

Neuron . 24/9

* NN are simplified models of the biological neuron system

* NNS are simplified imitations of Central Nervous System & have been motivated by the kind of computing performed by the human brain.

* Neurons are computing entities of brain, so hence the technology which tries to imitate neuron is termed as NNS, Artificial NN or Artificial Neural Systems.

* A human brain develops with time & this is known as 'experience'.

* Technically, this is 'development' of neurons to adapt themselves to their surrounding env. thus brain is rendered plastic, in its P/f processing capability.

* In addⁿ to plasticity, 'stability' is also imp in NN system i.e

Adaptive capability of an NN in the face of changing environment.

* Stability - plasticity - imp in NNs.

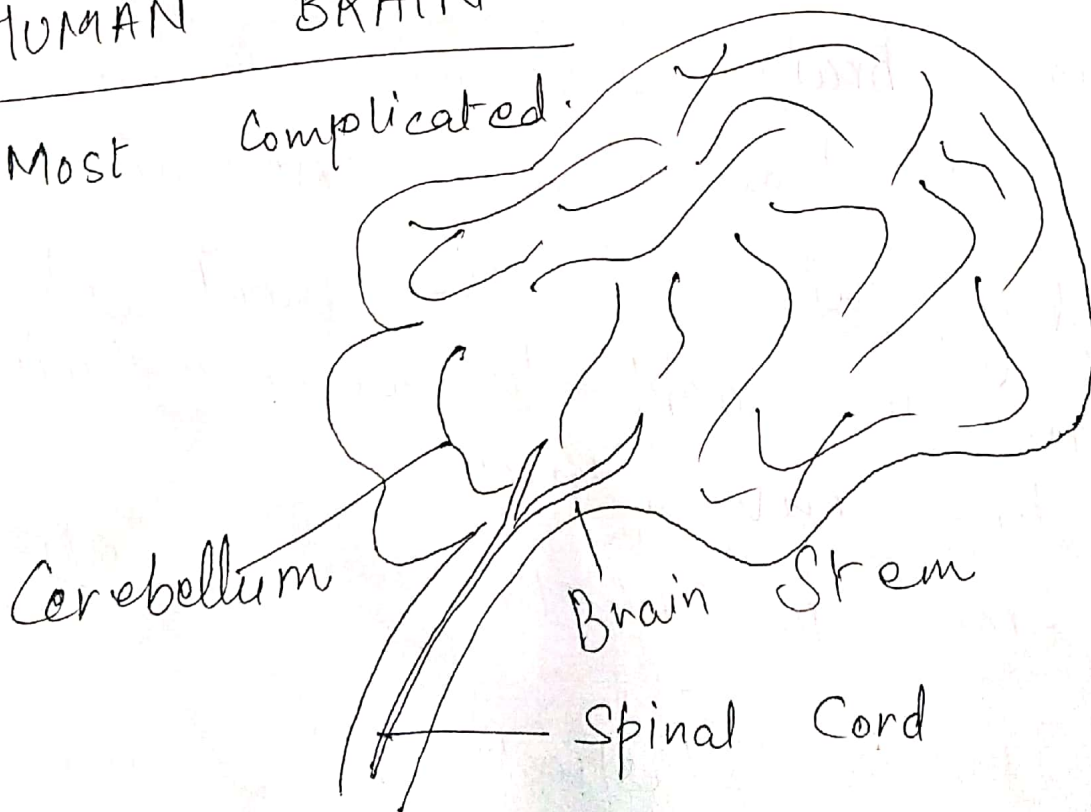
* Preserve learning as well as receptive to learning new i/f.

* So NN remain 'plastic' to significant/ useful i/f but remain 'stable' when presented with irrelevant i/f.

* This is stability - plasticity dilemma.

HUMAN BRAIN

* Most complicated.



* Brain contains about $\frac{10^{10} \text{ basic units}}{1 \text{ neurons}}$

* Each neuron is connected to 10^4 neurons.

* A neuron is a small cell that receives electro-chemical signals from various sources & responds by transmitting electrical impulses to other neurons.

* An avg. brain weighs — 1.5 kg
* avg. neuron weighs — 1.5×10^{-9} gms.

