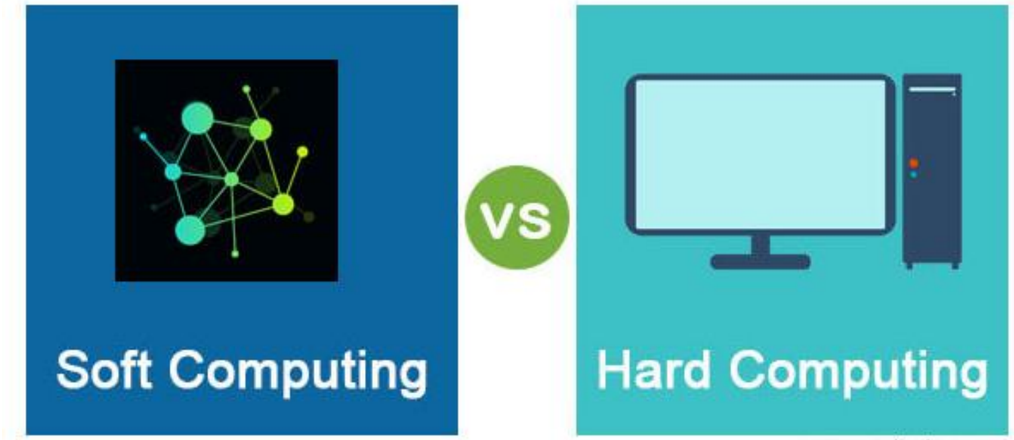
Module No. 05

Classification models

By Prof. Shraddha H. Dalvi

Problem solving

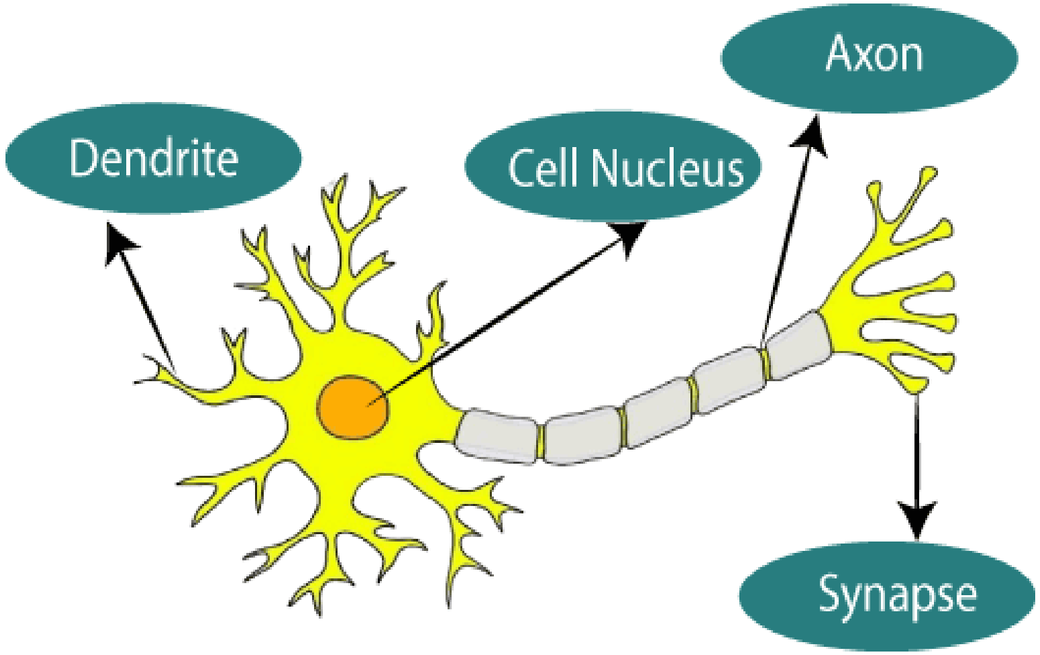
- Hard Computing- Precise models
- Soft Computing- Approximate models

