

ANN

Intro.

- ↳ ANN is an info. processing paradigm inspired by biological nervous sys.
- ↳ ANN have the ability to learn from exp.

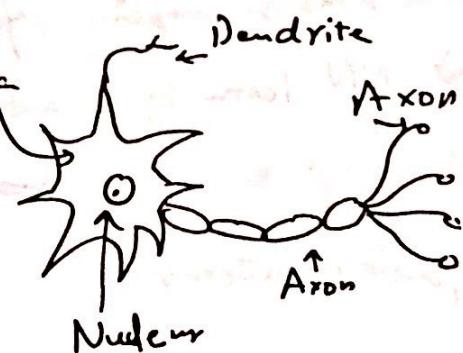
Biological Neuron

↳ Basic element of human brain

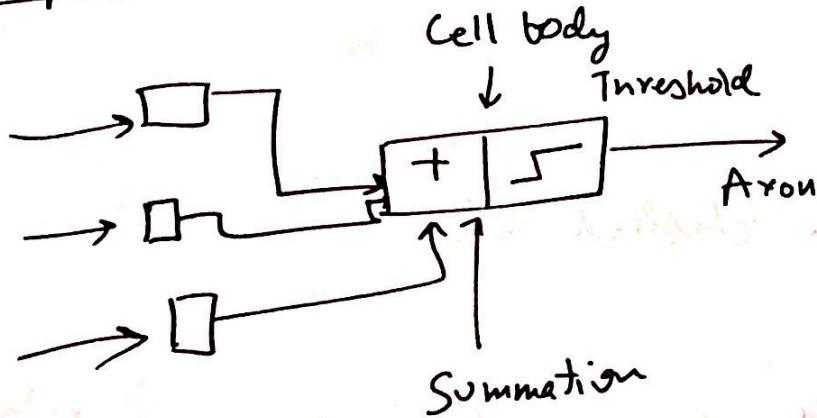
↳ Many inputs & one output.

↳ Four main components

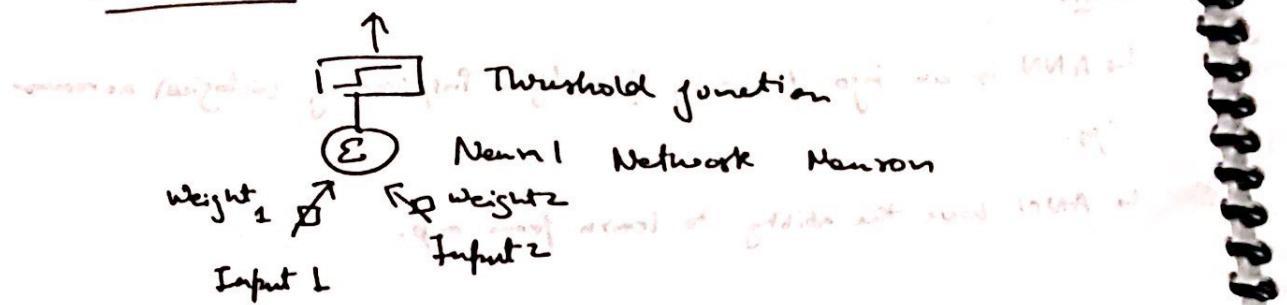
- Soma
- Axon
- Dendrite
- Synapses



Perceptron



Simple ANN



Characteristics of NN.

- * Exhibits mapping capabilities
- * NN learn by examples
- * Robust & fault ~~tolerant~~ tolerant. Recall the incomplete partial patterns.
- * can process the info. in parallel, at high speed, in a distributed manner.

Training

Supervised → provide desired output.

Unsupervised → make sense of the inputs without outside help.

Learning laws

Hall's Rule

↳ If a neuron has both an increase in strength and a decrease in strength, then it will fire.

Hopfield L

If desire to increase

(compute)

Weight

Sum

Train

Scal

O.

Learning laws

Holts Rule

↳ If a neuron receives an input from another neuron & if both are highly active, the weight b/w neurons should be strengthened.

Hopfield Law

If desired & actual output are both active or both inactive increment the connection weight by learning rate.

$$w := w + \eta \frac{\Delta E_{\text{total}}}{d w}$$

Components of N.N.

Weighting factors. adaptive coeff. that determine intensity of input signal.

Summation. product sum of the input.

Transfer function. weighted sum \rightarrow working output.

Scaling & limiting. \rightarrow adds an offset to limit upper & lower \rightarrow multiplies a scale factor. to transfer value. bound.

Output function. Neurons compete with each other, inhibiting processing element.

NN vs traditional computing

Characteristic	Traditional	ANN
Processing style.	Seq. Logical Crl.	Parallel Gestalt Image Pic. Control
Learning methods	by rules Accounting word processing math inventory digital cams	by examples sensor processing Speech recognition pattern recog. tent recog.
Processing	VLSI	variety.
Processing approach	One rule at a time	Multiple
Self learning	Only algo parameters	continuously adaptive
Neurobiology	None	Moderate.
Fault tolerance	None	Significant.

