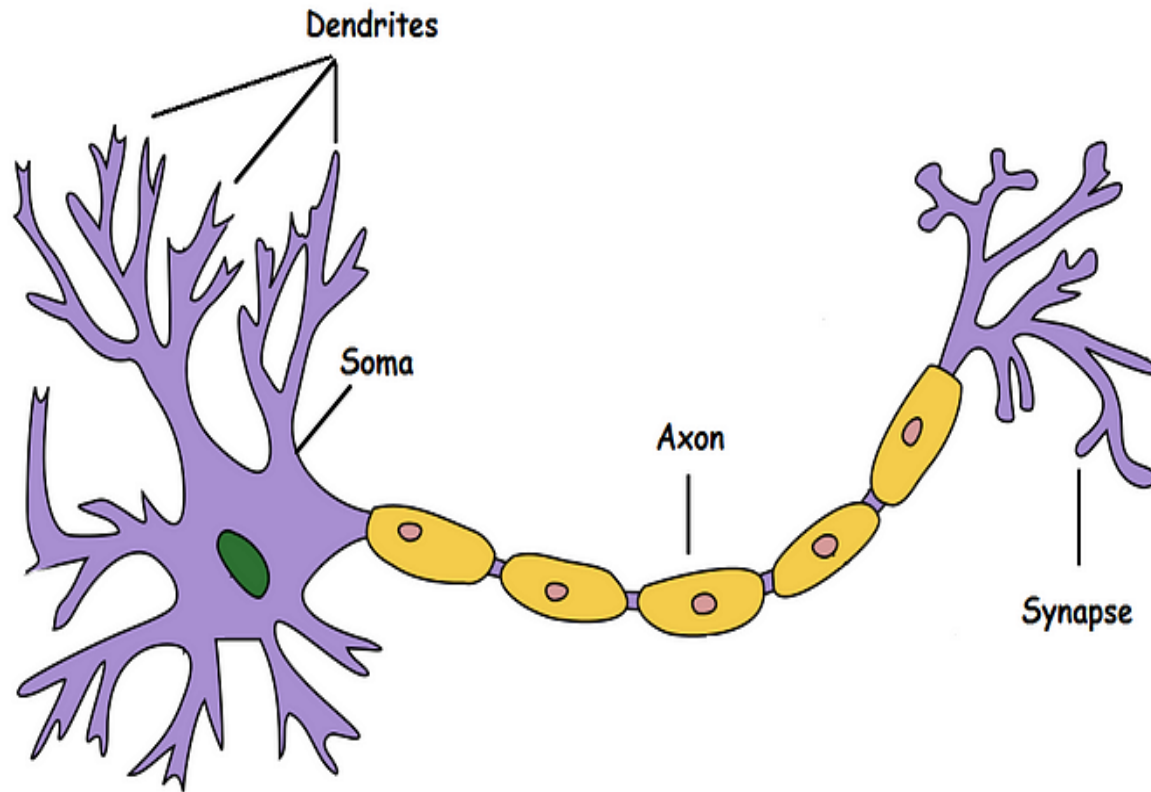


Biological Neurons

Biological Neurons



A neuron takes an input signal (dendrite), processes it like the CPU (soma), passes the output through a cable like structure to other connected neurons (axon to synapse to other neuron's dendrite).

Dendrite: Receives signals from other neurons

Soma: Processes the information

Axon: Transmits the output of this neuron

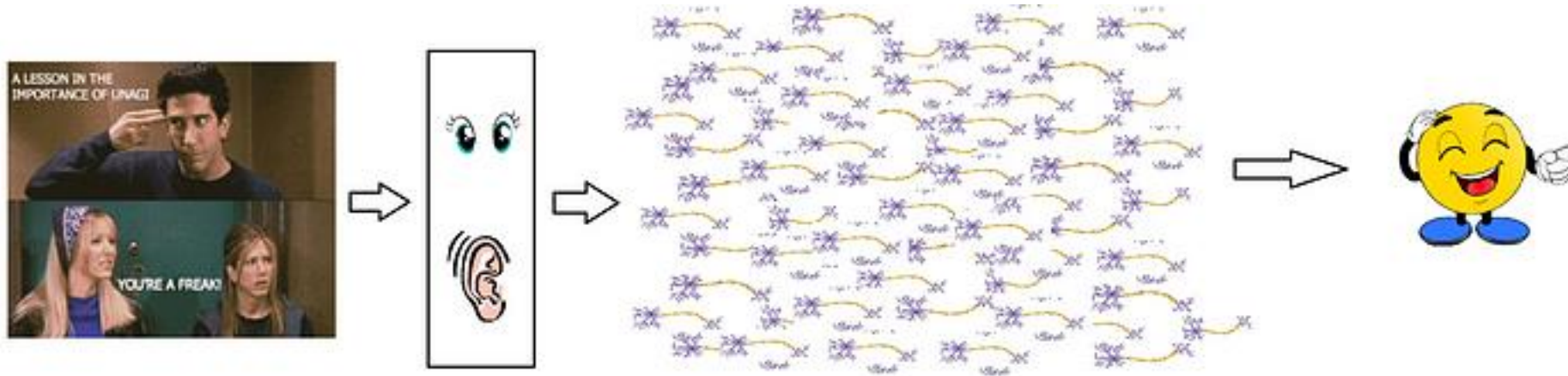
Synapse: Point of connection to other neurons