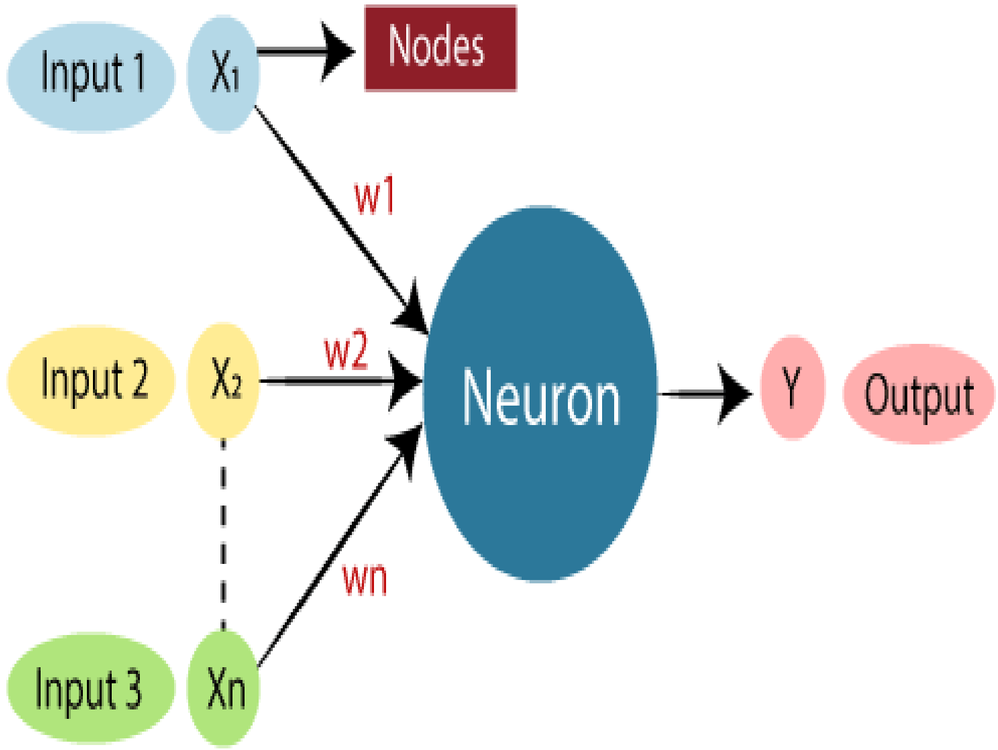


Human Brain

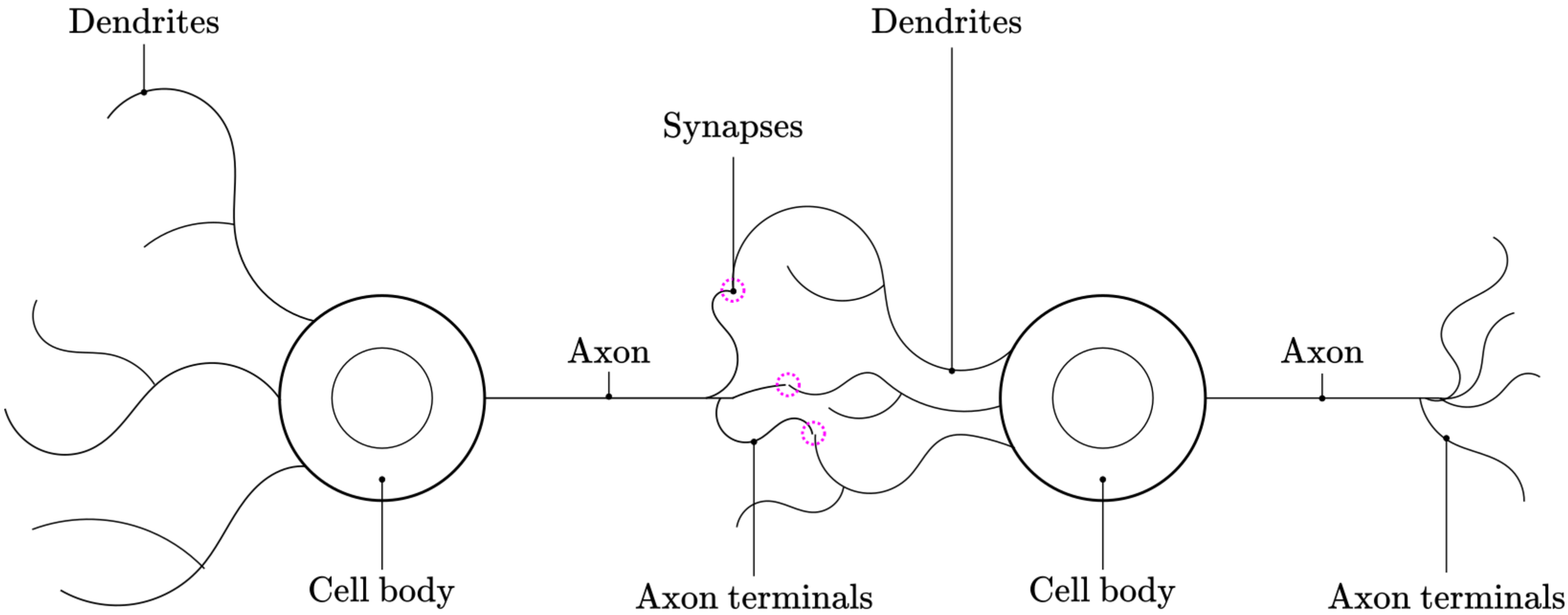
- Basic element is neuron
- Neurons provide us with ability to remember, think and apply previous experiences to our every action.
- The human brain comprises about 100 billion neurons
- The power of human brain comes from sheer numbers of neurons and their multiple interconnections.

