HISTORY :-

Nervous System :-

1888 - 1891 (Discovery of Neurons)
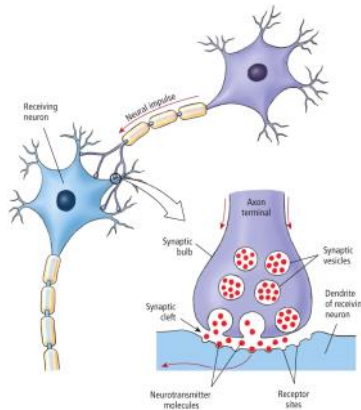
Neurons :-

⇒ Heinrich Wilhelm Gottfried ... (Neurons)

⇒ Discrete cells forming a network.

1950 (Synapse)

Using electron microscopy.
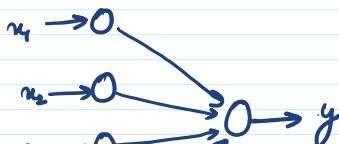

AI
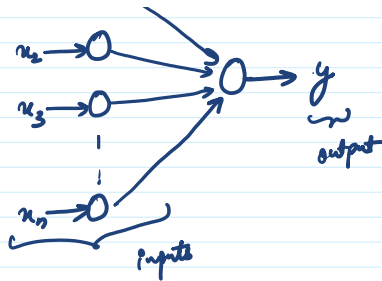Spring

Neurons are interconnected
through "synapses"

1943

McCulloch Pitts Neuron

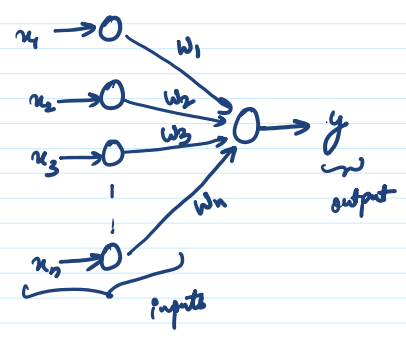(Simplest neuron)

Input — x_1, x_2, x_3 - ...

Output — y

$x_2 \rightarrow$ O
$x_3 \rightarrow$ O
$\vdots$
$x_n \rightarrow$ O

$\rightarrow$ O $\rightarrow y$

output

inputs

1958

Perceptrons

neurons with weights.

$(w_1, w_2, w_3, \cdots)$

$\Rightarrow$ may be able to learn, make decisions.

$x_1 \rightarrow$ O $\quad w_1$
$x_2 \rightarrow$ O $\quad w_2$
$x_3 \rightarrow$ O $\quad w_3$
$\vdots$
$x_n \rightarrow$ O $\quad w_n$

$\rightarrow$ O $\rightarrow y$

output

inputs

1968

Multilayer Perceptrons

(MLP)

Input layer $\rightarrow$ hidden layers $\rightarrow$ Output layer

AI
winter

$x_1 \rightarrow$ O $\quad w_{11}$ $\quad$ O $\quad w_{21}$
$\quad\quad w_{12}$ $\quad\quad w_{22}$
$x_2 \rightarrow$ O
$x_3 \rightarrow$ O
$\vdots$
$x_n \rightarrow$ O

$\rightarrow$ O $\rightarrow y$

output
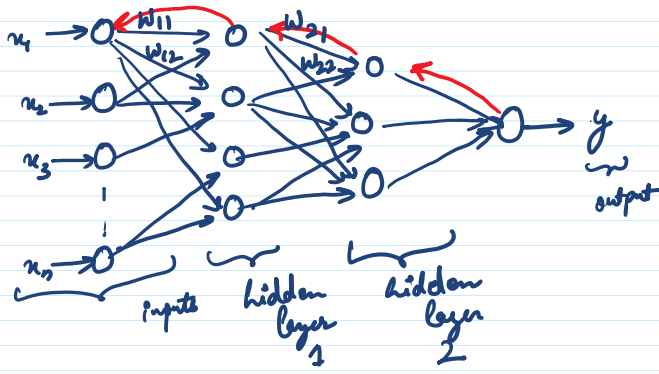
inputs $\quad$ hidden layer 1 $\quad$ hidden layer 2
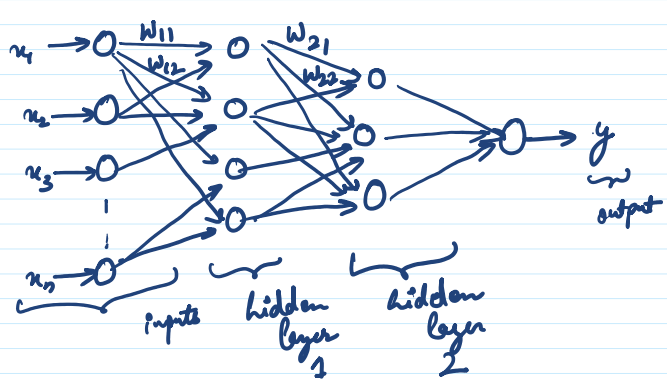
1986

Backpropagation :—

Rumelhart et. al.

Gradient Descent :—

motivated by the need to compute the orbit of heavenly bodies.

1989

Universal Approximation Theorem :—

MLP can be used to approximate any continous function to any desired precision.

$$x \longrightarrow \boxed{f} \longrightarrow y$$

2010

Ciresan et. al.

New record benchmark on MNIST dataset.

(1994)

Class 0 → 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 → 0
Class 1 → 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 → 1
2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 → 2
3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 → 3
4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
5 5 5 5 5 5 5 5 5 5 5 5 5 5 5
6 6 6 6 6 6 6 6 6 6 6 6 6 6 6
7 7 7 7 7 7 7 7 7 7 7 7 7 7 7

Classes.

Class 9. → [digit images] → 9.

Input data.

2012 - 2016

Record benchmark on ImageNet Dataset

1000 classes.

(Car, human, birds, animals etc.)

Top-5 error								
2010 NEC-UIUC	2011 XRCE	2012 AlexNet	2013 ZFNet	2014 GoogLeNet VGGNet	Human	2015 ResNet	2016 GoogLeNet -v4	2017
28%	26%	16.4%	11.7%	6.7%	5%	3.6%	3.1%	2.3%