

**AI**

**A**rtificial  
**I**ntelligence

# **Artificial Intelligence :**

**1) Charniak, E. & McDermott, D. 1985**

***Introduction to Artificial Intelligence***

***Reading, Massachusetts: Addison – Wesley***

**2) Rich, E. 1983.**

***Artificial Intelligence,***

***New York: McGraw – Hill***

**3) Winston, P. H. 1984.**

***Artificial Intelligence (2<sup>nd</sup> Edition)***

***Reading, Massachusetts: Addison – Wesley***

**4) *Artificial Intelligence & the Design of Expert Systems***

***By: George F. Luger & William A. stubblefield 2009***

# **Expert Systems:**

## ***1) Introduction To Expert Systems***

***F. Hayes – Roth***

***Addison***

## ***2) Expert Systems Techniques & Applications***

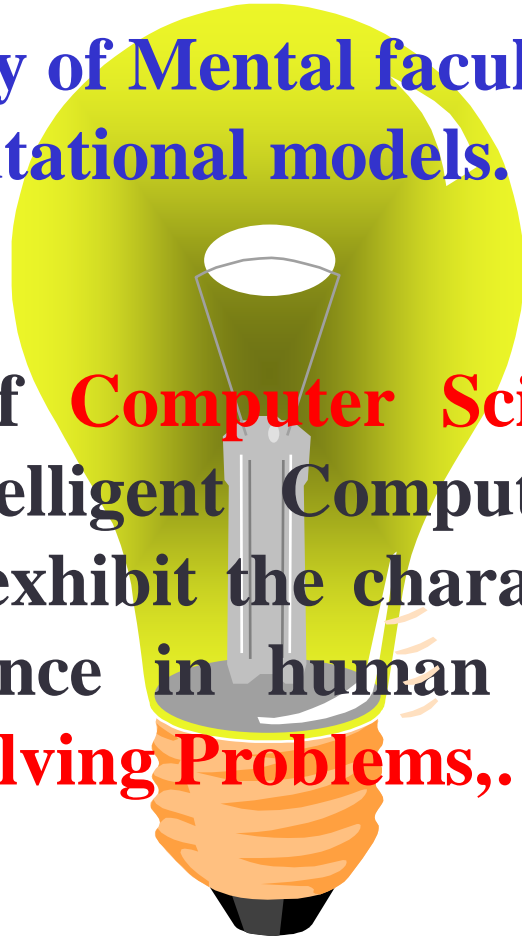
***P. Jackson***

***Addison***

# What is AI?



- **AI** is the study of Mental faculties through the use of Computational models.
- **AI** is part of **Computer Science** concerned with designing intelligent Computers System, that is, systems that exhibit the characteristics we associate with intelligence in human behavior:- **Learning, Reasoning, Solving Problems,....**



# **AI & The World**

❖ AI Researches are trying to create a computer which think

❖ AI applications :-

✓ Robotics

✓ Natural language processing

✓ Vision

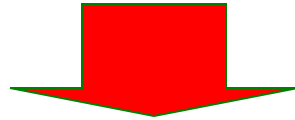
✓ Speech

✓ Expert systems

# *What is AI about?*

❖ AI is getting computers to do things that seem to be intelligent

❖ “INTELLIGENCE” is a vague word



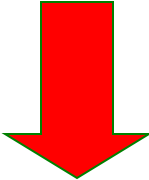
AI is not well-defined field

- Advanced SW engineering (sophisticated SW techniques for hard problems that CAN'T be solved in an easy way).
- Non-numeric ways of solving problems.

❖ **AI** is concerned with programming computers to perform tasks that are presently done by humans.

❖ **AI goal:-**

**To build a person or an animal**

**Fundamental**  **assumption**

**What the brain does may be thought of at some level as a kind of computation**

# ***AI includes getting computer to :***

- ❖ **Communicating in Natural Language (NLP)**
- ❖ **Remember complicated interrelated fact, and draw conclusion from them (Inference)**
- ❖ **Plan sequence of action to accomplish goals (Planning)**
- ❖ **Offer advice based on complicated rules (ES)**
- ❖ **Look through cameras & see what's there (Vision)**
- ❖ **Move objects (Robotics)**

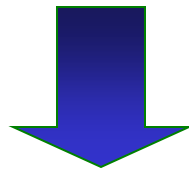


# **Why AI is not a science ?**

- ❖ AI does not quite fit in with other categories of science.
- ❖ Most areas of AI do not develop in the way that a the mathematical area traditionally develops.
- ❖ AI does not fit in the general model of physical science.
- ❖ In AI we are almost never in the business of finding theories or descriptions of existing physical phenomena which are identical by experiment, or using experiments to look in nature for phenomena which those theories or descriptions predict.

