

Artificial Intelligence



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Artificial Intelligence

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Heuristic

Data

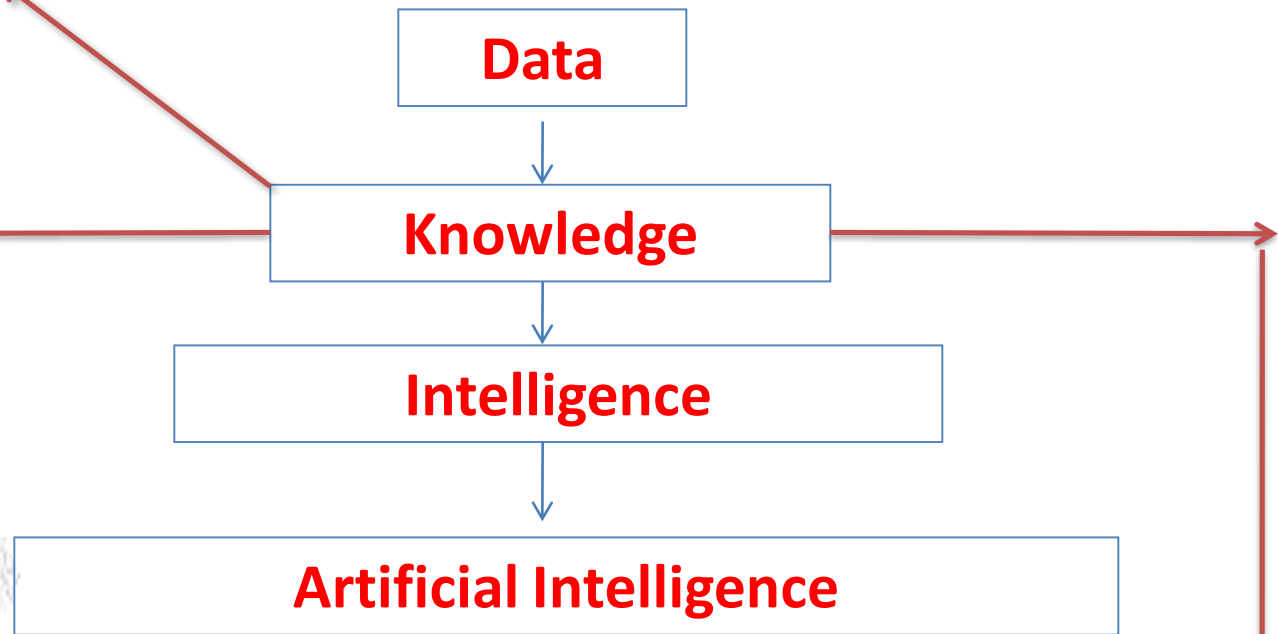
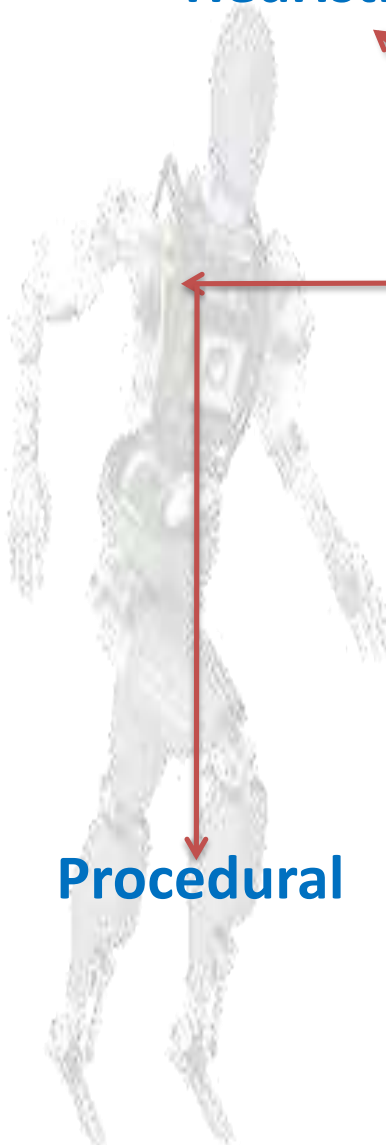
Knowledge

