

**University of Science and Technology**  
**Faculty of Computer Science and Information**  
**Technology**



# **Artificial Intelligence (AI)**



**4<sup>th</sup> Year B.Sc : Information Technology**

**Academic Year : 2017-2018**

**Instructor : Diao Eldin Mustafa Ahmed**

**Introduction to AI –(1/2)**

# Overview of Human Intelligence and Science challenges

❑ Philosophers have been trying for over two thousand years to understand and resolve two big questions of the universe:

➤ How does a human mind work ? And

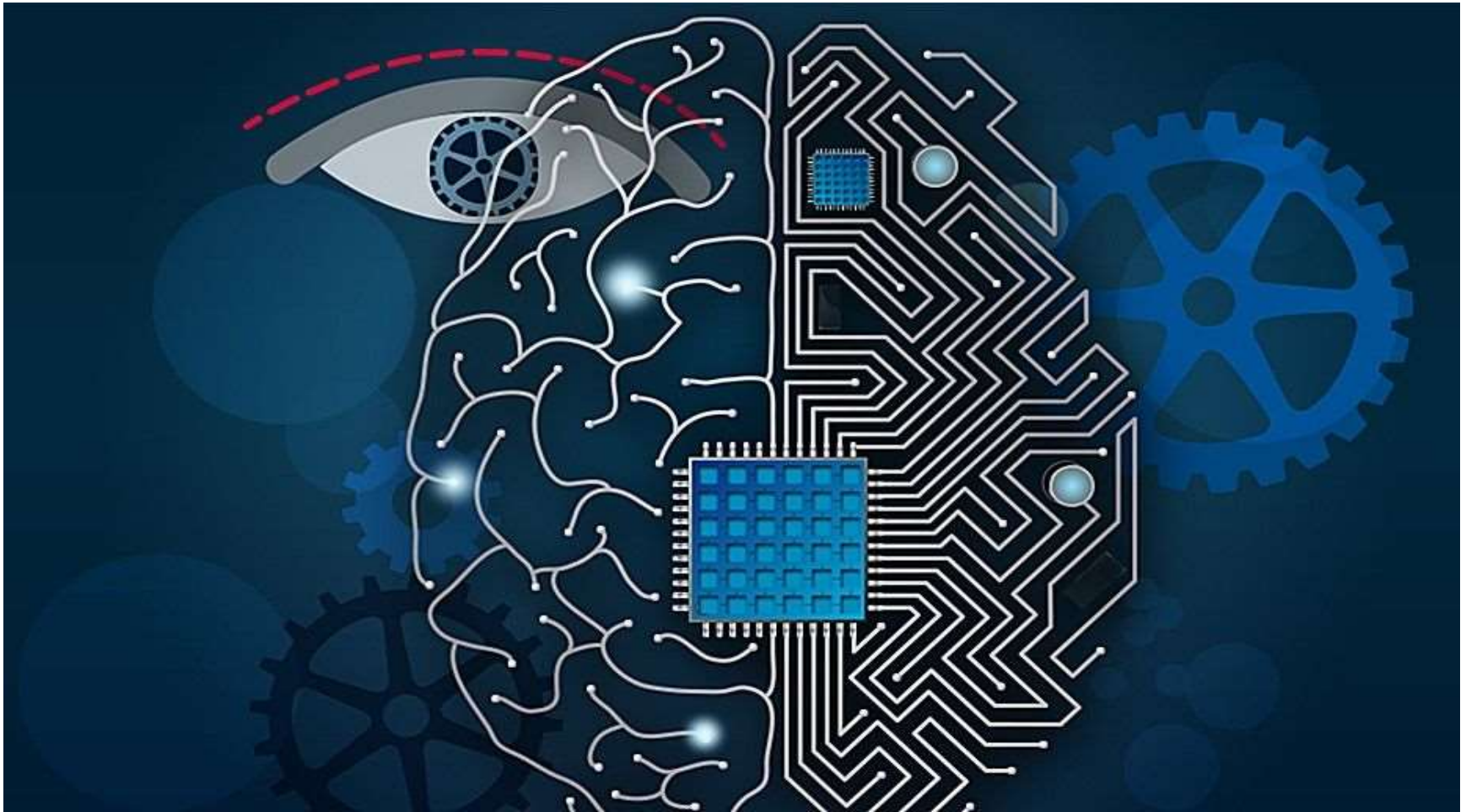
كيف يعمل عقل الإنسان

➤ Can non-humans (machines/ Software) have minds?