* Some neurons have perform I/O ops. (afferent/efferent) cells

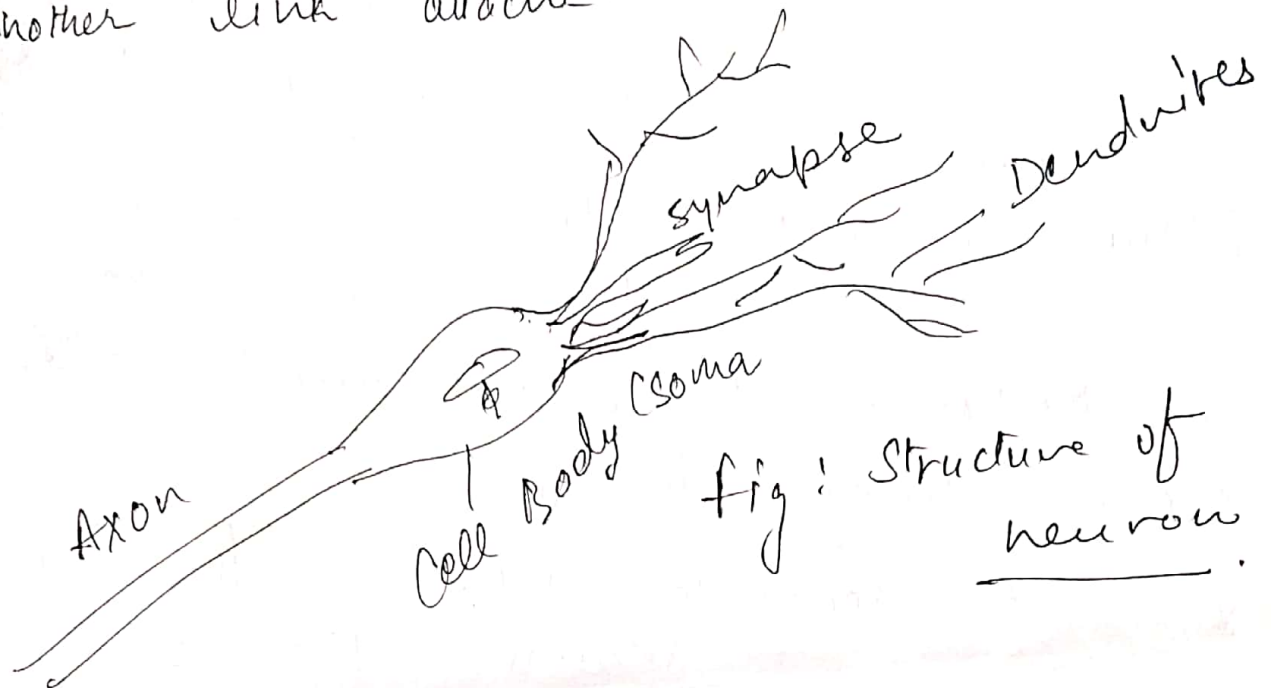
* Remaining form a part of interconnected N/w of neurons which are responsible for signal transformation & storage of info.

* All neurons have common characteristics.

* A neuron is composed of nucleus — cell body (soma)

* Attached to soma are long irregularly shaped filaments called dendrites.

- * The dendrites are I/P Channels
- * look like branches of tree.
- * Another link attached to Soma is Axon.



- * Axon - Electrically Active & serves as o/p channel.
- * + * Appear on o/p cells are non-linear threshold devices which produce a voltage pulse called Action Potential or Spike - lasts for a millisecond.
- * ~~the~~ Soma on receiving cumulative I/Ps, internal electric potⁿ of cell (Membrane potⁿ) increases.
 + → Neuron 'fires' by propagating action potⁿ down the axon to other neurons.

* Axon Terminates in a ~~sp~~-contact,

minute Gap. ———→ Synapse / Synaptic Junction
Connects of Axon to dendritic link of 2nd.
Contains Neuro-transmitter fluid.

↓
Responsible for accelerating / relaying electric charges to soma.

* Each dendritic link can have many Synapses, ∴ massive Interconnectivity.

* A neuron — Many Synaptic P/O
Related to learning

* Size of Synapse

↓
larger Area — Excitatory
Smaller Area — Inhibitory.

* Neural Activity — learning + Memory.

* ~~Hebbian learning~~

* Excitatory neuron — Takes action
Inhibitory neuron — Prevents it.