Intelligence

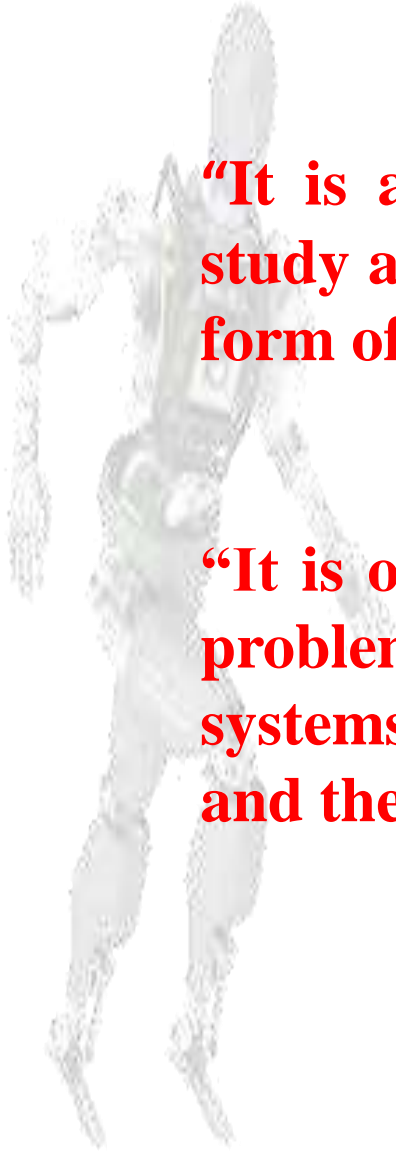
Artificial Intelligence

Procedural

Declarative



Definitions of AI



“It is a branch of computer science concerned with the study and creation of computer system which exhibit some form of Intelligence”

“It is only the computer system where the solution of the problem is discovered by the system itself. In all other systems, the solution is discovered by the programmers and the system executes the solution”

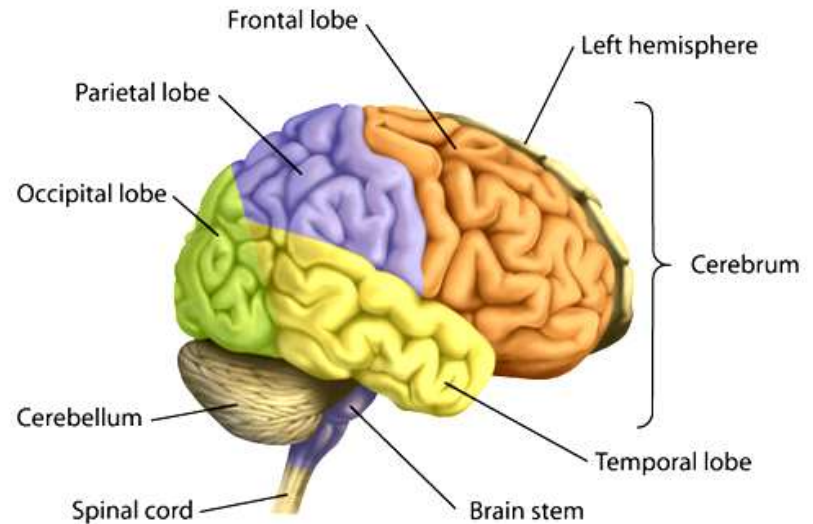
Definitions of AI.....

“It is an Engineering discipline concerned with designing such a computer system which can think like human being, act like human being, think rationally and act rationally”

The Biological Neural Network

Characteristics of Human Brain

- Ability to learn from experience
- Ability to generalize the knowledge it possess
- Ability to perform abstraction
- To make errors



