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## **FACULTY OF ENGINEERING AND TECHNOLOGY**

**Soft Computing**

**LECTURE -01**

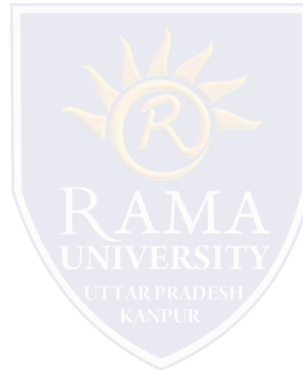
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# OUTLINE

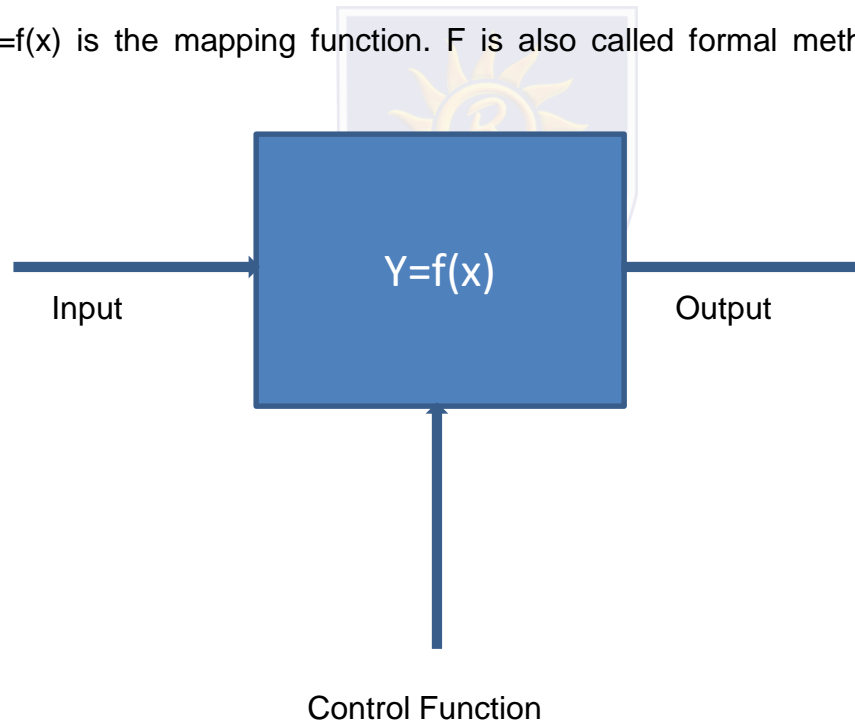
- **Introduction of Concept of Computing**
- **Concept of Soft Computing**
- **Goal of soft computing**
- **Example of soft computing**
- **Artificial neural network(ANN)**
- **Neuron model**
- **Architecture of ANN(Single layer /Multilayer)**



## What is Computing?

A computing means convert input into desired output with the help of some procedure or mapping function.

So here input is called antecedent and output is called consequence. And  $f$  is the function which is used to convert input into output. Here  $y=f(x)$  is the mapping function.  $F$  is also called formal method or algorithm to solve the problem.



## Soft Computing

Soft computing is an emerging approach to computing which parallel the remarkable ability of the human mind to reason and learn in a environment of uncertainty and imprecision.

Some of it's major components includes:

- ❑ Artificial Neural Network(ANN)
- ❑ Fuzzy Logic/ Fuzzy System (FL)
- ❑ Genetic Algorithm(GA)



These methodologies form the core of soft computing. And we can say that soft computing approach solve the problem just like our brain system.

### ▪Goals of soft computing

The main goal of soft computing is to develop intelligent machines to provide solutions to real world problems.

which are not modeled, or too difficult to model mathematically. it's aim is to exploit the tolerance for Approximation,

Uncertainty, Imprecision, and Partial Truth in order to achieve close resemblance with human like decision making.