هل من الممكن أن يكون (للآلات / البرمجيات) عقل

❑ However, these questions are still unanswered .

# Overview of Human Intelligence and Science Challenges



# Overview of Human Intelligence and Science challenges

- ❑ Some philosophers have picked up the computational approach originated by computer scientists and accepted the idea that **machines can do everything that humans can do.**
- ❑ Others have openly opposed this idea, claiming that such highly sophisticated behaviors such as **love**, **creative discovery** and **moral choice** will always be beyond the scope of any machine.

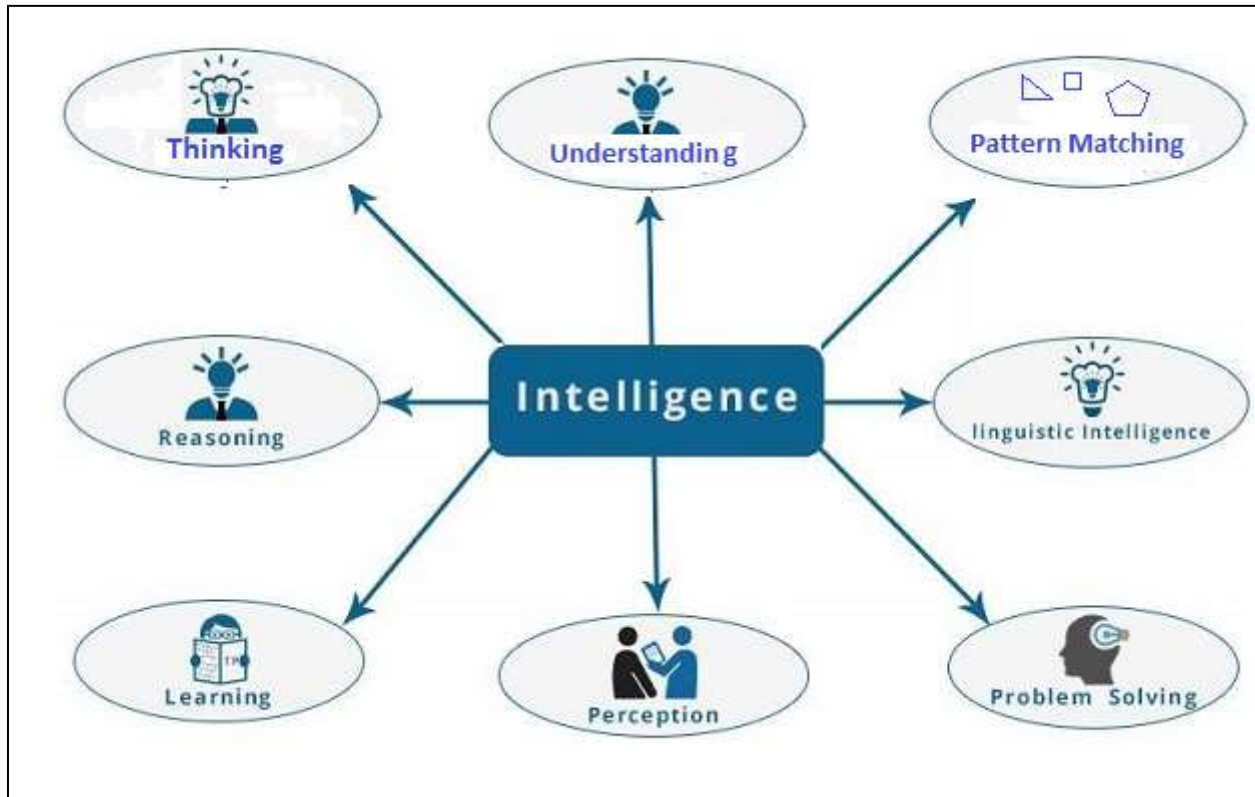
# Overview of Human Intelligence and Science challenges