Biological Neuron





Biological Neuron



Understand some basic terminologies

- **Soma or Cell body**: where the cell nucleus is located
- **Dendrites**: where the nerve is connected to the cell body
- **Axon:** carries impulses from the neuron

Biological Neuron	Artificial Neuron
Cell	Neuron
Dendrites	Weights/ Interconnections
Soma	Net Input
Axon	Output

Comparison Of Biological Neuron And Artificial Neuron

Biological Neuron	Artificial Neuron
It is made of cells.	The cells correspond to neurons.
It has dendrites which are interconnections between cell body.	The connection weights correspond to dendrites.
Soma receives the input.	Soma is similar to net input weight.
The axon receives the signal.	The output of ANN corresponds to axon.

Definition

- ANN is an information processing model that is inspired by the way biological nervous systems, such as brain, process information.
- This model tries to replicate most basic functions of the brain.
- ANN is composed of large number of highly interconnected processing elements working in unison to solve specific problem.

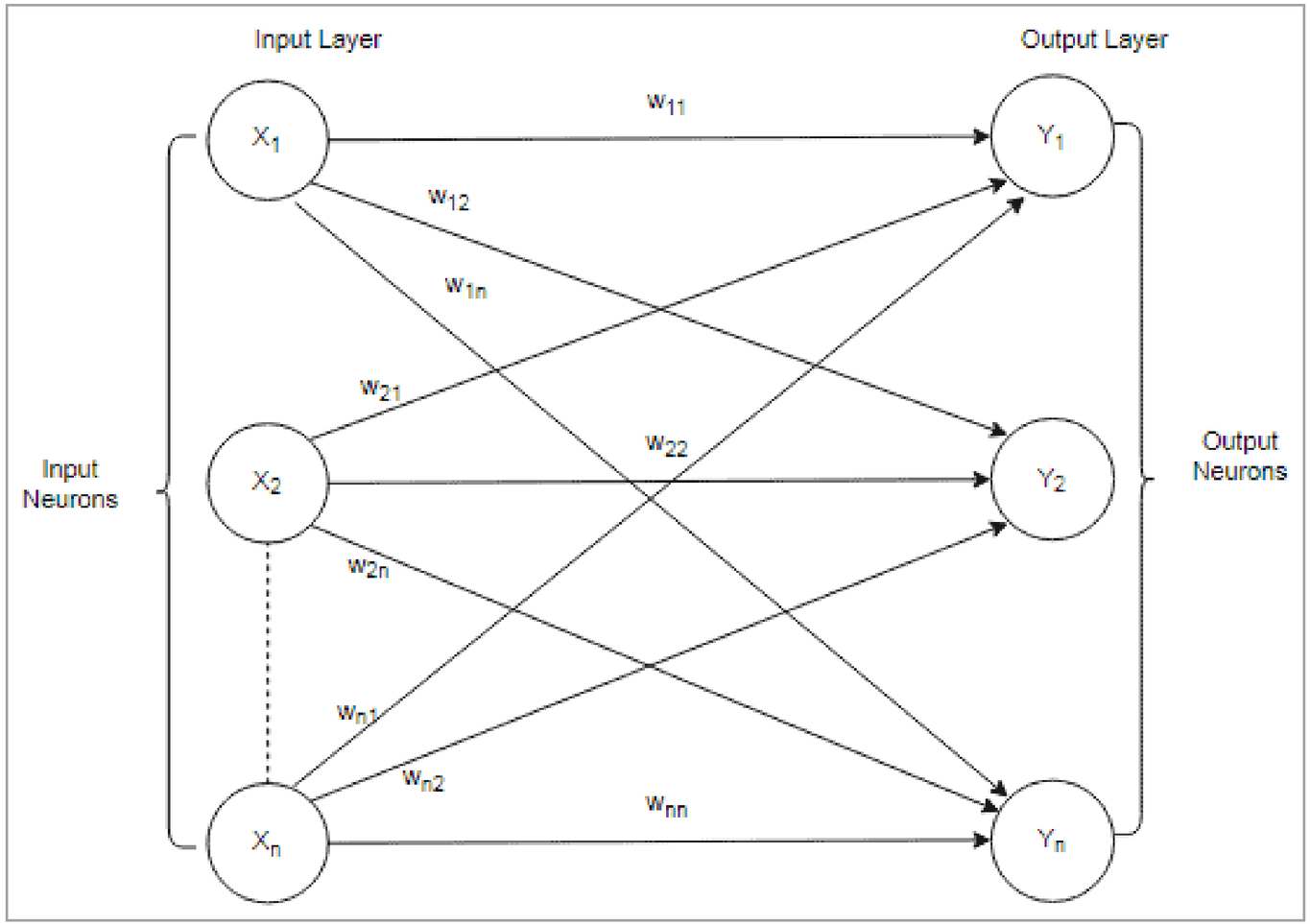
Artificial Neural Networks

- **Basic Models:**
  - **Interconnections**
  - **Training or learning rule**
  - **Activation functions**

Artificial Neural Networks

- **The ANN has 3 main layers:**
  - **Input Layer: The input patterns are fed to the input layers. There is one input layer.**
  - **Hidden Layers: The hidden layers refine the input by removing redundant information and send the information to the next hidden layer for further processing.**
  - **Output Layer: This hidden layer connects to the “output layer” where the output is shown.**