# EXAMPLES OF SOFT COMPUTING

## ▪ Artificial neural network

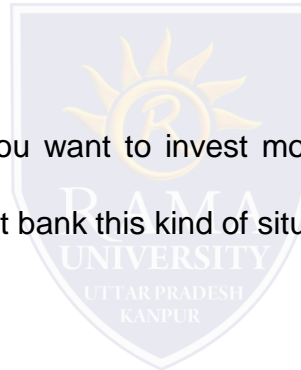
▪ **E.g. Reorganization of hand written character.** Suppose three person write a letter “A” in different writing but our brain system recognized letter “A” correctly.

## ▪ Evolutionary computing

▪ **E.g. Money allocation problem.** Suppose you want to invest money then you have to check which bank give maximum return so you can invest easily on that bank this kind of situation belongs to evolutionary system.

## ▪ Fuzzy logic

▪ **E.g. Robot movement.** Suppose our robot system want to move from one place to another place then how robot decide best optimum path is based on fuzzy logic.



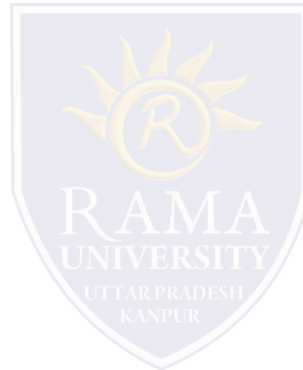
# INTRODUCTION OF ANN AND ITS CHARECTERISTICS

## Artificial Neural Network

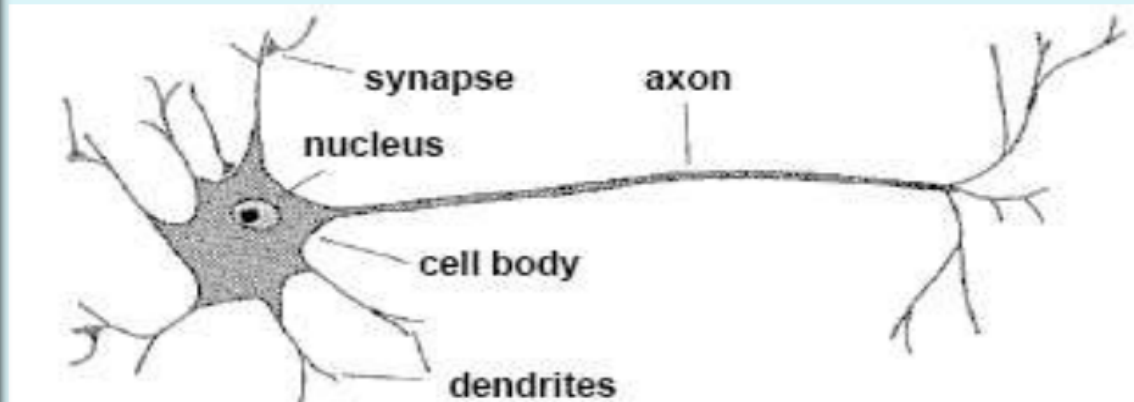
An ANN, in general, is a highly interconnected network of a large number of processing elements called neurons in an architecture inspired by the brain.

### ANN Characteristics are

- Mapping Capabilities / Pattern Association
- Generalization
- Robustness
- Fault Tolerance
- Parallel and High speed information processing
- Low cost Solution