Human Brain

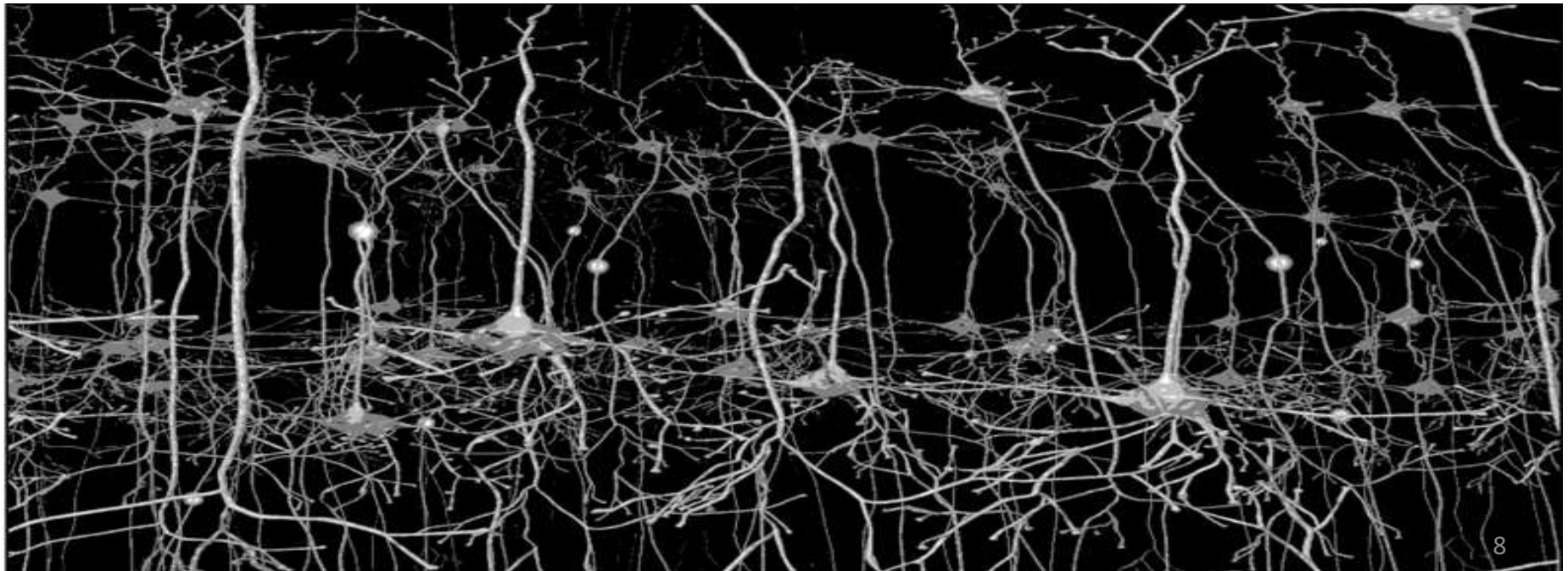
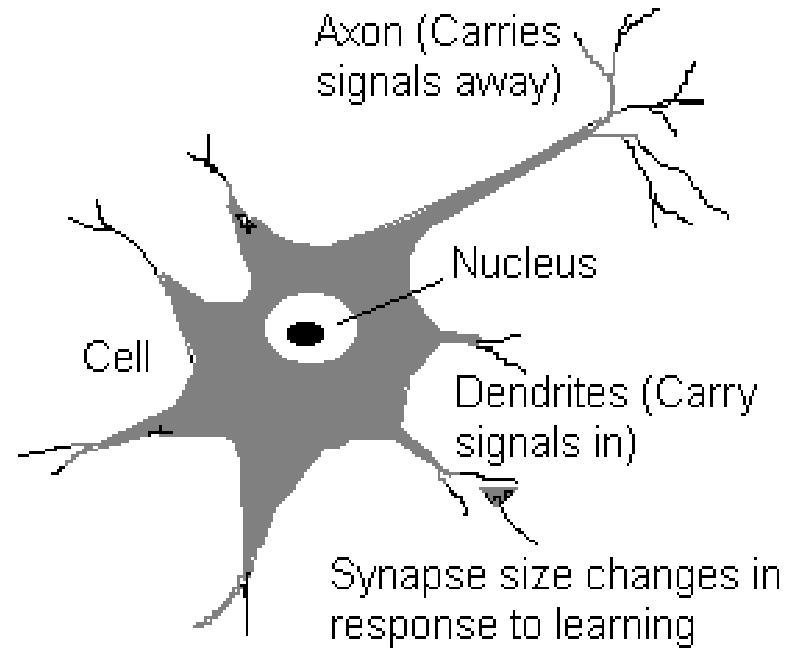
Basic Characteristics →

- **Composed of Billions of Nerve Cells - Neurons**
- **Over one hundred billion neurons.**
- **Over one hundred trillion connections called synapses.**
- **Neurons are responsible for thought emotion, cognition etc.**
- **Consists of a dense network blood vessels.**

