Neural Networks

Language and conceptualization

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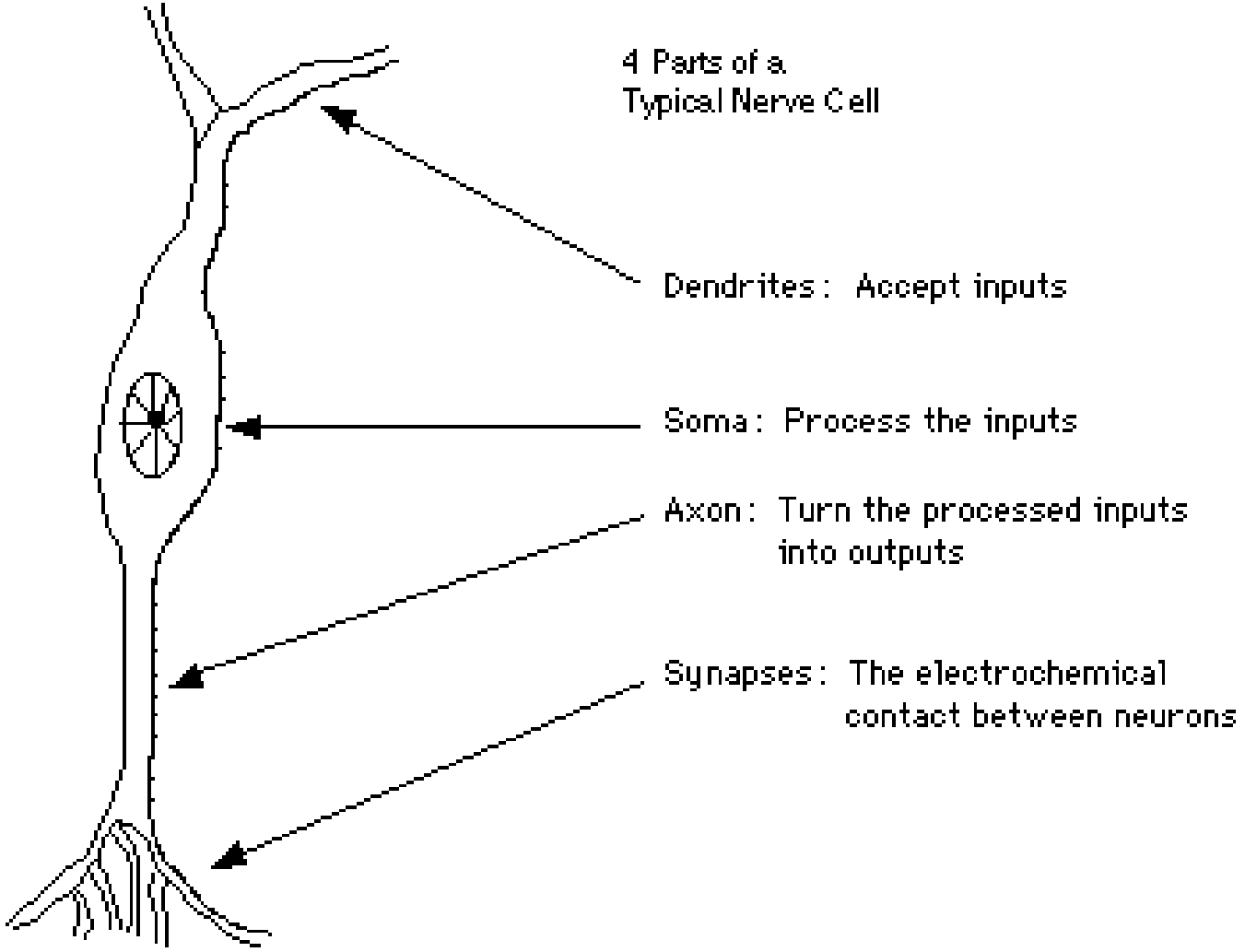
Neural Networks

- biological (brain)
- Artificial
  - form of a multiprocessor computer system
  - modelled after brain
  - can learn to recognize patters/detect trends