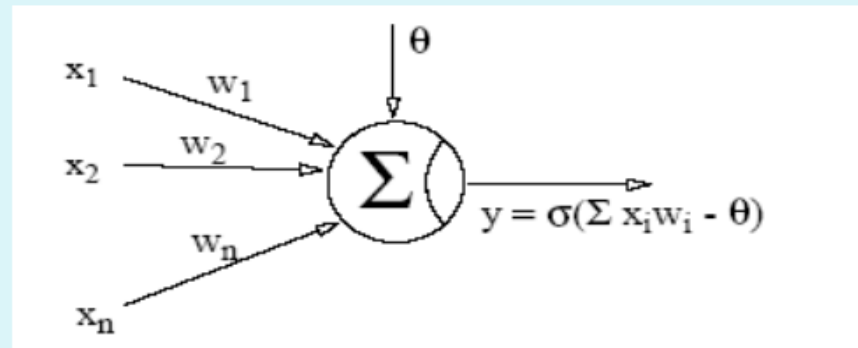


## Neuron

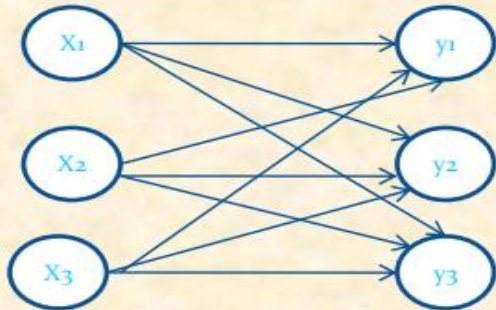


Biological neuron

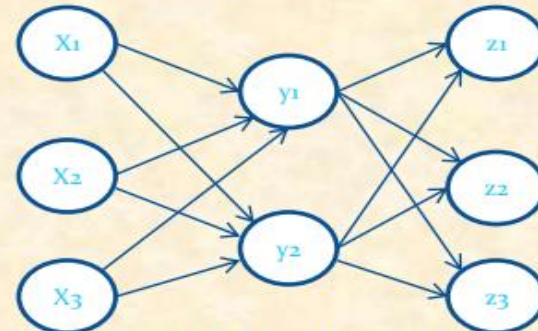
Model of a neuron



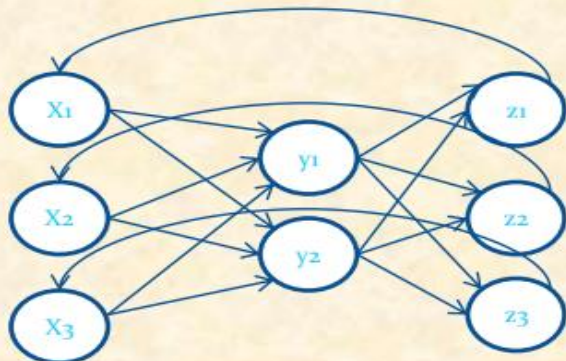
## ANN ARCHITECTURES



Input Layer      Output Layer  
1. Single Layer Feedforward Network



Input Layer      Hidden Layer      Output Layer  
2. Multilayer Feedforward Network