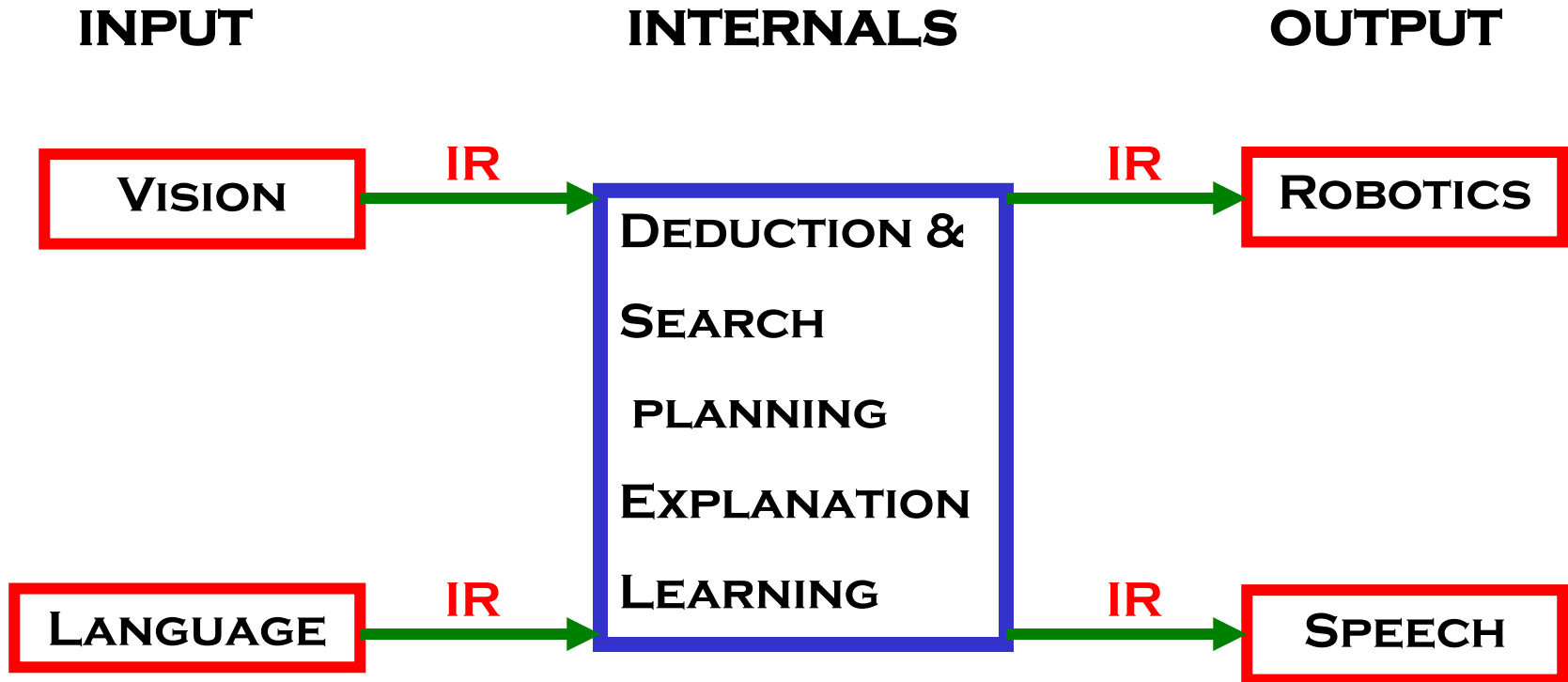
❖ **AI** can be distinguished from other sciences in that it refers to objects (Programs or conceptual structures capable of being realized in programs) which are created by humans rather than objects having a prior natural existence.

**AI CAN BE VIEWED AS A TECHNOLOGY**



**DEALS WITH CREATED OBJECTS**

# *MENTAL FACULTIES*



**IR** : INTERNAL REPRESENTATION

# **Major Application area**

## ***Fundamental concerns***

- ◆ Knowledge Represents : Addresses the problem of capture the full range of knowledge required for intelligent behavior formal language.
- ◆ Search : Is a problem – solving techniques that systematically explore a space of problem state.

