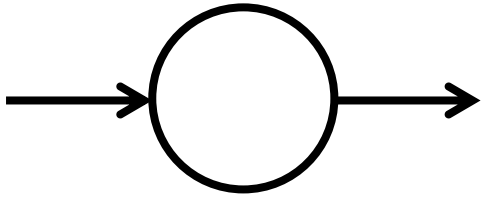
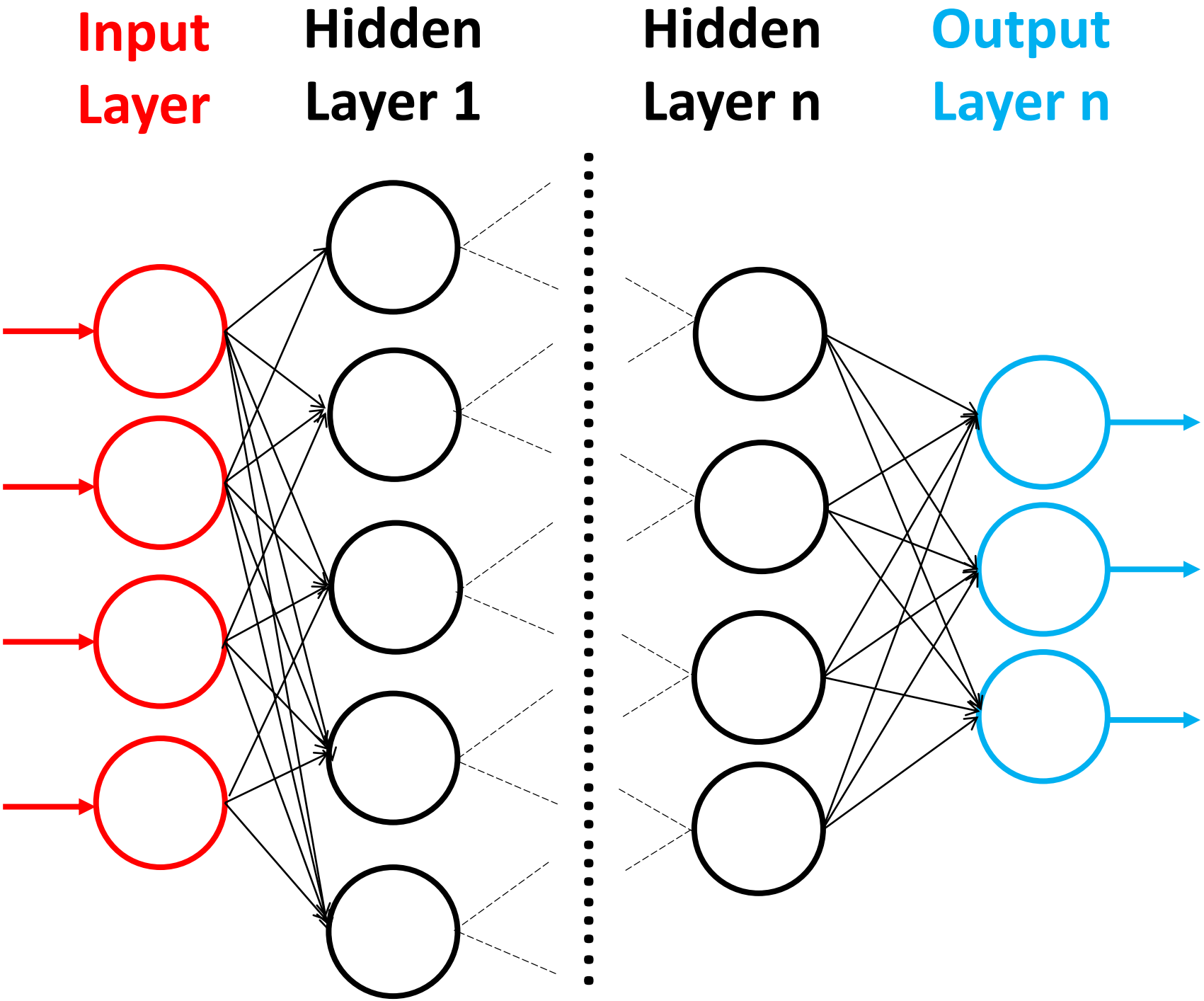
Artificial neural network