The Neuron

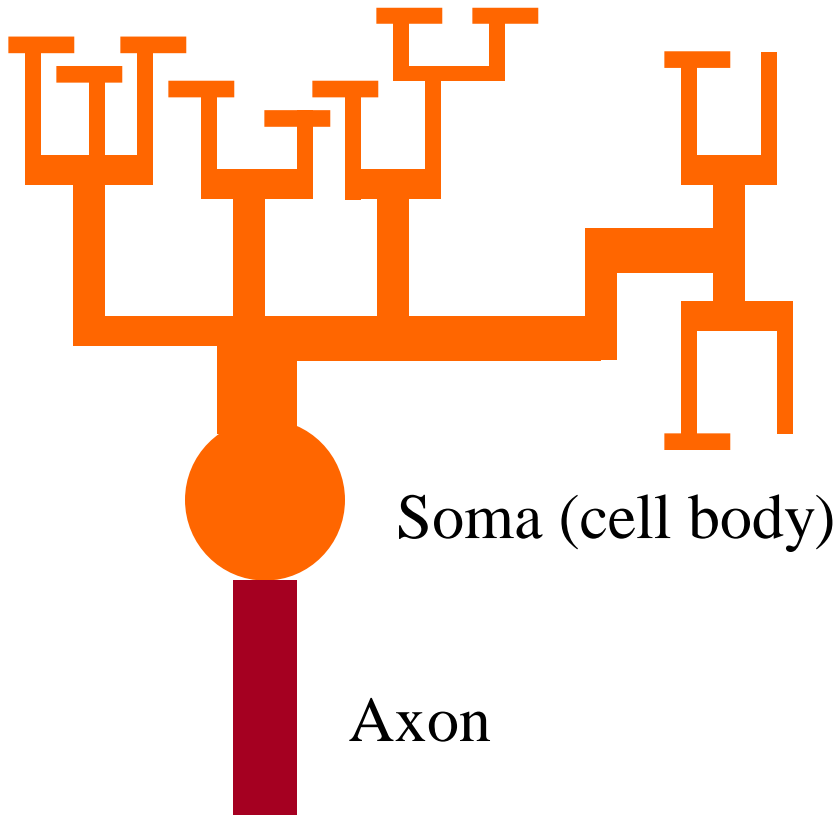
Consists of three sections

- cell body
- dendrites
- axon

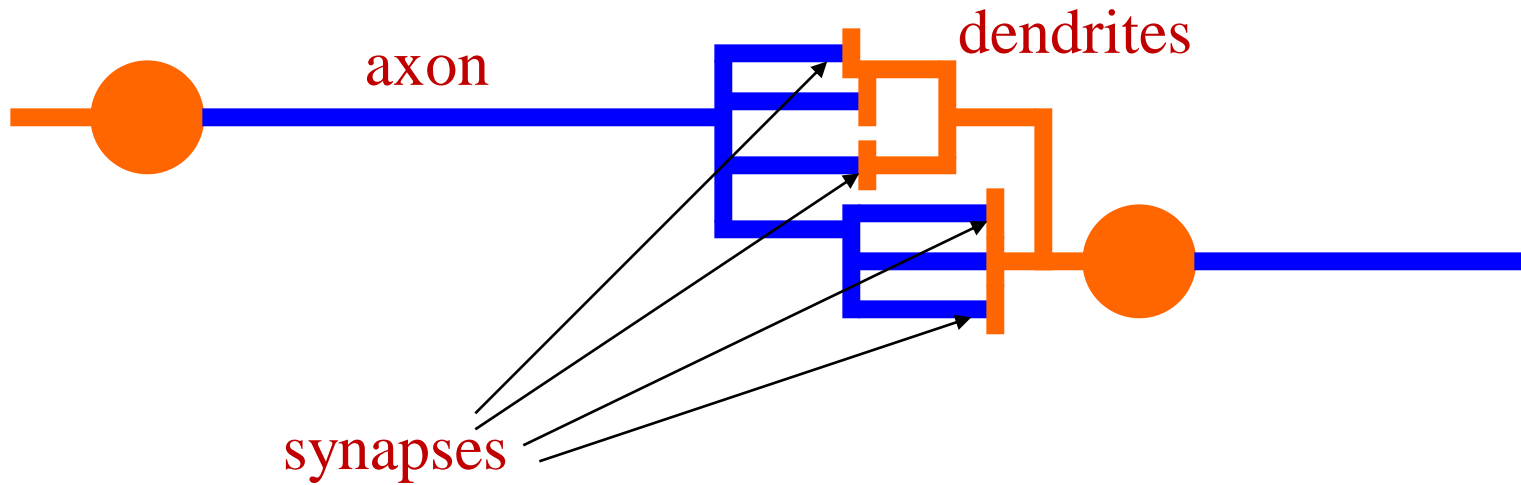


Biological inspiration

Dendrites

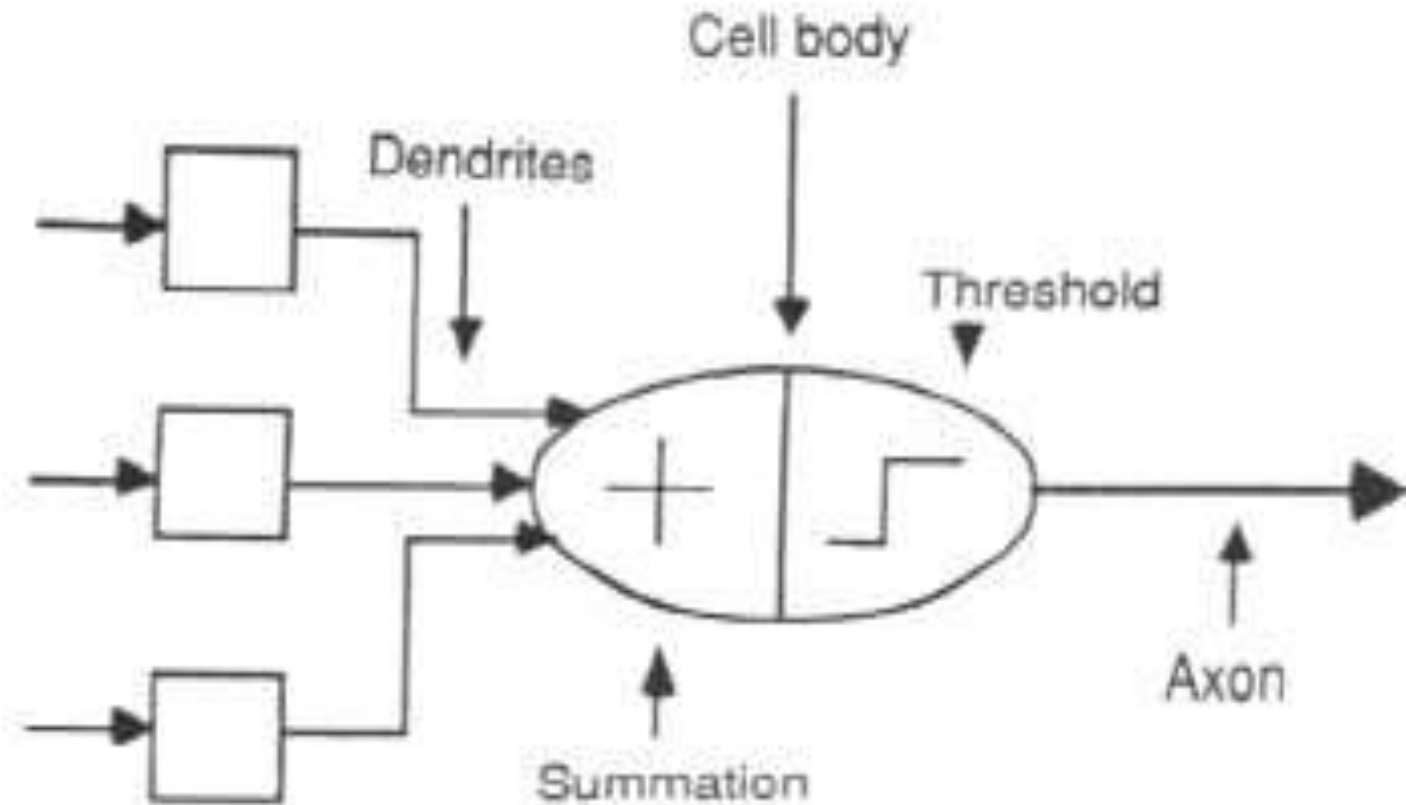


Biological inspiration

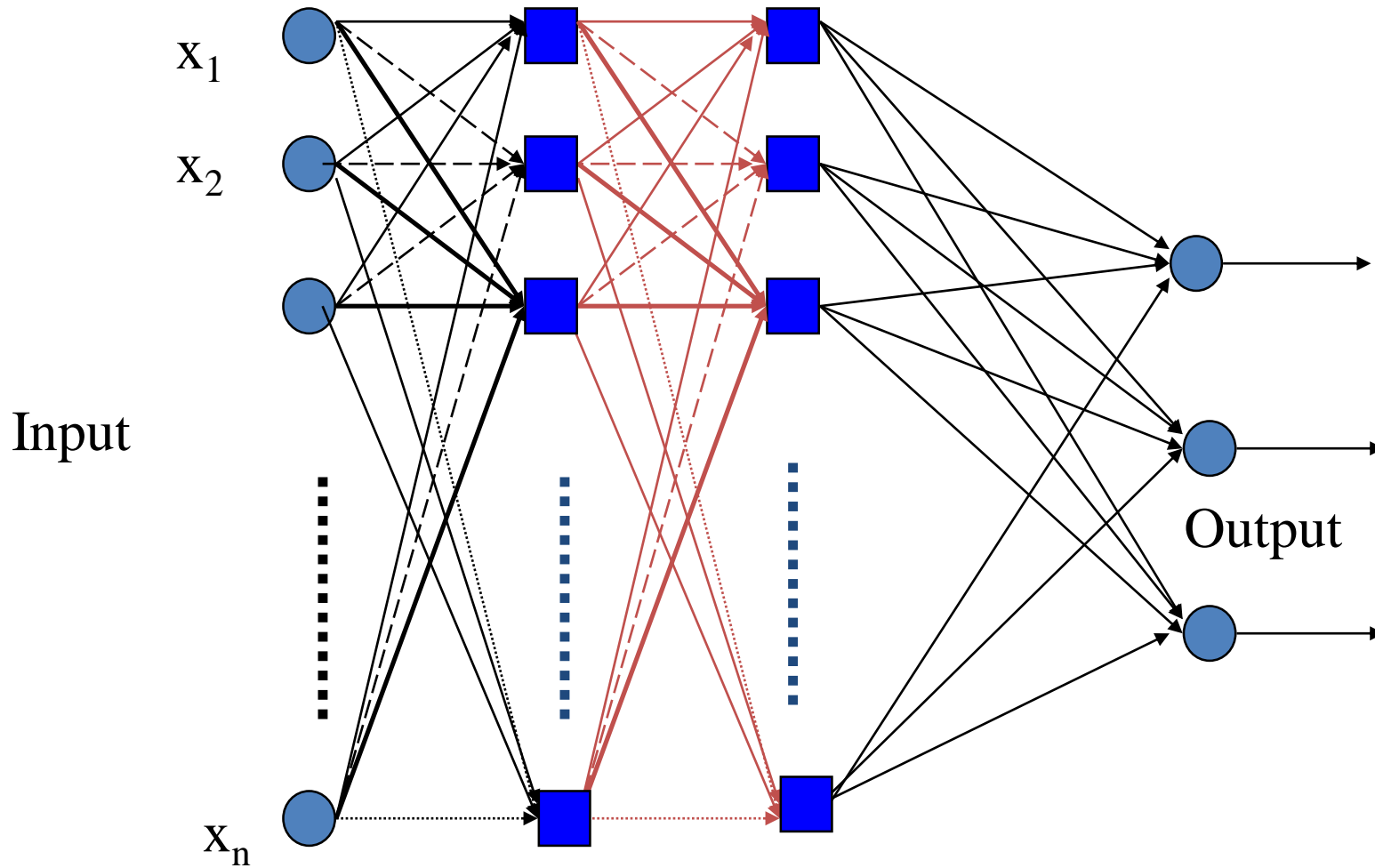


The information transmission happens at the synapses.

Biological Neuron



An Example of Three-Layer Feed-forward Networks



It resembles brain in 2 respects

Knowledge is acquired by the network through a learning process.

Interneuron connection strengths known as synaptic weights are used to store the knowledge.

Why Artificial Neural Network ?

➤ **An artificial neural network is composed of many artificial neurons that are linked together according to a specific network architecture. The objective of the neural network is to transform the inputs into meaningful outputs.**

➤ **ANN is an information processing paradigm inspired by biological nervous systems. The key element of this is the novel structure of information processing system. It is composed of a large number of highly interconnected processing elements (neurons) working in unison to solve specific problems.**