1) **Game playing** (board game)

***Well – defined set of rules.***

***Easy representation of board***

***Generate extremely large search spaces (heuristics)***

## 2) Automated Reasoning and Theorem proving.

Representing the problem description and relevant background information as logical axioms and treating problem instances as theorems to be proved.

## 3) Expert Systems

Problems – solving in a domain – specific knowledge.

Expert knowledge in a combination of :

✓ *Theoretical understanding of the problem*

✓ *A Collection of heuristic problem – solving rule*

*(DENDRAL, MYCIN, PROSPECTOR, INTERNIST, XCON).*

**4) Natural language understanding: the creation of computers that are capable of understanding human language.**

**5) Planning robotics.**

**☐ Planning assumes a robot that is capable of performing certain atomic actions, It attempts to find a sequence of those actions that will accomplish some higher–level tasks such as moving across an obstacle-filled room.**

**6) Machine Learning.**

**☐ Unlike a human being, an expert, if it's given the same or similar problems a second time, will not remember the solution. It performs the same sequence of computation again.**

**☐**

# **THE AI SCIENTIFIC ISSUES**

**What are the central scientific issues of the AI field from Which this more applied research draws its inspiration?**

- 1) Knowledge Representation: How will the knowledge of the field be represented as a data structure in the memory of the computer, so that it can be conveniently accessed for a problem-solving?**
- 1) Knowledge utilization: How can this knowledge be used in problems – solving? What design for the inference engine is available?**
- 3) Knowledge acquisition: How is it possible to acquire the knowledge so important for problems – solving automatically?**

- So AI is a branch of computer science that is concerned with the automation of intelligent behavior.
- Because Intelligence is an ambiguous (vague) word so AI is not a well-defined field

**AI is a part of computer science**



**Based on theoretical and applied principles in that field:**

- ❖ **Data structure used in knowledge representation**
- ❖ **Algorithms needed to apply that knowledge**
- ❖ **Language and programming techniques used in their implementation**



**The problem of defining A.I. becomes one of defining intelligence itself.**

- 1) Is Intelligence a single faculty, or is it just a name for a collection of distinct unrelated abilities?**
- 2) To what extent is intelligence learned as opposed to having an a priori existence?**
- 3) What happens when learning occurs?**
- 4) What is creativity? Intuition?**
- 5) Can Intelligence be inferred from observable behavior, or does it require evidence of a particular internal mechanism?**
- 6) How is knowledge represented in the nerve tissue of living beings, and what lessons does this have for the design of intelligence machines?**
- 7) Is it even possible to achieve intelligence on a computer, or does an intelligent entity require the richness of sensation and experience that might be found only in a biological existence?**

- All these unanswered questions have helped to shape the problems and solution methodologies that constitute the core of modern A.I.
- Different interpretations have been used by different researchers as defining the scope and view of Artificial Intelligence.

1. One view is that artificial intelligence is about designing systems that are as intelligent as humans. This view involves trying to understand human thought and an effort to build machines that emulate the human thought process. This view is the cognitive science approach to AI.

2. The second approach is best come to life by the concept of the Turing Test. Turing held that in future computers can be programmed to acquire abilities equaling human intelligence.

# Turing Test

**Consider There are two rooms, A and B. One of the rooms contains a computer. The other contains a human.**

**The interrogator is outside and does not know which one is a computer. He can ask questions through a teletype and receives answers from both A and B.**

**The interrogator needs to identify whether A or B are humans. To pass the Turing test, the machine has to fool the interrogator into believing that it is human**



**The turning test**

- 1) The turning test measures the performance of an allegedly intelligent machine against that human being.**
- 2) The intelligence to distinguish the computer from the human being interrogator.**
- 3) Comparing machine performance on a given set of problems to that of a human expert.**