An artificial neuron



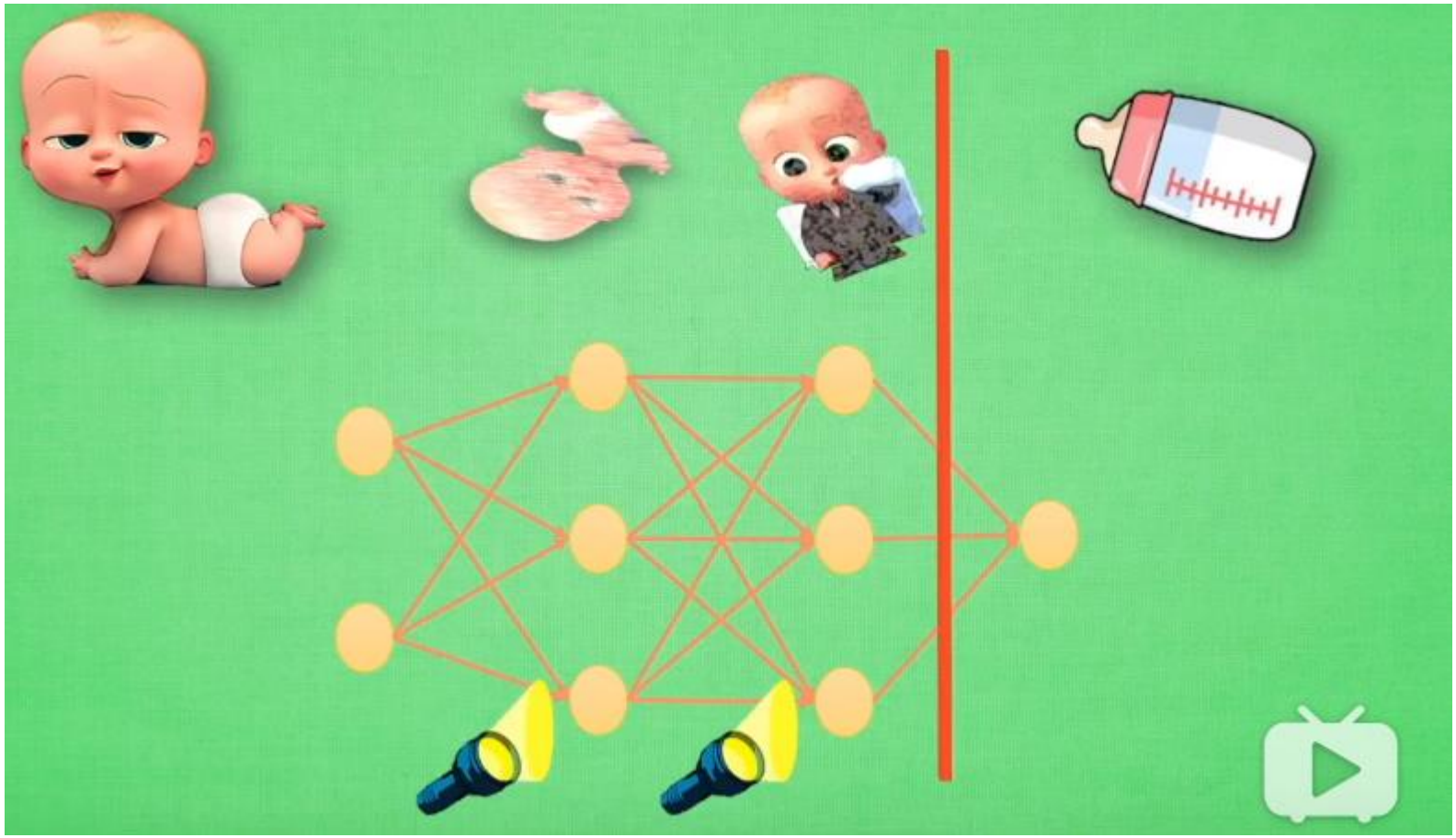
An artificial neuron that receives a signal can process it and then signal additional artificial neurons connected to it.

- In common ANN implementations, the signal at a connection between artificial neurons is a real number, and the output of each artificial neuron is computed by some non-linear function of the sum of its inputs.
- The connections between artificial neurons are called 'edges'. Artificial neurons and edges typically have a weight that adjusts as learning proceeds. The weight increases or decreases the strength of the signal at a connection.
- Artificial neurons may have a threshold such that the signal is only sent if the aggregate signal crosses that threshold.
- Typically, artificial neurons are aggregated into layers. Different layers may perform different kinds of transformations on their inputs.
- Signals travel from the first layer (the input layer), to the last layer (the output layer), possibly after traversing the layers multiple times.


Input Layer
Hidden Layer 1
Hidden Layer n
Output Layer n

Artificial neural network is not a black box

Basis after each hidden layer is reconstructed, as illustrated by the following picture:



Difference between artificial NN and natural NN

The main difference is, humans can forget but neural networks cannot. Once fully trained, a neural net will not forget. Whatever a neural network learns is hard-coded and becomes permanent.

A human's knowledge is volatile and may not become permanent. There are several factors that cause our brain cells to die and if they do, the information that is stored in that part is lost and we start to forget.

Algebraic structure of ANN

Neurons:
A neuron with label j receiving an input pj(t)

Comparison between neural network and tensor network

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Quantum neural network