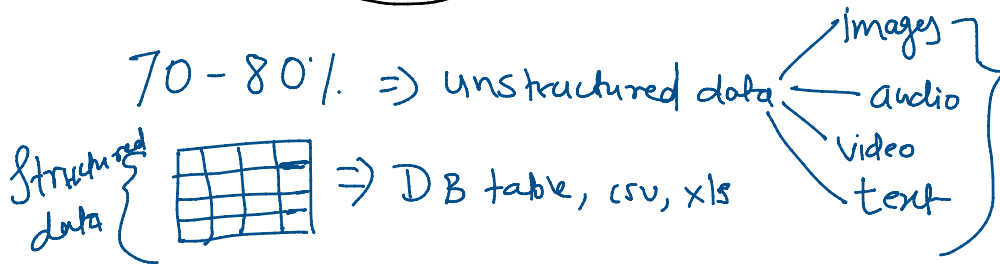
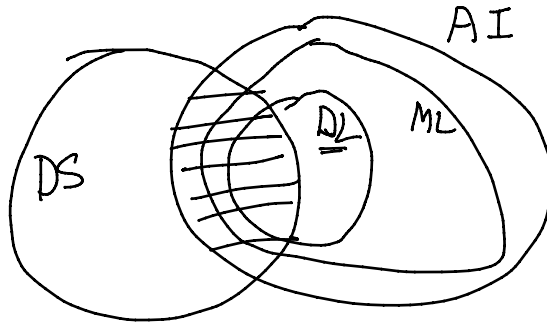
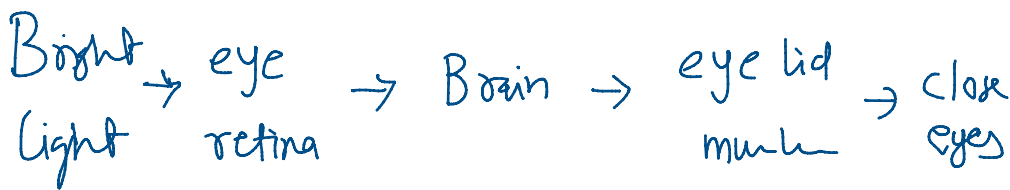