Expert system



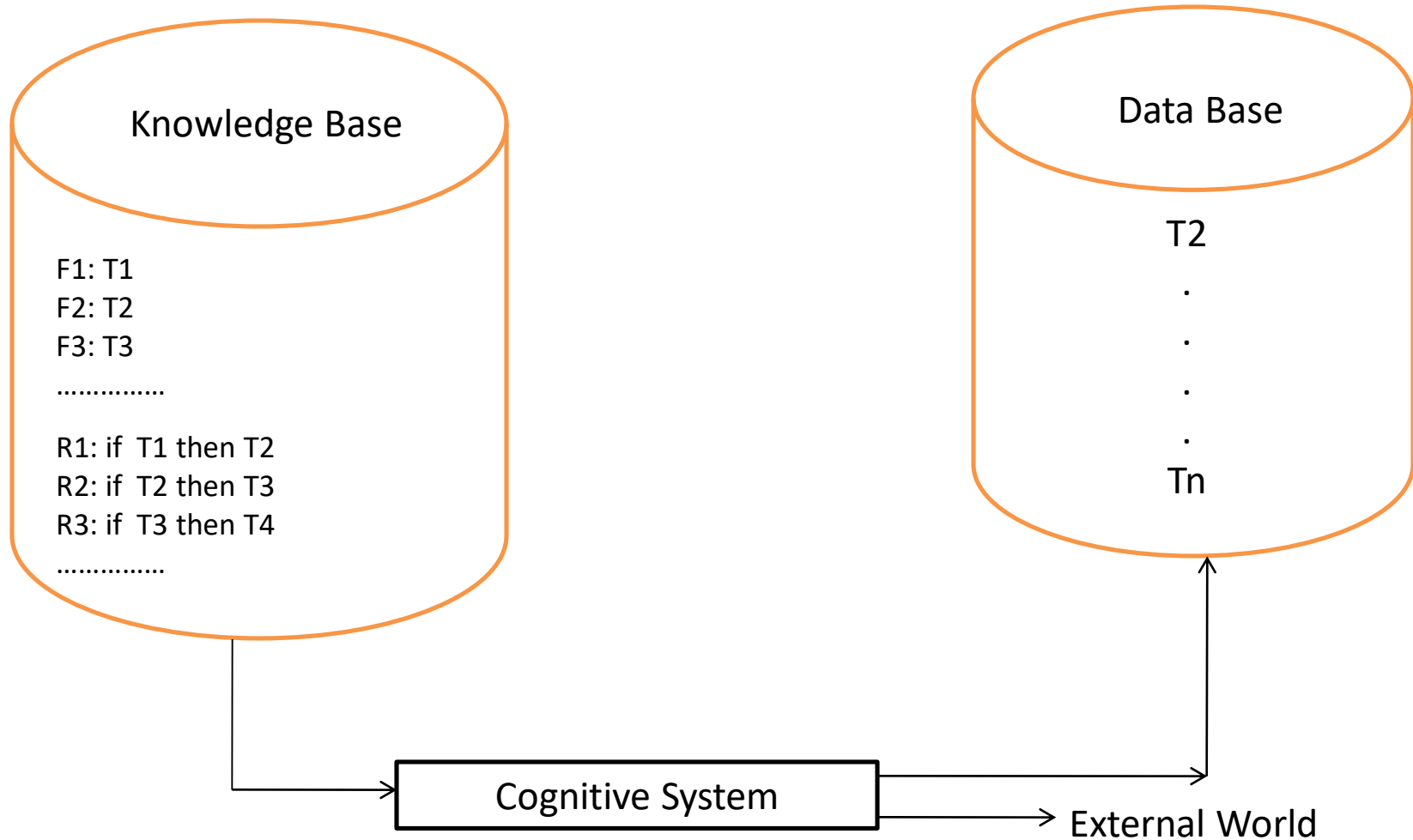
Definition

- **It can be defined as a computer program that simulates the judgment and behavior of a human or an organization that has expert knowledge and experience in a particular field.**
- **An expert system may be viewed as a computer simulation of a human expert.**
- **Expert systems make extensive use of specialized knowledge to solve problems at the level of a human expert**

Expert System Vs. Conventional System

- Expert system use knowledge rather than data to control the solution process. Here the knowledge is used generally heuristic in nature rather than algorithmic.
- Expert system are capable of explaining how a particular conclusion was reached and why requested information is needed during a consultation.
- Expert systems use symbolic representations for knowledge (Frames, Scripts, Graphs, etc.) and perform their inference through symbolic computations.

Design Principle



Design Principle (Ctd.)

Knowledge Base

The knowledge stored in knowledge base are treated as “Constant Knowledge” or “Passive Knowledge”

The knowledge base translates the knowledge of an expert in a precise and limited domain.

It has two fundamental elements: **1) Fact 2) Rule**

A fact is a simple assertion, i.e., a declaration made to the system.

Example: The Sky is Cloudy, It is Hot, etc.

A Rule is an inference which partitions the fact in terms of If-Then clause.