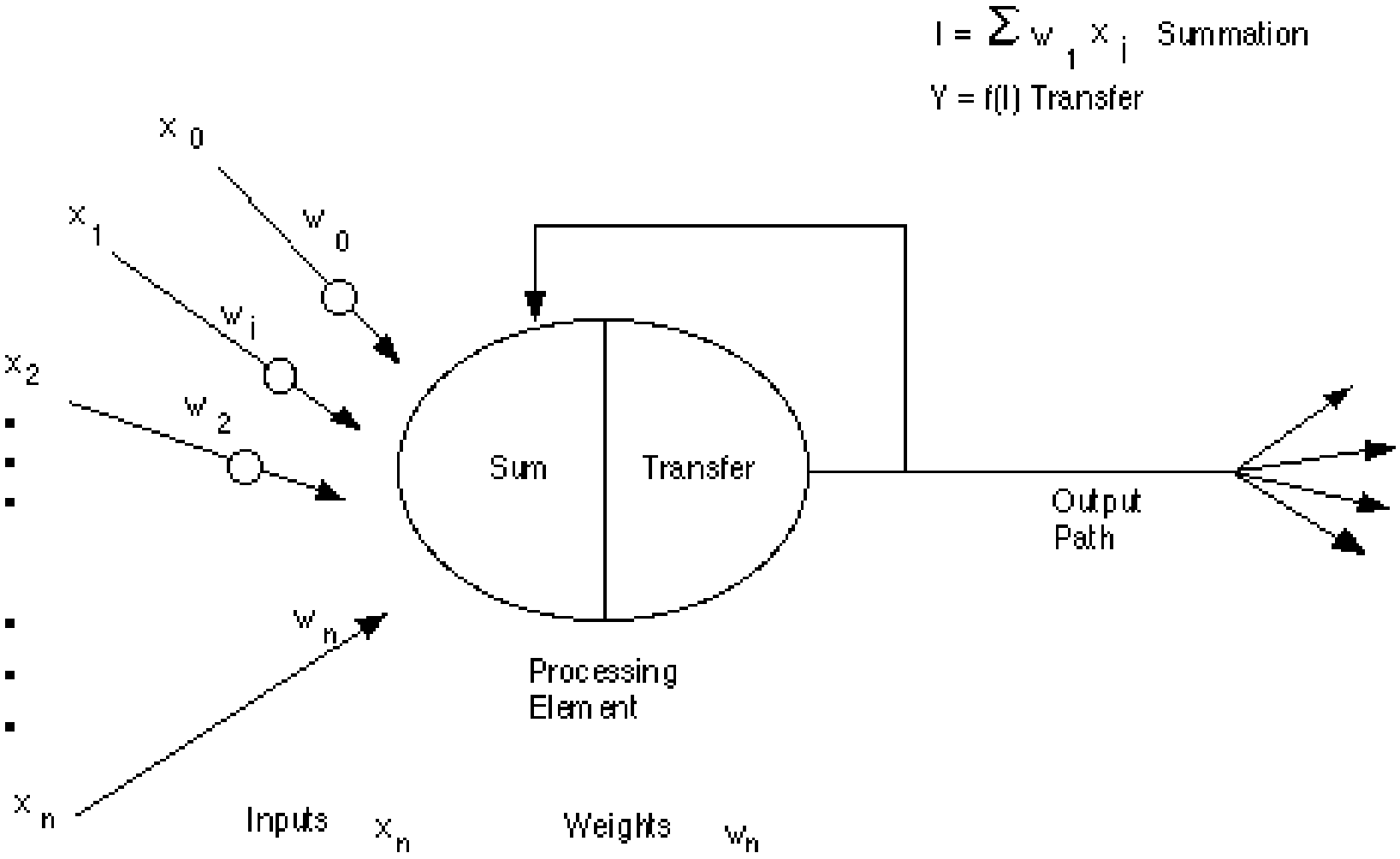
Biological Neuron



Artificial Neuron

- Basic unit of a neural network
- Input multiplied by a connection weight
- Weight determines strength of connection
- Output depends on weight of input and how nodes are connected

