_j = 6 \cdot 1 + 2 \cdot 0 + 2 \cdot 0$$

$$= 6$$

$6 \leq$ threshold $\therefore$ o/p is 0. The neuron won't fire.

Basic Structure of NN - History

$\sum_j w_j \cdot x_j > \text{threshold}$ or $\sum_j w_j x_j \leq \text{threshold}$] Cumbersome

↓ Dot product

$w \cdot x > \text{threshold}$ or $w \cdot x \leq \text{threshold}$

↓

$w \cdot x - \text{threshold} > 0$ or $w \cdot x - \text{threshold} \leq 0$

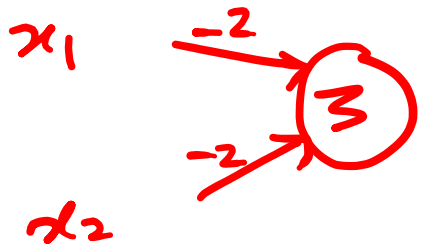
↓ Perceptron's bias, $b \equiv -\text{threshold}$

$w \cdot x + b > 0$ or $wx + b \leq 0$

$\therefore \text{Output} = \begin{cases} 0 & \text{if } w \cdot x + b \leq 0 \\ 1 & \text{if } wx + b > 0 \end{cases}$

, where w & x are vectors whose components are weights & i/ps resp.

Basic Structure of NN - History



$$O/P = \begin{cases} 0 & \text{if } w \cdot x + b < 0 \\ 1 & \text{if } w \cdot x + b \geq 0 \end{cases}$$

x_1	x_2	$w \cdot x + b$	O/P	
0	0	$0 \cdot -2 + 0 \cdot -2 + 3 = 3$	1	fire
0	1	$0 \cdot -2 + 1 \cdot -2 + 3 = +1$	1	fire
1	0	$1 \cdot -2 + 0 \cdot -2 + 3 = +1$	1	fire
1	1	$1 \cdot -2 + 1 \cdot -2 + 3 = -1$	0	not fire