Input Layer      Hidden Layer      Output Layer  
3. Recurrent Networks

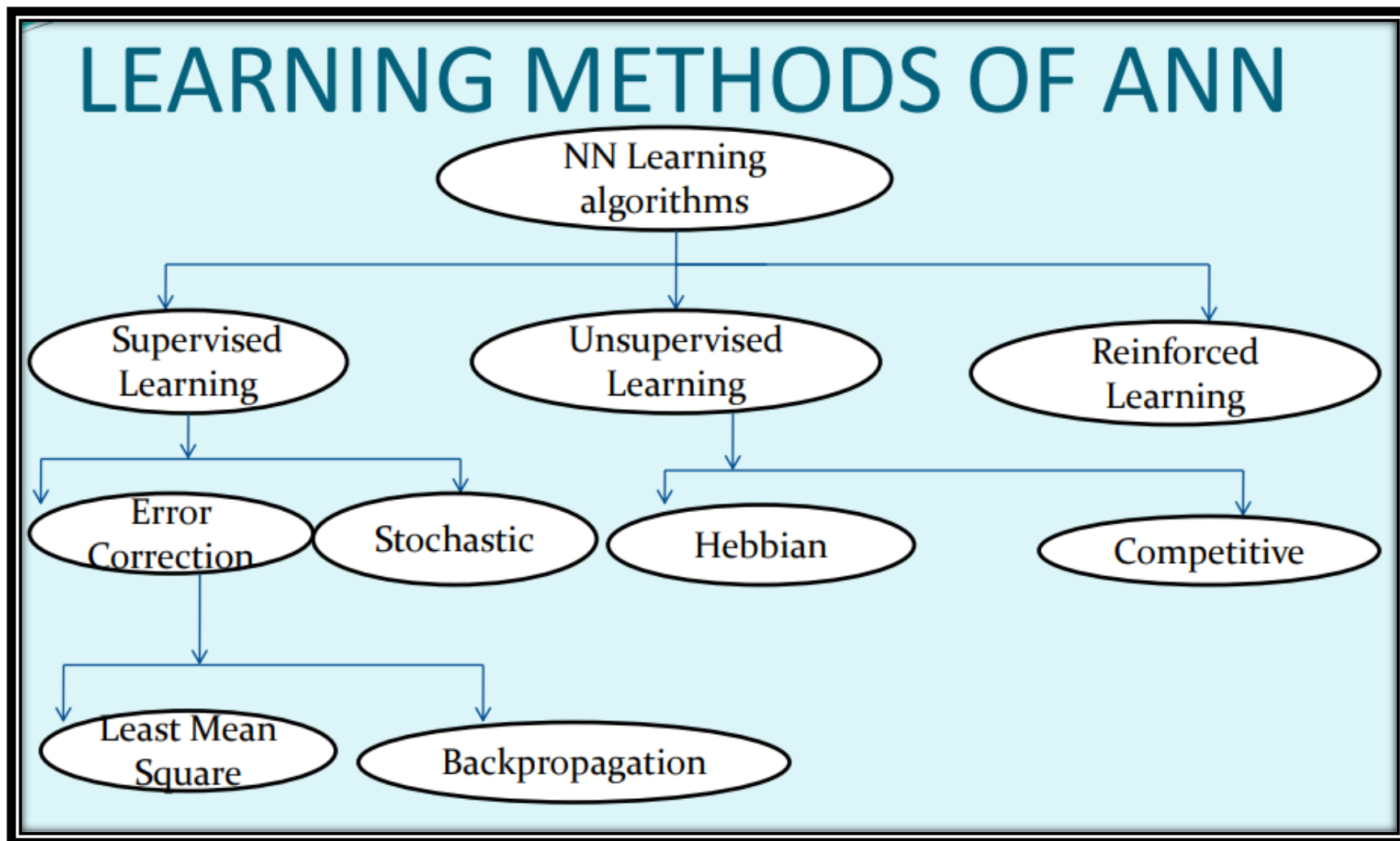
$X_i$  - Input Neuron

$Y_i$  - Hidden / Output Neuron

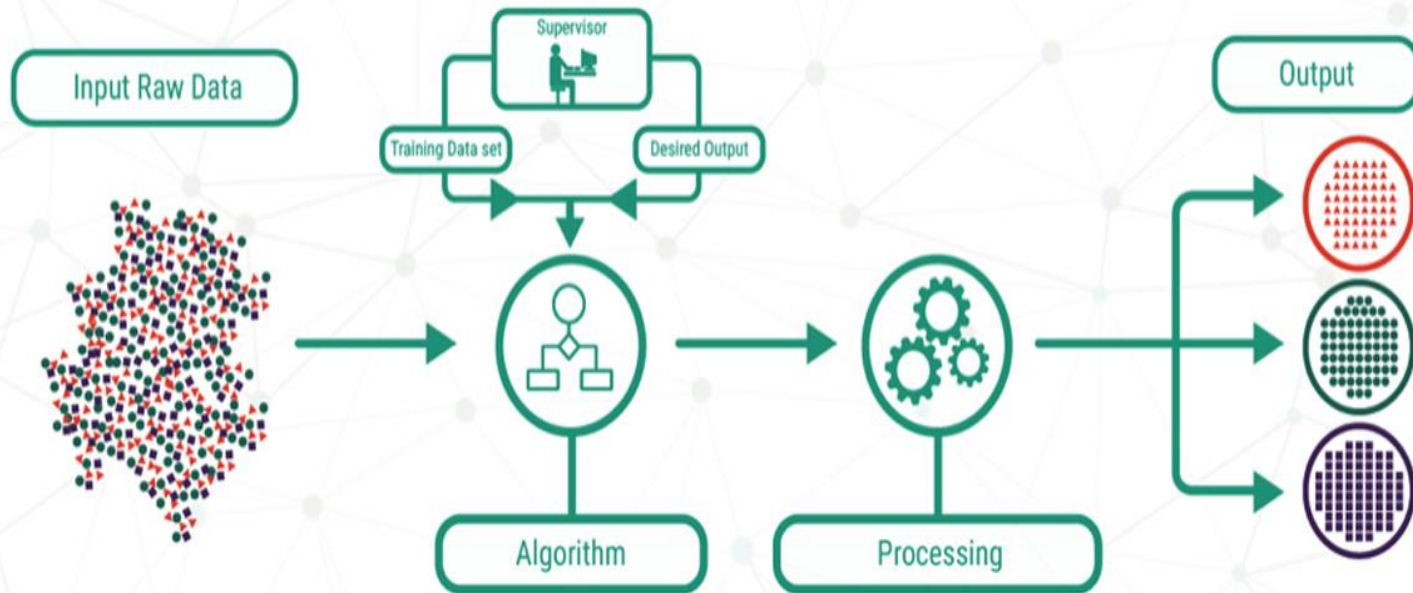
$Z_i$  - Output Neuron

$i = 1, 2, 3, 4, \dots$





## Supervised Learning



# REFERENCES

- ❑ <https://image.slidesharecdn.com/softcorecomputing-121025042248-phpapp02/95/soft-computing-6-638.jpg?cb=1351139029>
- ❑ [https://www.google.com/search?q=supervised+learning&tbm=isch&ved=2ahUKEwi54tWBhczqAhVSeSsKHYYVwC-UQ2cCegQIABAA&oq=superwised+&gs\\_lcp=CgNpbWcQARgAMgYIABAKEBg6BAgAEEM6BQgAELED OglIADoKCAAQsQMQgwEQQzoHCAAQsQMQQzoGCAAQBRAeUPuqlljCyCJg0NoiaABwAHgAgAGwAogBzhKSAQcwLjMuNy4xmAEAoAEBqgELZ3dzLXdpei1pbWc&sclient=img&ei=ckYNX7nhMdLyrQGF4a2oDg&bih=757&biw=1440&safe=strict#imgrc=IN8WA3i9OzXAVM](https://www.google.com/search?q=supervised+learning&tbm=isch&ved=2ahUKEwi54tWBhczqAhVSeSsKHYYVwC-UQ2cCegQIABAA&oq=superwised+&gs_lcp=CgNpbWcQARgAMgYIABAKEBg6BAgAEEM6BQgAELED OglIADoKCAAQsQMQgwEQQzoHCAAQsQMQQzoGCAAQBRAeUPuqlljCyCJg0NoiaABwAHgAgAGwAogBzhKSAQcwLjMuNy4xmAEAoAEBqgELZ3dzLXdpei1pbWc&sclient=img&ei=ckYNX7nhMdLyrQGF4a2oDg&bih=757&biw=1440&safe=strict#imgrc=IN8WA3i9OzXAVM)
- ❑ <https://image.slidesharecdn.com/softcorecomputing-121025042248-phpapp02/95/soft-computing-8-638.jpg?cb=1351139029>