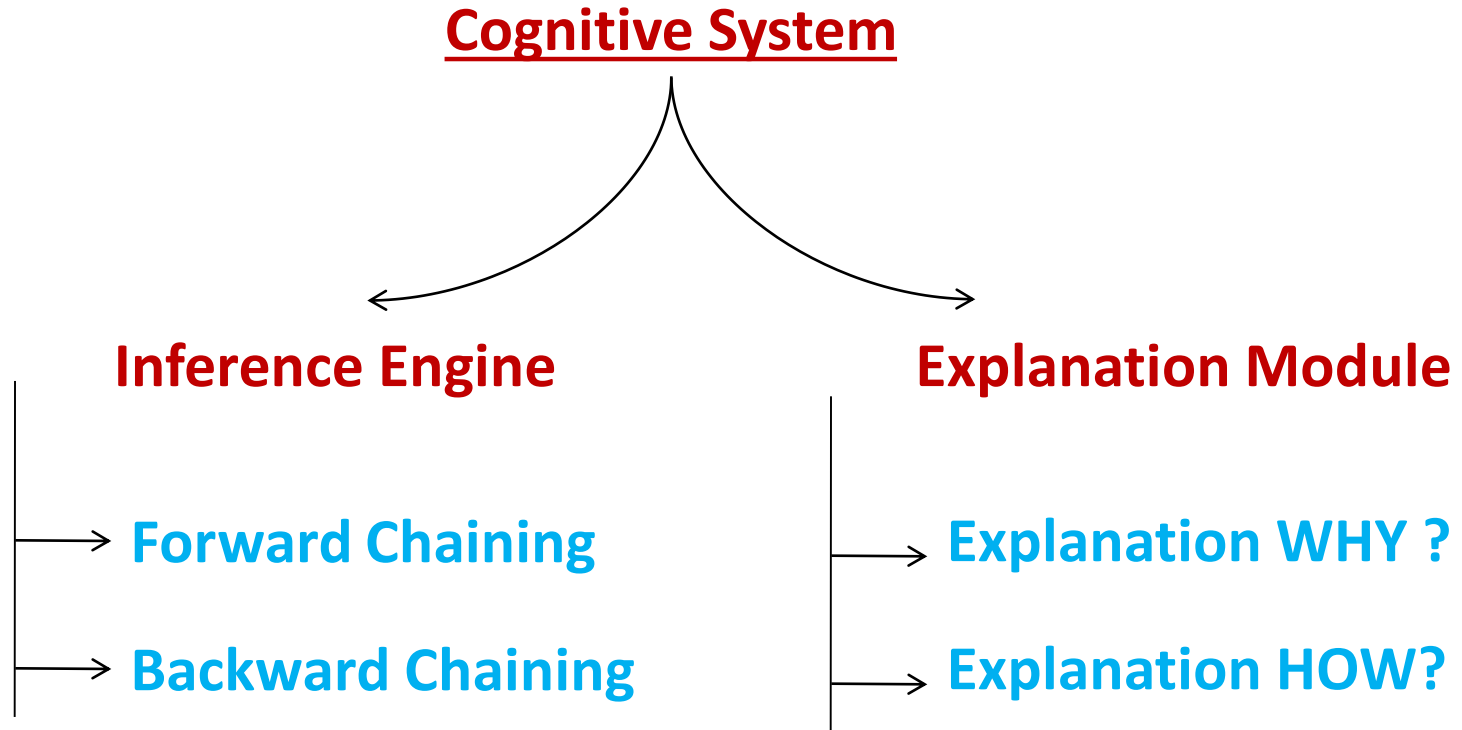
Design Principle (Ctd.)

Data Base

The knowledge stored in Data base are treated as “Volatile Knowledge”.

The Data base possesses two methods for enriching the data. The first is internal mechanism, called inference engine and the second is to communicate with external worlds to obtain the results. This interaction can be carried out through different learning process.

Design Principle (Ctd.)



Design Principle (Ctd.)

Explanation WHY ?

U : Is B son of A ?

S: Is the following true?

A is the father of B.

U: Why?

S: I need the fact:

A is the father of B to establish the following fact “B is the son of A”.

By using the rule no. 4:

If A is the father of B then B is the son of A.

U: True

S : Yes, B is the son of A

Design Principle (Ctd.)

Explanation HOW ?

S: My diagnosis is “A is the father of B”

U: How?

S: The result was obtained by the addition of following facts and rules.

Fact no 11: A is the parent of Hari.

Fact no 15: A is a male.

Rule 110: X is father of Y :

X is parent of Y, X is male.

So A is the father of B.

Why we need an Expert System

- **Humans are unable to comprehend large amounts of data quickly.**
- **Humans can't retain large amount of data in memory.**
- **Humans forget the steps of important details of a problem.**
- **Humans get tired from physical or mental work load after doing lots of operations.**
- **The working capacity of humans is very low.**
- **Humans are very slow in recalling the important tasks.**
- **Humans can't take consistent decisions on day after tomorrow.**
- **Humans are not accurate or can't keep the accuracy after solving lots of complex operations.**
- **Humans deliberately avoid decision responsibilities.**

Applications of Expert System

- **Diagnosis of complex electronics and electromechanical systems.**
- **Diagnosis of software development projects.**
- **Location of faults in computer and communication systems.**
- **The design of very large scale integration systems.**
- **Identifications of chemical compound structure and chemical compounds.**
- **Numerous applications related to space planning and exploration.**



Any query

THANK U