**HW to Chapter 1 "Brain, Neurons, and Models"**

**Non-programming Assignment:**

1. How does natural neuron work?

Ans. A natural neuron is a fundamental unit of the brain and nervous system and is responsible for processing and transmitting information. I achieves it through a combination of electrical and chemical signals.

The cell body contains 3 main parts:

1. Soma: It is the cell body and is responsible for taking care of essential cell functions.

2. Axon: It is a long, thin structure that carries the signals away from the Soma and is cover in a insulation layer called myelin sheet.

3. Dendrites: These are branch like structure present on the Soma and Axon terminals that are responsible for receiving the signals from other neurons.

When a neuron is sufficiently activated by a stimulus, it generates an electric impulse. This impulse travels along the axon/dendrites to the end. At the end there exists the neural junction also called the synapse where the biochemical agents that are responsible for neuro transmission called neurotransmitters are exchanged.

1. How does natural neuron transmit signal to other neurons?

Ans. The transmission of a neural signal to other neuron takes place at synapse, which are the junctions where two neurons meet. The following is a step-by-step process of how the transmission typically occurs:

* + Action Potential Generation: When a neuron is simulated with a electrical signal that is greater that a certain threshold either from a fellow neuron or a muscle or tissue etc.
  + Once the action potential is generated at the dendrites it is transmitted through the axon to the synapse.
  + At the synapse when the action potential reaches it, it triggers the release of chemical called the neurotransmitters.
  + These neurotransmitters are diffused across the synaptic cleft and bind to the receptors on the adjoining neuron.
  + Depending on the inhibitory and excitor signals from other neurons, the receiving neuron may proceed with the propagation of the signal or not.
  + Once the signal is passed over the synapse, the neuron returns to a resting state during which it is not available to transmit any signals.

1. Describe the McCulloch and Pitts model of artificial neuron?

Ans. The McCulloch and Pitts model is a simplified computational model that aimed to replicate the working of a natural neuron. The model consisted of the following parts:

* + Binary Inputs: The model would receive multiple inputs (x1, x2, x3,…xn) where each is binary i.e. either 0 or 1.
  + The model then proceeds to calculate the arithmetic sum of the inputs - g(x)



* + The output of the neuron is determined based on the logic that the aggregation (g(x)) exceeds the set threshold (θ) i.e., 1 if g(x) > θ, or 0 if g(x) < θ.
  + Logic Gate: By adjusting the threshold and number of inputs the model can mimic the logic gates.

**Programming Assignment:**

Github: https://github.com/sayeedahmed01/INFO-7375-Neural-Networks-AI/tree/main/HW-1