**HW to Chapter 1 “Brain, Neurons, and Models”**

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**Non-programming Assignment:**

1.How does natural neuron work?

Natural neurons function as fundamental units in the brain responsible for transmitting information. Each neuron can switch into an excited state (referred to as "firing") when it receives sufficient stimulus. This process involves the neuron consolidating the incoming stimulus as an electric potential. When the input signal exceeds a specific threshold, the neuron generates an action potential (electrical signal). The signal is then transmitted through the neuron's axons and dendrites, which connect to other neurons via synapses. This allows communication between neurons and forms the basis of neural networks​.

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

A natural neuron transmits signals to other neurons through synapses, which act as junctions between neurons. When a neuron fires, the electrical potential is passed through its axons and dendrites to the synapses. At the synapse, neurotransmitters (biochemical agents) help carry the electrical signal from the presynaptic neuron (sending neuron) to the postsynaptic neuron (receiving neuron). If the postsynaptic neuron receives enough signal to exceed its own threshold, it too will fire and propagate the signal further. This process is key to how neurons communicate within neural networks in the brain​​.

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

The McCulloch and Pitts neuron model, introduced in 1943, is one of the earliest computational models of artificial neurons. It simplifies the behavior of a biological neuron into a binary, logic-based model. In this model:

Inputs: The neuron receives multiple binary inputs (either 0 or 1).

Aggregation: The inputs are aggregated (summed) to compute a total signal.

Threshold: If the aggregated signal exceeds a predefined threshold, the neuron "fires" by producing a binary output (1), otherwise, the output remains 0.

Output: The output is either 1 (if the threshold is exceeded) or 0 (if not).

The model is deterministic and does not account for the accumulation of signals over time, refractory periods, or inhibitory inputs, unlike natural neurons. It is often used to represent logical operations like AND, OR, and NOT​​​.