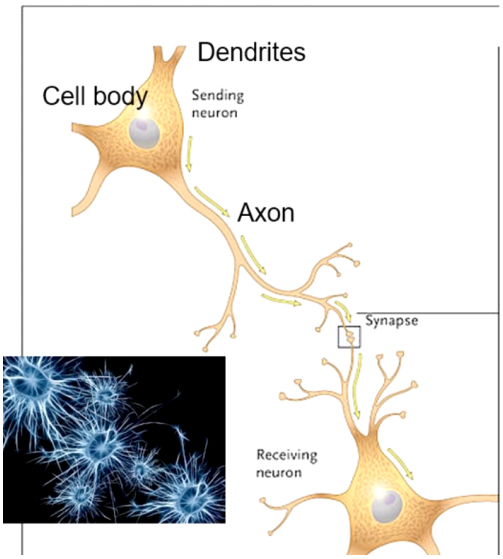
Human Neuron

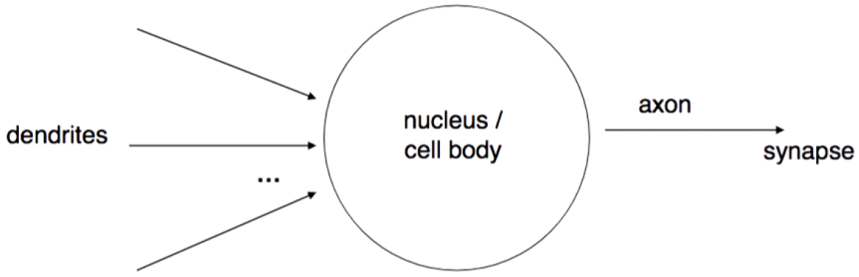


Dendrites ~ Input
Cell body ~ Processing
Axon/Synapse ~ Output

Human brain ~ 10^{12} neurons

I/O Abstraction

- similar to blackbox/function



signal input **signal processing** **signal output**

-

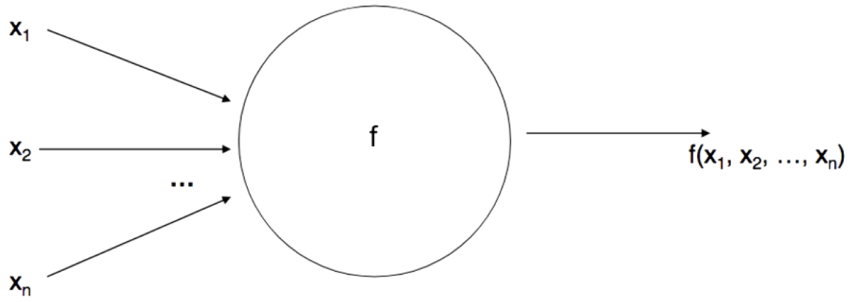
McCulloch-Pitts Neuron

- simplest neuron
- binary input, binary output
- output of 1 if sum of all input bits > threshold else 0

$x_1 \ldots x_n \in \{0,1\} = B$

$f: B^n \rightarrow B$

f is a threshold function: if $sum(x_1 \ldots x_n) > T$ then 1, else 0



McCulloch-Pitts Neuron with Inhibitory Inputs

- based on McCulloch-Pitts Neuron
- two types of inputs
  - normal inputs x
  - inhibitory inputs y
- one inhibitory input true ==> false
- allows boolean logic

if (at least one y_i = 1)
then 0
else if (sum(x_1 ... x_n) > threshold T)
then 1
else
0

$$f(x_1 \ldots x_n, y_1 \ldots y_m) = f(x_1 \ldots x_n) * \pi(1-y_i)$$