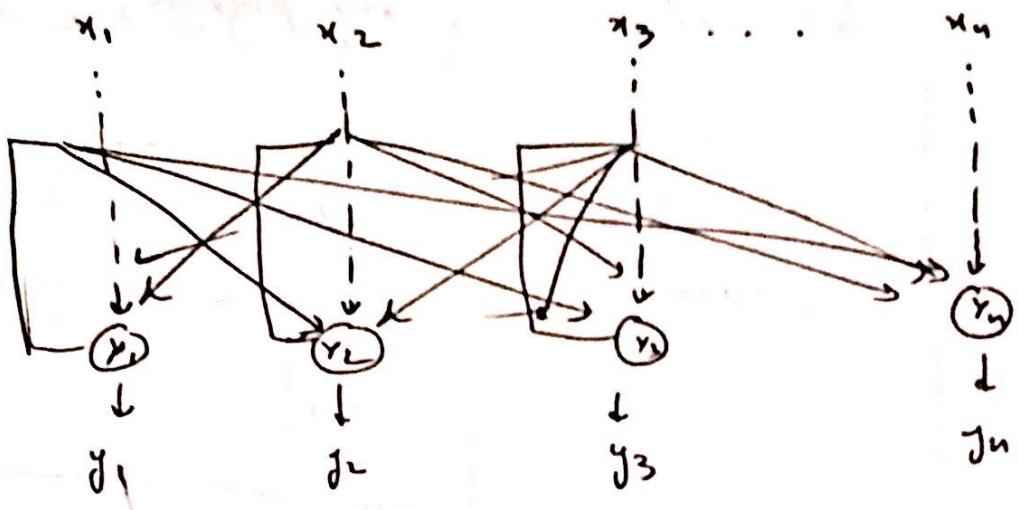
	Req. big processor	Custom built chip
Type		

- ↳ Single layer feed forward N.N
- ↳ Multi layer feed forward N.N.
- ↳ Recurrent.

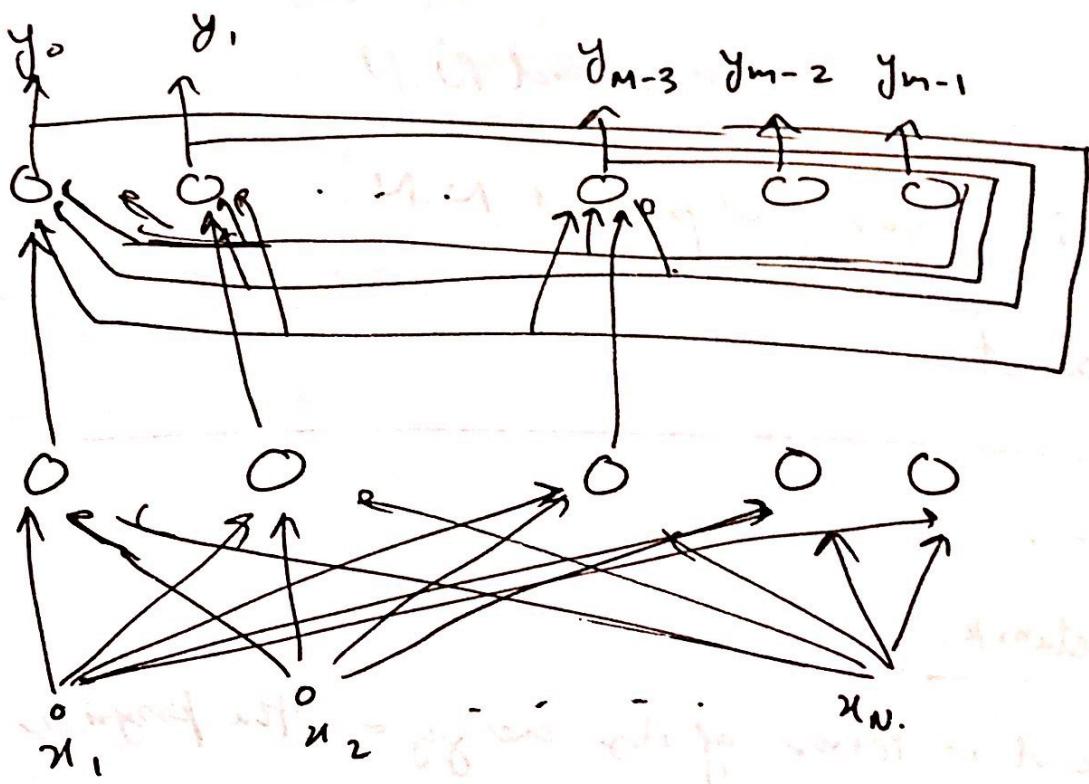
RNN.

Hopfield Network.

- ↳ conceptualized in terms of its energy ~ the physics of Dynamic Sys.
- ↳ Input, Hopfield layer & an output layer.
- ↳ Hopfield law
- ↳ Storage capacity is limited



Hamming Network.



- ↳ Ext. of hopefield network.
- ↳ 3 layer input, category & output layer.
- ↳ Learning similar to hopefield methodology.
- ↳ fewer processing.

Self organising map.

- ↳ Unsupervised learning
- ↳ 2 dim. input layer
- ↳ Learns without supervision.
- ↳ Basic operations.
- ↳ 2D Kohonen layer input.

Application

- ↳ Complex sys. modeling
- ↳ character. Recog.
- ↳ Image data compression
- ↳ Target classification.
- ↳ Noise filtering
- ↳ Text to speech conv.