Single layer feed forward network



Multi layer feed forward network

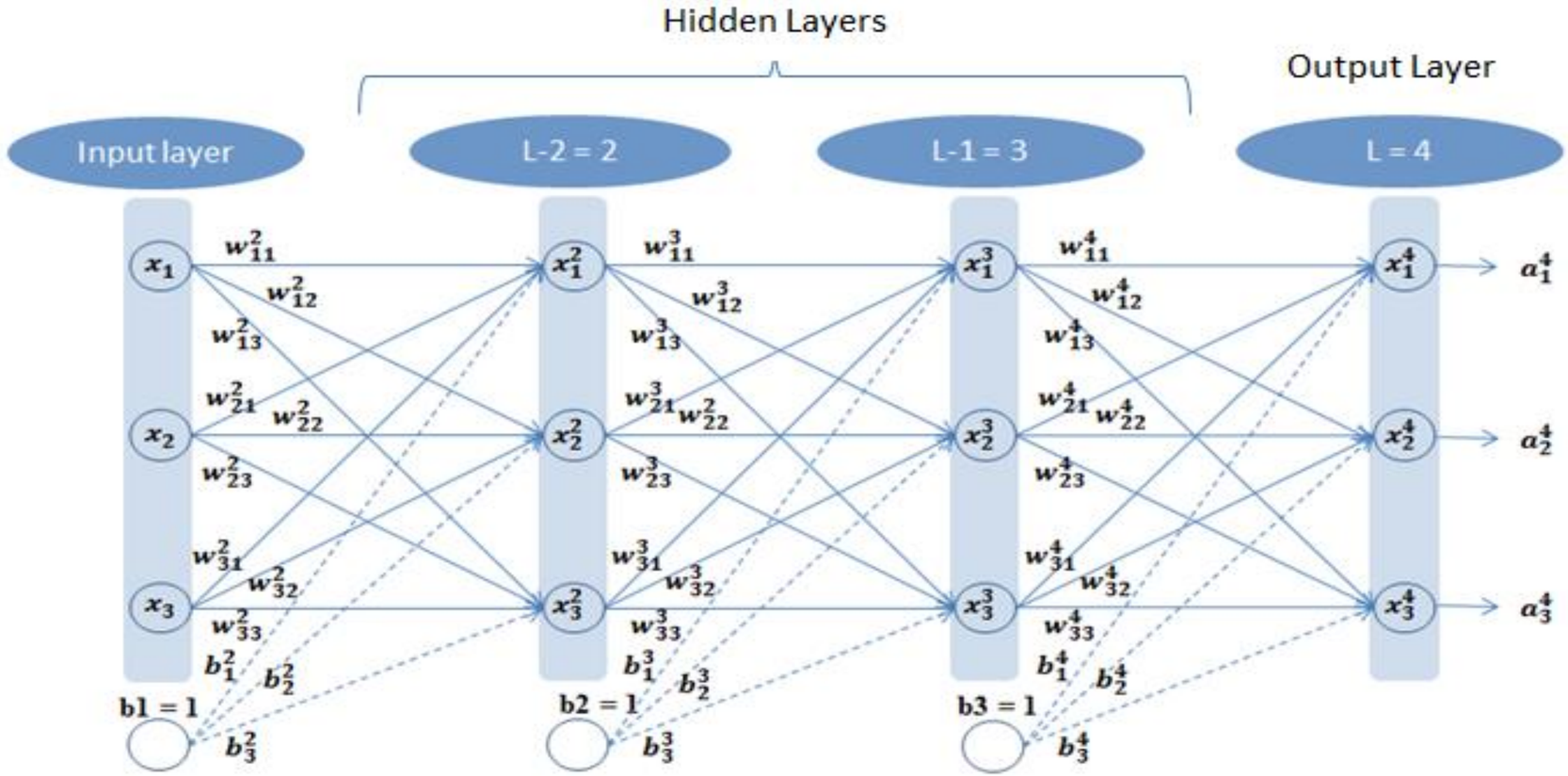