- ❑ The nature of philosophy allows for disagreements to remain unresolved.
- ❑ In fact, engineers and scientists have already built machines that we can call 'intelligent'. So what does the word 'intelligence' mean?
- ❑ Let us look at a dictionary definition.
  - 1 - Someone's intelligence is their ability to understand and learn things.
  - 2 - Intelligence is the ability to think and understand instead of doing things by instinct or automatically

# What is Human Intelligence ?

- ❑ It is composed of :
  - **Thinking** (abstractly, using analogies)
  - **Learning** and **understanding** from experience
  - **Knowledge applying** successfully in new situations
  - **Acting** in complex environments,
  - **Perceiving** one's environment
  - **Automated behaviors.**
  - **Solve problems** and to make decisions.
  - **Pattern matching** and **recognition.**
  - **Reasoning** (to solve problems and discover hidden knowledge)
  - **Inference** and **prediction.**
  - **Perception.**
  - **Analysis .**
  - **Linguistic Intelligence.**
  - **Creativity , Ingenuity , Expressive-ness, Curiosity.**

# What is Human Intelligence ?



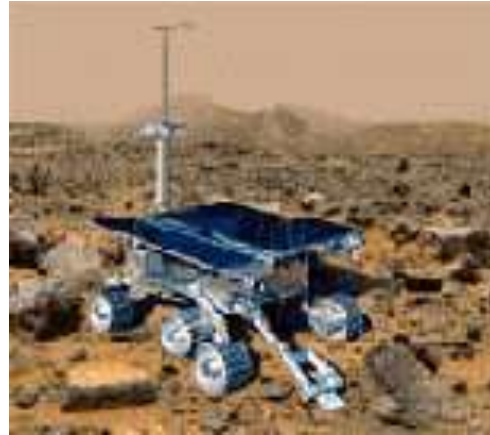
# What is Intelligent Systems ?

## □ The ability of a system to :

- Calculate
- Reason
- Perceive relationships and analogies
- Learn from experience
- Store and retrieve information from memory
- Solve problems, comprehend complex ideas
- Use natural language fluently
- Classify, generalize, and adapt new situations.



# Why study AI?



Internet  
Search engines



Medicine/  
Diagnosis

Science



Industry

Science



Automation  
Self-Driving

Labor



Appliances

**What  
else?**

# Course Learning Outcomes

At the end of this course the students should be :

❑ **Knowledge and Understanding**

You should have a knowledge and understanding of the basic concepts of Artificial Intelligence including problem solving ,Search strategies , Knowledge Representation(KR) ,Game playing , Machine Learning, Expert Systems , Fuzzy Logic and Neural Networks (NN).

❑ **Intellectual Skills**

You should be able to use this knowledge and understanding of appropriate principles and guidelines to synthesise solutions to tasks in AI and to critically evaluate alternatives.

❑ **Practical Skills**

You should be able to use a well known declarative language (Prolog) and to construct simple AI programs .

# Course Learning Outcomes

- **Transferable Skills**

You should be able to solve problems and evaluate outcomes and alternatives

# Course Contents and Schedule

## □ Introduction to AI (Lecture 0,1)

- ✓ Definition
- ✓ History
- ✓ Applications
- ✓ The state of art and research areas

## □ Intelligent Agents (Lecture 2,3)

- ✓ Agents and environment
- ✓ Good behavior
- ✓ The concept of rationality
- ✓ The nature of environments
- ✓ Structure of agents