1. A 3-input neuron is trained to output a zero when the input is 110 and a one when the input is 111. After generalization, the output will be zero when and only when the input is?

- a) 000 or 110 or 011 or 101
- b) 010 or 100 or 110 or 101
- c) 000 or 010 or 110 or 100
- d) 100 or 111 or 101 or 001

2. What is perceptron?

- a) a single layer feed-forward neural network with pre-processing
- b) an auto-associative neural network
- c) a double layer auto-associative neural network
- d) a neural network that contains feedback

3. What is an auto-associative network?

- a) a neural network that contains no loops
- b) a neural network that contains feedback
- c) a neural network that has only one loop
- d) a single layer feed-forward neural network with pre-processing

4. A 4-input neuron has weights 1, 2, 3 and 4. The transfer function is linear with the constant of proportionality being equal to 2. The inputs are 4, 10, 5 and 20 respectively. What will be the output?

- a) 238
- b) 76
- c) 119
- d) 123

5. Which of the following is true?

- (i) On average, neural networks have higher computational rates than conventional computers.
  - (ii) Neural networks learn by example.
  - (iii) Neural networks mimic the way the human brain works.
- a) All of the mentioned are true
  - b) (ii) and (iii) are true
  - c) (i), (ii) and (iii) are true
  - d) None of the mentioned