Biological Neurons



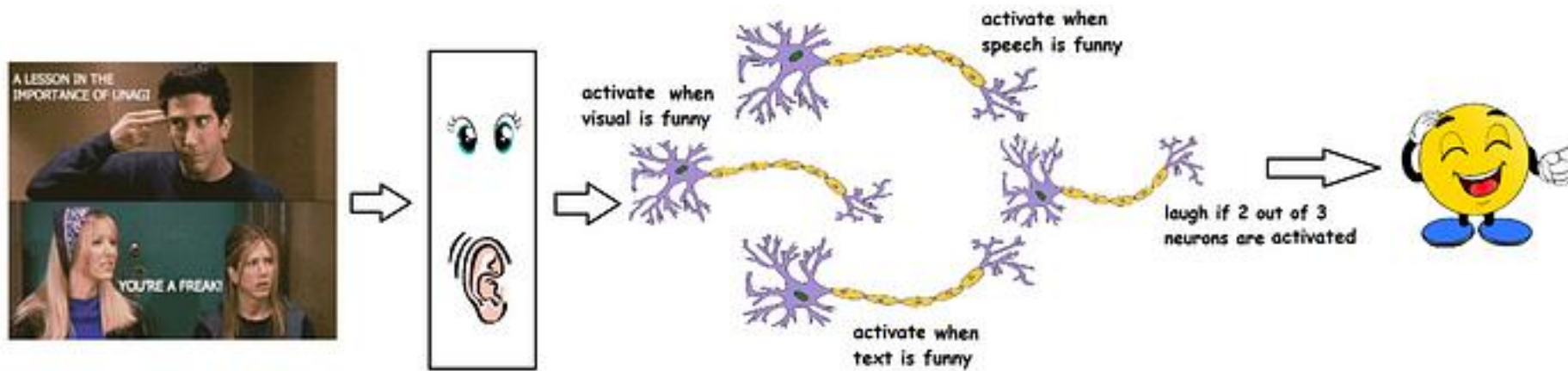
- Our sense organs interact with the outer world and send the visual and sound information to the neurons.
- Let's say you are watching Friends.
- Now the information your brain receives is taken in by the “laugh or not” set of neurons that will help you make a decision on whether to laugh or not.
- Each neuron gets fired/activated only when its respective criteria is met (shown in upcoming slides)

Biological Neurons



- In reality, it is not just a couple of neurons which would do the decision making.
- There is a massively parallel interconnected network of 10^{11} neurons (100 billion) in our brain
Their connections are not as simple as shown in the previous slide

Biological Neurons



- The sense organs pass the information to the first/lowest layer of neurons to process it.
- And the output of the processes is passed on to the next layers in a hierarchical manner, some of the neurons will fire and some won't and this process goes on until it results in a final response — in this case, laughter.
- This massively parallel network also ensures that there is a division of work.
- Each neuron only fires when its intended criteria is met i.e., a neuron may perform a certain role to a certain stimulus, as shown below.

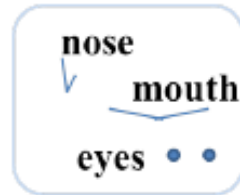
Biological Neurons

- General belief that neurons are arranged in a hierarchical fashion (however, many credible alternatives with experimental support are proposed by the scientists)
- Each layer has its own role and responsibility.
- To detect a face, the brain could be relying on the entire network and not on a single layer.

Biological Neurons



Layer 1: detect edges & corners



Layer 2: form feature groups



**Layer 3: detect high level
objects, faces, etc.**

Sample illustration of hierarchical processing. Credits: Dr.Mitesh M. Khapra's lecture slides