Convolutional Neural Networks

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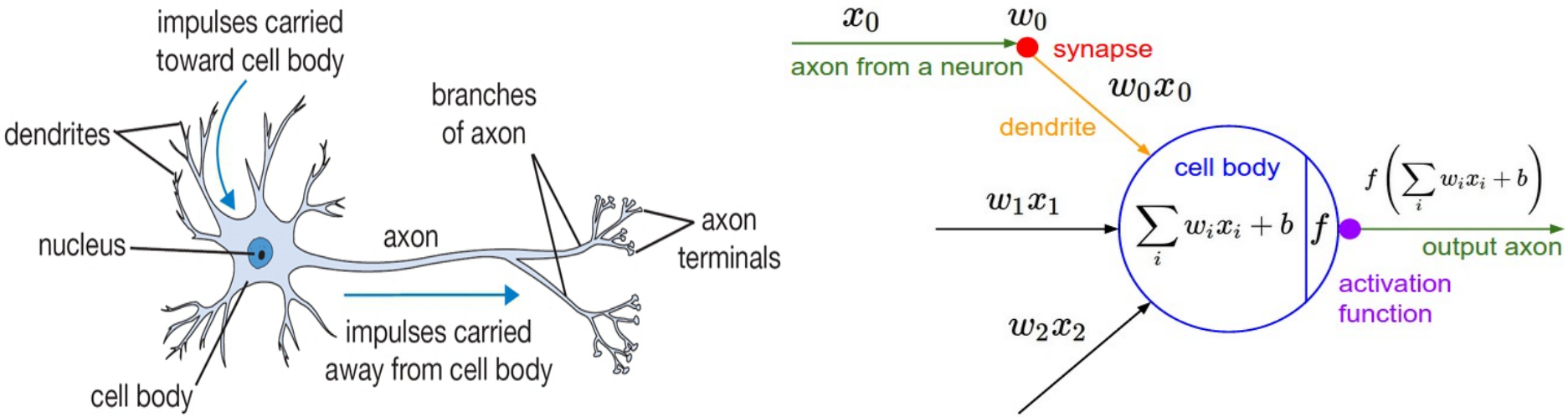
Background and Motivation - Neural Networks

Primary motivation: Neural Networks mathematically simulate biological functionalities of the human brain



(a) biological model

(b) mathematical representation

Figure: neuronal model and computational abstraction

Background and Motivation - Principle

Neural Networks generally contain:

- an n-dimensional input
- one or many layers of interconnected neurons
- an output-layer

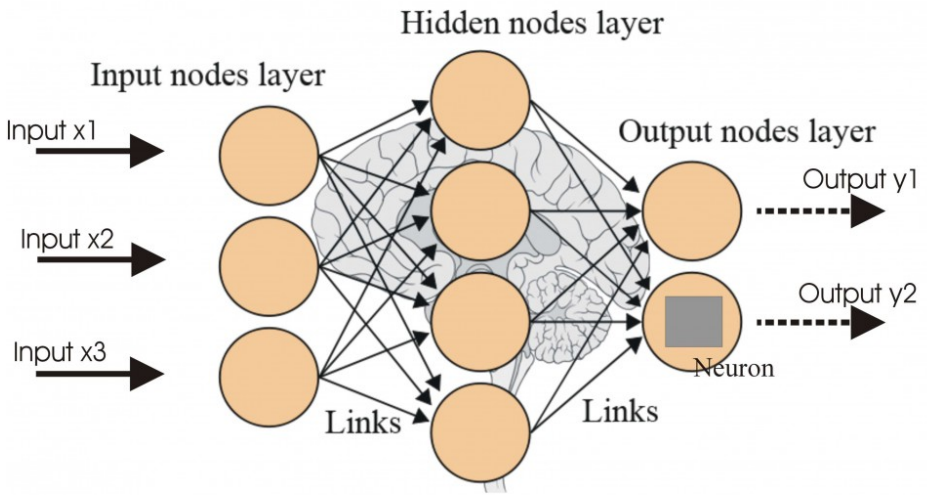


Figure: Basic concept of a Neural Network

Background and Motivation - Convolutional Neural Networks

Convolutional Neural Networks (CNNs) are a subtype of Neural Networks:

- all neurons in a layer are identical
- layers are interconnected through a kernel function
- different types of layers are used

Background and Motivation - Convolutional Neural Networks

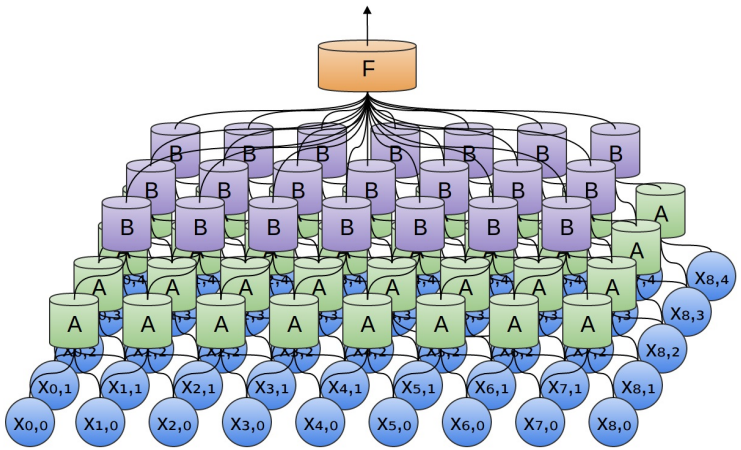


Figure: 2-dimensional CNN

1. Using identical copies of the same neuron allows for complex models with few parameters
2. Convolutional layers are not fully connected; each neurons is locally connected with a subsection of the previous layer

Background and Motivation - Convolutional Neural Networks

Propagation - Forward Propagation

Forward propagation is the process of computing the output of a network for a given input

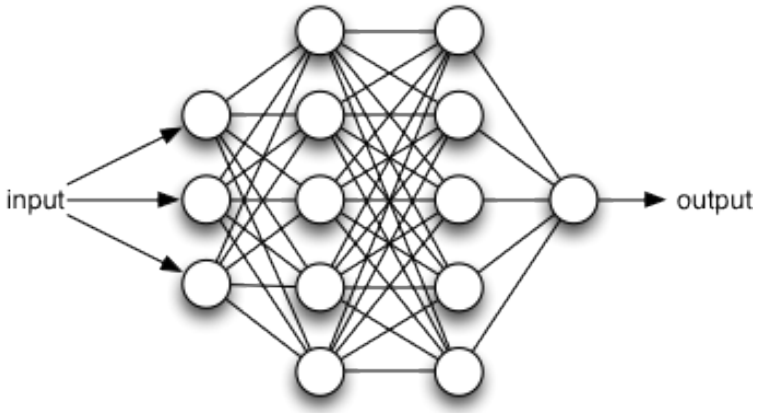


Figure: Forward propagation in a complex neural network

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http://cs231n.github.io/convolutional-networks/
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