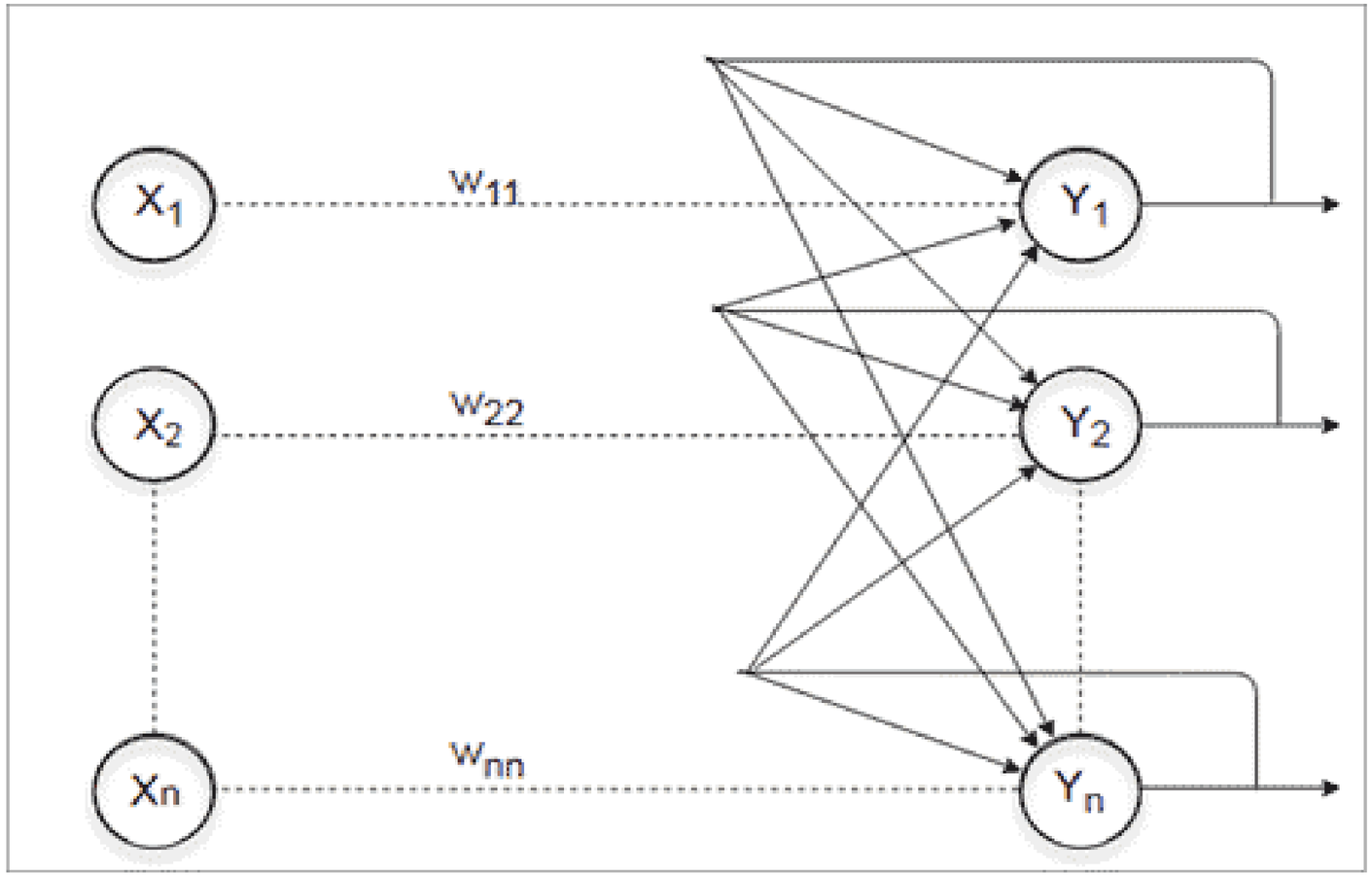
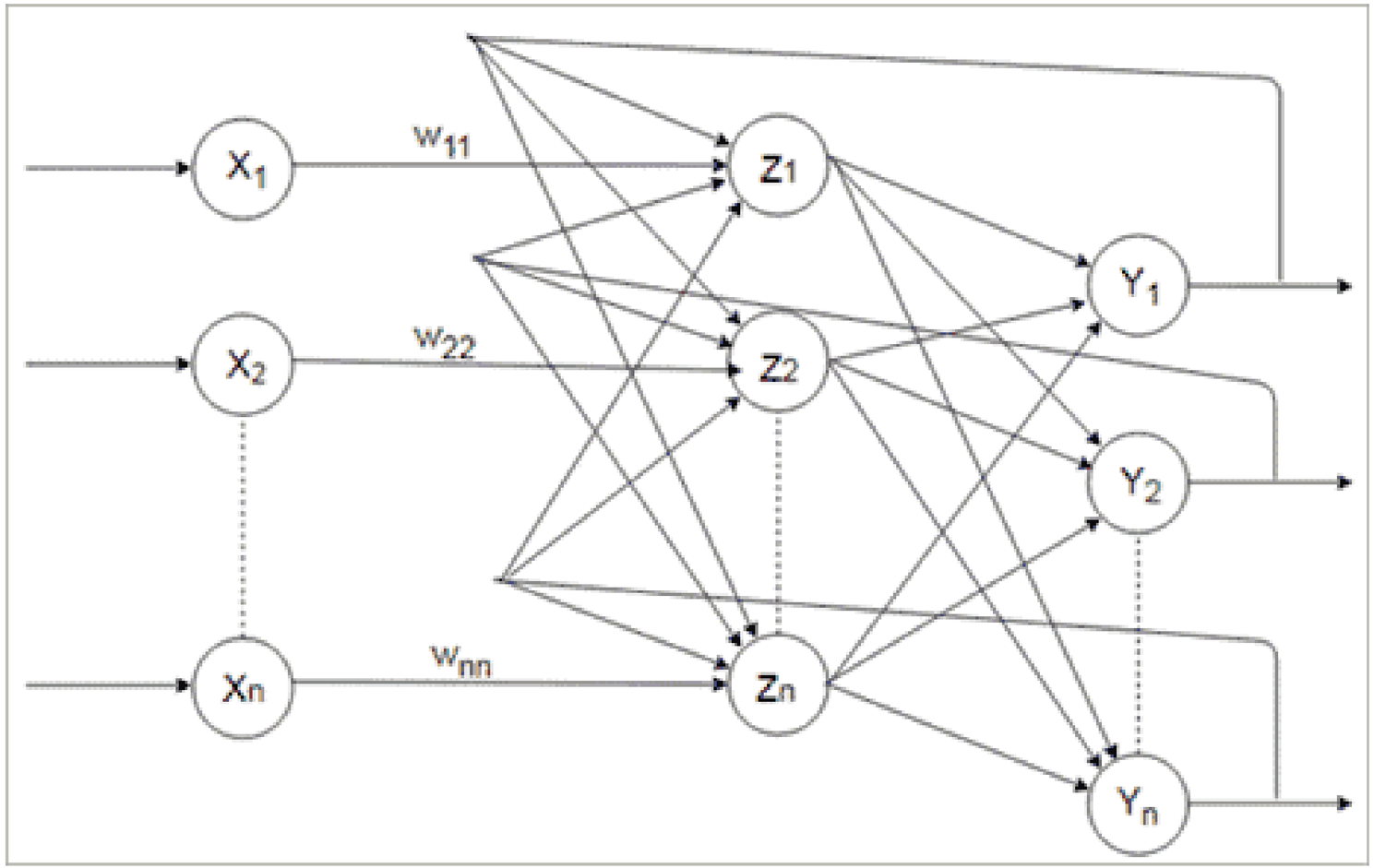