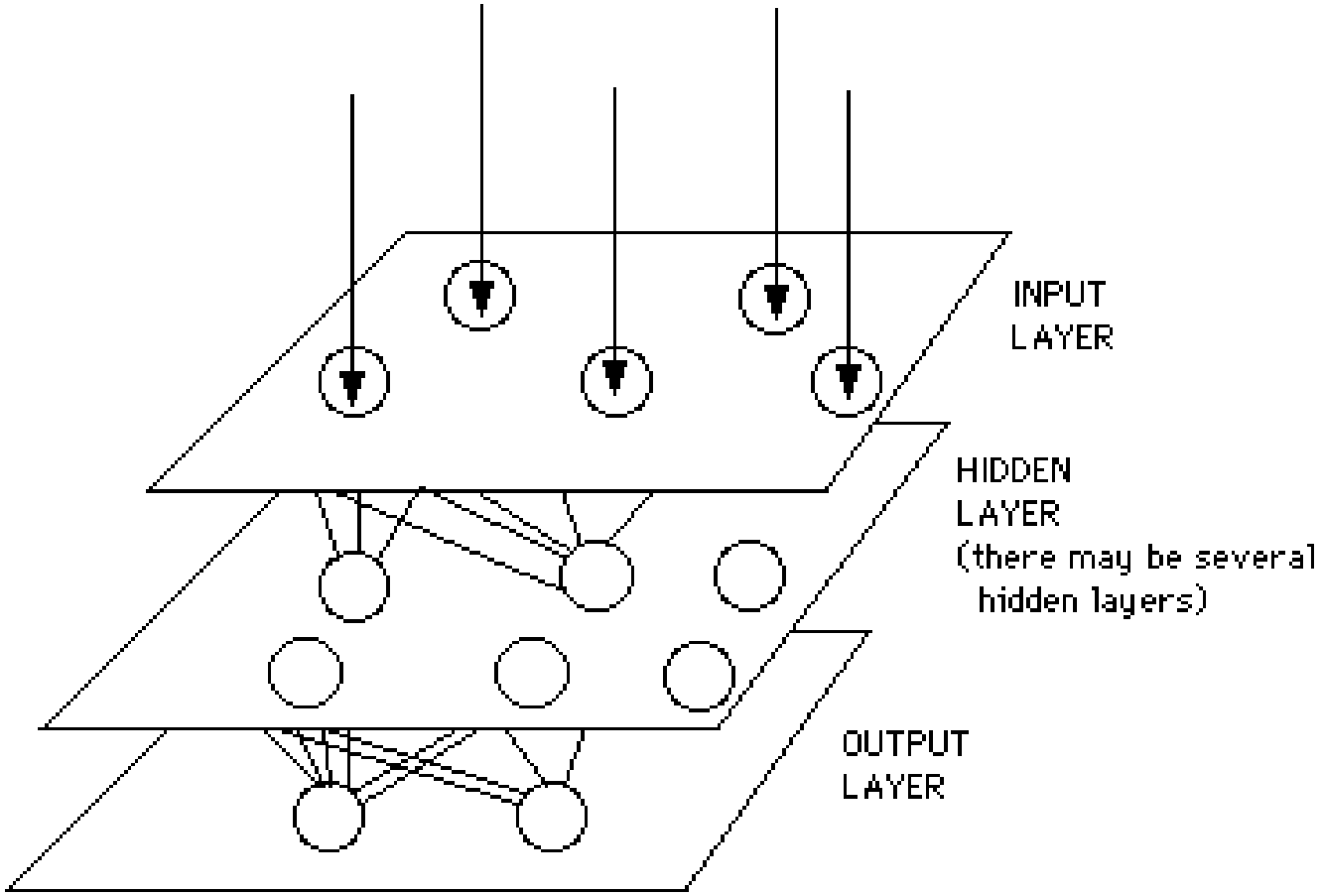
Artificial Neuron



Neural Network Layers

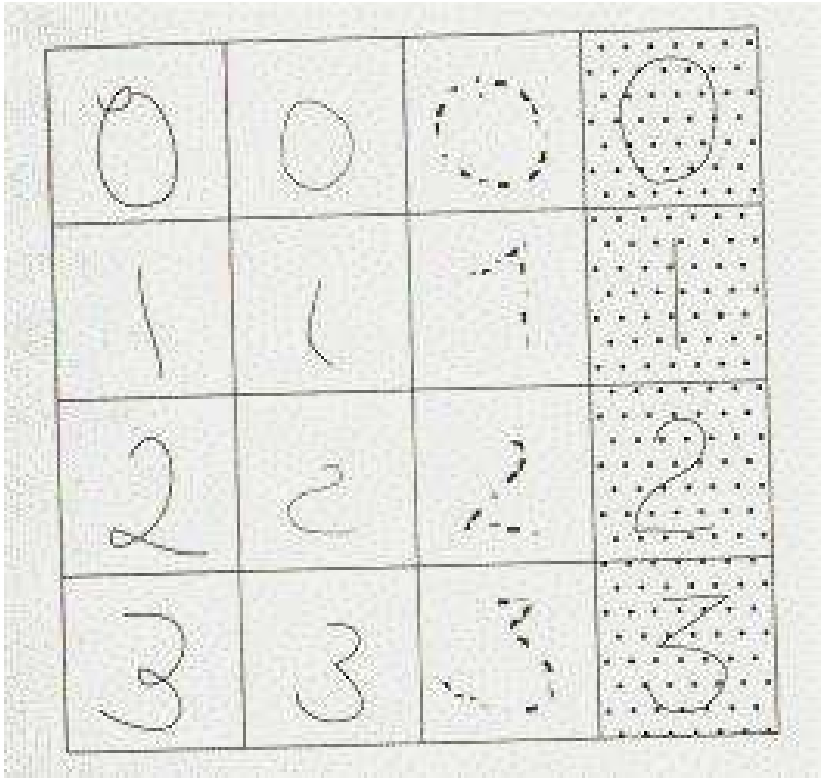
- Neurons connected and grouped in layers:
  - input layer
    - Receives input from external environment
  - output layer
    - Communicates output (result) to user or external environment
  - hidden layer(s)
    - Between input and output layers

Neural Network Layers



Learning and Training of a Neural Network

- Trained with examples



Learning and Training of a Neural Network

- NN learns by adjusting connection weights
- Unsupervised learning:
  - NN has to find way to organize itself, adapts purely in response to input
- Supervised learning:
  - NN is told desired output (in addition to input)
  - information about errors filtered back and used to adjust connections

Learning Laws

- Various learning laws for updating connection weights
- e.g. the Delta Rule
  - Weights adjusted to minimize the difference between desired and actual output of a neuron (the "delta")

Uses of a Neural Network

Possible uses include:

- Image processing
- Sound processing
- Financial prediction (share values, exchange rates, etc.)
- Forecasting (sales, production requirements, energy requirements, etc.)