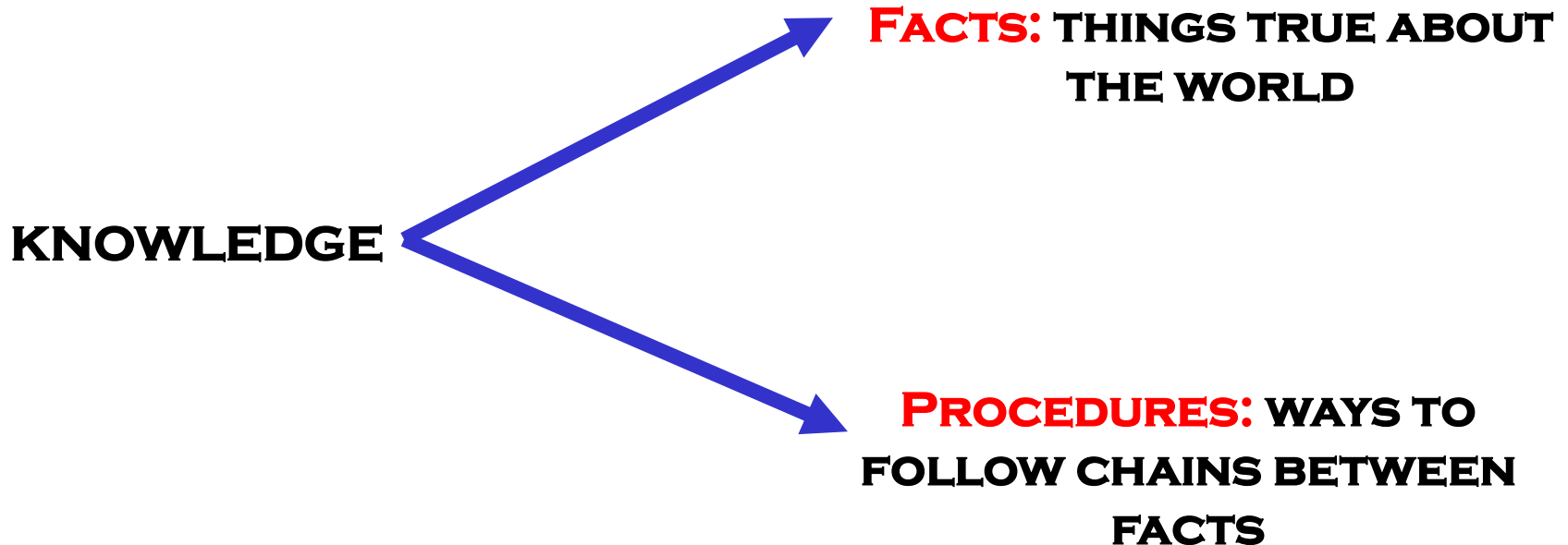
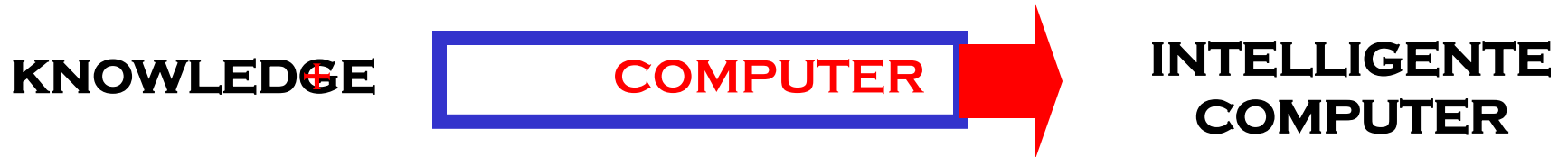
- 3. Logic and laws of thought deals with studies of ideal or rational thought process and inference.**

**The emphasis in this case is on the inferencing mechanism, and its properties.**

**That is how the system arrives at a conclusion, or the reasoning behind its selection of actions is very important in this point of view.**

## **REPRESENTING FACTS**

The two most fundamental concerns of A.I. are knowledge representation and search  
If we need to build intelligent computers we must tell to them all the common sense  
(knowledge) we have that they don't.



## • Two main types of knowledge :

- **Declarative Knowledge** : it means what do you know (Fact) , things true about

the world summation 2 and 2 is 4.

sum(2, 2, 4).

sum (2, 5, 7).

eg. : computer (cpu).

computer (memory).

computer (input).

computer(output).

- **Procedural knowledge** : how to do things (rules). Rules are a good way of represent

procedural knowledge

- eg. how to multiply 2 numbers or ahmed is grand father of mohamad

grandfather (ahmed , mohamad):- male(ahmed),male (hardi),

father(ahmed, hardi),

father(hardi, mohamad)