# Agenda

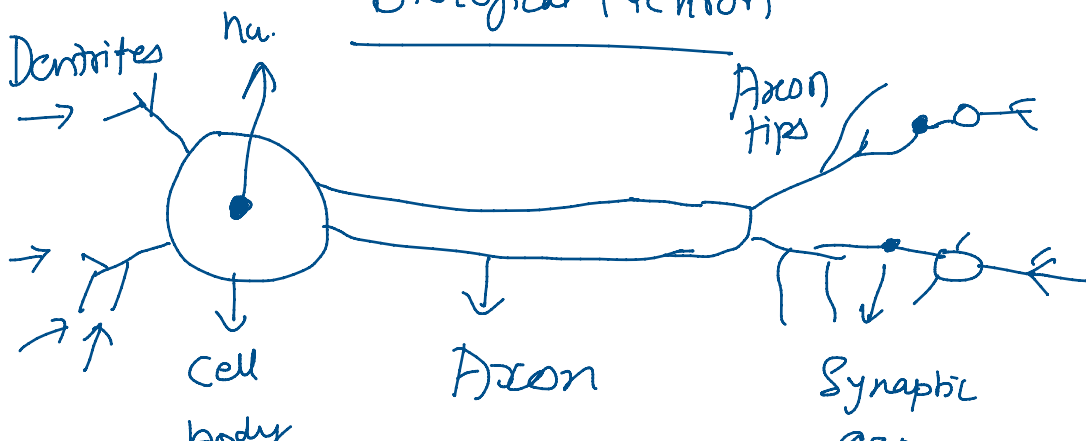
## Intro DL



## Human nervous system



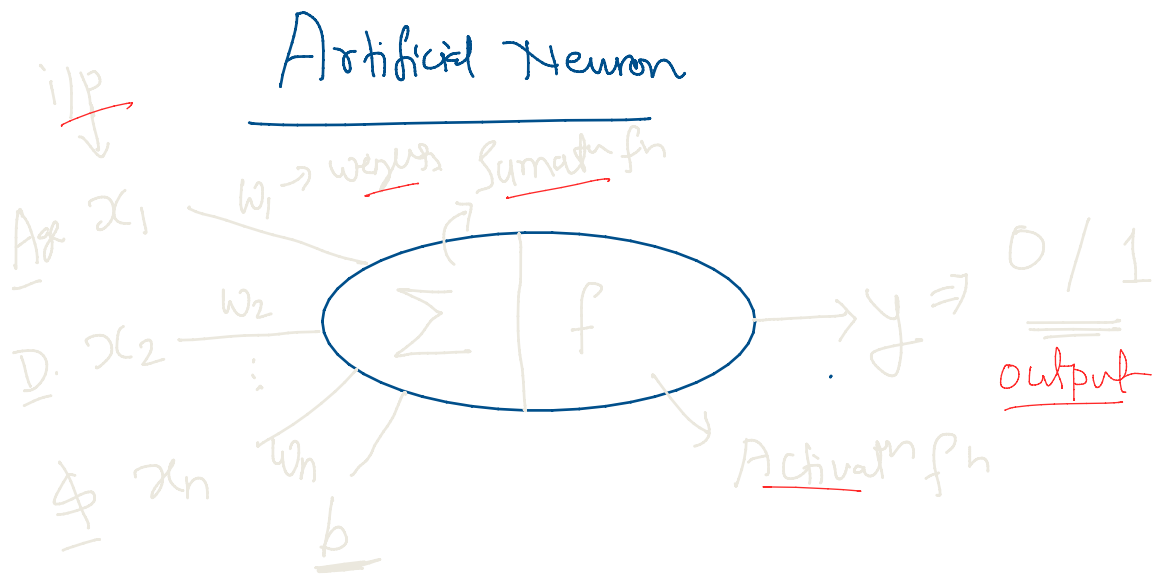
## Biological Neuron



cell body      Axon      Synaptic gap

# neurons  $\rightarrow 10^6 - 10^8$

# synapse  $\rightarrow 10^{11}$



Summation fn  $Z = x_1 \cdot w_1 + x_2 \cdot w_2 + \dots + x_n w_n + b$

$$Z = \sum_{i=1}^n x_i \cdot w_i + b$$

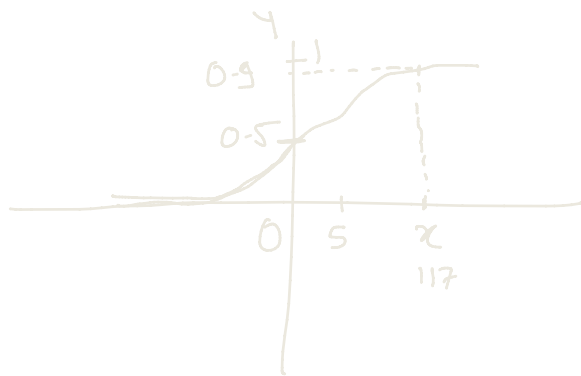
Activation fn  $f(Z) = y$



$$80 \xrightarrow{0.4} 1 \quad 1$$

ht	wt	Outcome ( <u>0/1</u> )
170cm	80kg	1 ✓
<u>160cm</u>	<u>60kg</u>	0 <span style="color: red;">1</span>