Figure 1

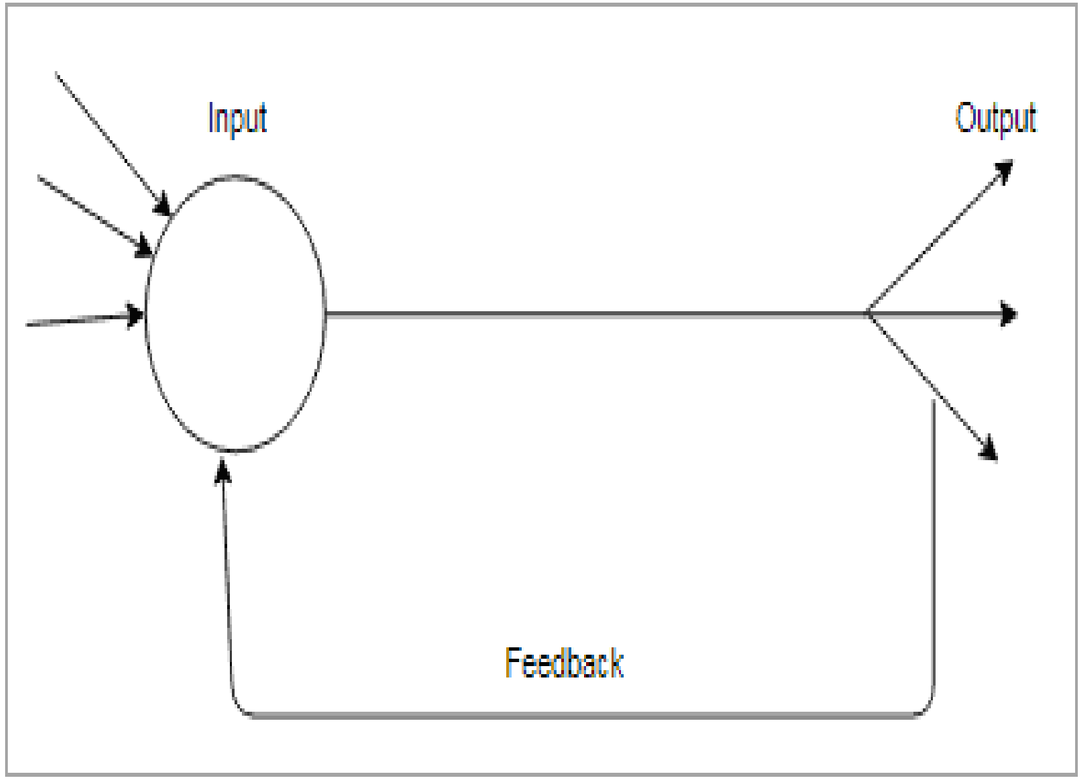
Single layer recurrent network



Multi layer recurrent network



Single node with own feedback



Learning

- **Supervised Learning**
- **Unsupervised Learning**
- **Reinforcement Learning**