$$Z = \underline{170 \times 0.5 + 80 \times 0.4 = 117}$$



$$\frac{\text{logistic } p_n}{1 + e^{-z}}$$

$$f(z) = f(117) = 1$$

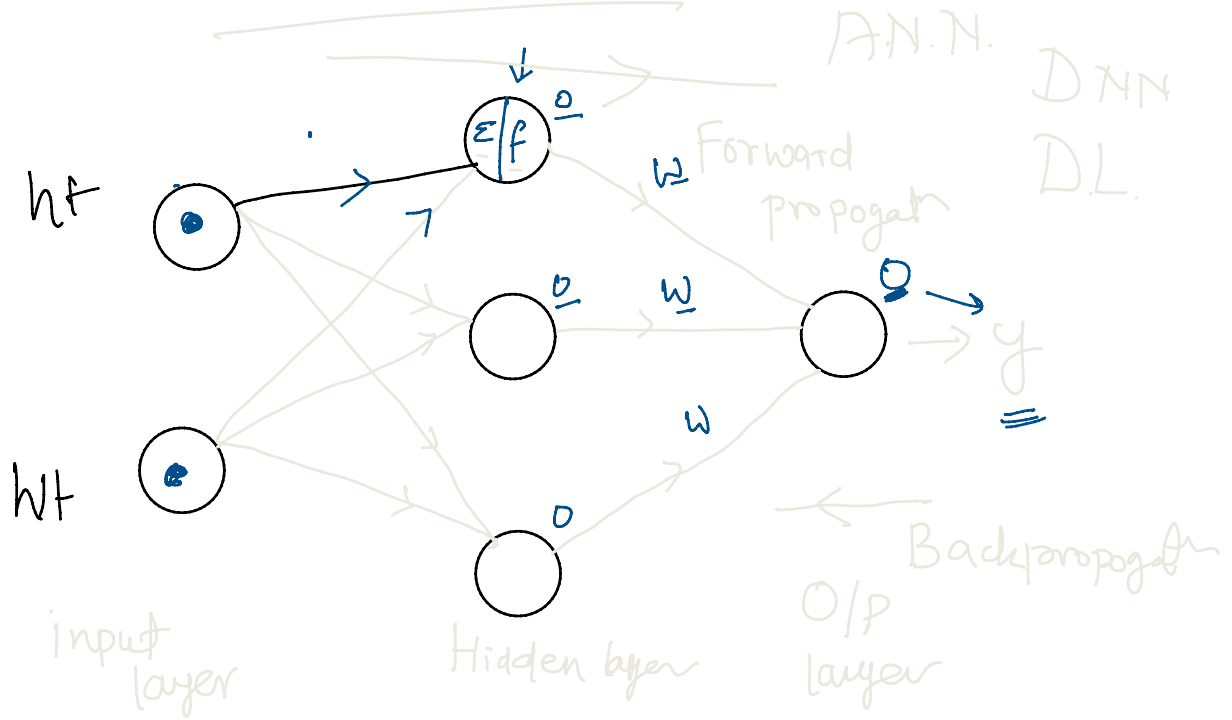
$$\begin{matrix} 160 & \xrightarrow{0.8} \\ 60 & \xrightarrow{0.6} \end{matrix} \quad \left( \sum p \right) \quad 1/0$$

$$\underline{160 \times 0.5 + 60 \times 0.4 = Z}$$

$$\frac{1}{1 + e^{-z}}$$

$$f(z) = 1 \Leftarrow$$

Age, gender, Ch., b.s.



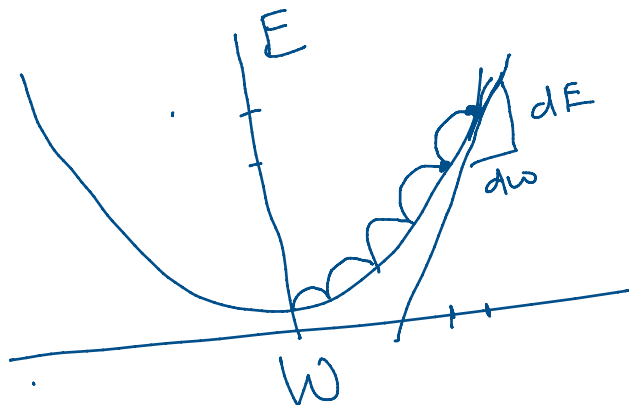
## Gradient Descent



time ↓  
distance ↓

Learning rate

$$W_{\text{new}} = W_{\text{old}} - \eta \frac{\partial E}{\partial W_{\text{old}}}$$



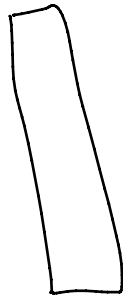
# Categorical f<sup>t</sup>

nominal  
city name

ordinal

shirt size XL > L > M, S

11



i/p

10



h/l



0/L

1  
0 →

AF - S.

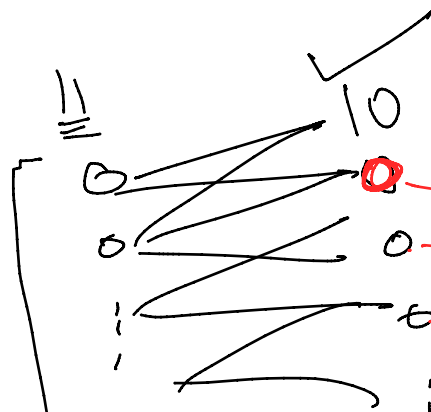
$(\mathbb{Z} | \mathbb{P})$

$f(\underline{\mathbb{Z}})$

~~4~~

$mx + c$

$mz + c \Rightarrow$



✓

1

0

10 + 1

11w

x70

110

+ 10

A handwritten diagram illustrating a mapping. On the left, a box contains the number 0. A curved arrow points from a vertical dashed line to this box. The vertical dashed line has a 0 at its base. A red arc connects the 0 on the vertical line to the text  $10 + 1$ . To the right of this, there is a calculation:  $+ 10$  followed by a horizontal line and the result  $120$ .

$$10 + 1 + 10 = 120$$