# Course Contents and Schedule

## ❑ Problem Solving (Solving Problems by Searching strategies) (lecture 4,5)

### ✓ Uninformed Search

#### ✓ Breadth-First Search(**BFS**)

#### ✓ Uniform-Cost Search(**UCS**)

#### ✓ Depth-First Search(**DFS**)

#### ✓ Depth-Limited Search(**DLS**)

#### ✓ Iterative deepening search

### ✓ Heuristic Search

#### ✓ Best First Search

#### ✓ Constraint Satisfaction Problems (**CSP**)

### ✓ Game Tree Search

# Course Contents and Schedule

## □ Representation of knowledge (lecture 6)

- ✓ Propositional logic
- ✓ first order predicate logic

## □ Knowledge inference (lecture 7,8)

- ✓ Production based system
- ✓ Frame based system.
- ✓ Inference - Backward chaining
- ✓ Forward chaining
- ✓ Rule value approach
- ✓ Fuzzy reasoning

# Course Contents and Schedule

## □ Expert systems (lecture 9)

- ✓ Architecture of expert systems,
- ✓ Roles of expert systems
- ✓ Knowledge Acquisition ,Meta knowledge, Heuristics
- ✓ Typical expert systems - MYCIN, DART, XOON
- ✓ Expert systems shells.

## □ Machine Learning (Lecture 10)

- ✓ A General Model of Learning
- ✓ Types of Learning Systems
- ✓ Knowledge-Free Inductive Learning Systems
- ✓ Learning from Single Examples

# Course Contents and Schedule

## □ Fuzzy Logic (Lecture 11,12)

- ✓ What is Fuzzy Logic?
- ✓ Fuzzy Logic Systems Architecture
- ✓ Fuzzy Set Theory
- ✓ Crisp and Non-Crisp Set
- ✓ Membership Function
- ✓ Application Areas of Fuzzy Logic

## □ Neural Networks (Lectures 13 ,14)

- ✓ Introduction, or how the brain works ?
- ✓ The neuron as a simple computing element
- ✓ The perceptron
- ✓ Multilayer neural networks



## Assessment Criteria

- Test at the 8<sup>th</sup> week 20 %
- Course Works ( Laboratory Assignment) 20%
- Attendance 0 %
- Final Exam 60 %

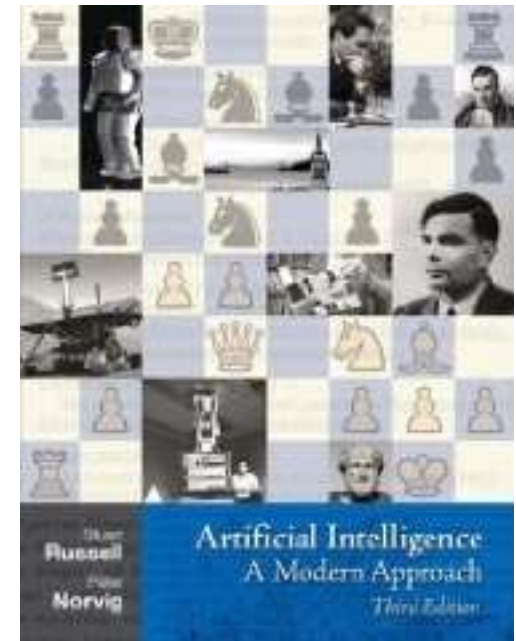
\* Each student absent more than 4 lectures will be withdrawn the final exam , and their grade in this subject will be “C” in the supplementary exam.

# Attendance

- ❑ I expect you to attend all the lectures.
- ❑ The lecture notes(docx) and Power Point(ppt) presentations dropped in ([acadox.com](http://acadox.com)) cover all the topics.
- ❑ These notes do not contain much details of discussion.
- ❑ The lectures will consist of slides (Power-point ), spoken material, and additional examples given on the blackboard.
- ❑ In order to understand the subject and the reasons for studying the material you will need to attend the lectures and take notes to supplement lecture slides.
- ❑ This is your responsibility. If there is anything you do not understand during the lectures, then ask, either during or after the lecture.
- ❑ In addition ,you must use the text book to supplement the lecture material by reading around the subjects.

# Text Books and References

**Text Book:** **Artificial Intelligence: A Modern Approach,**  
Stuart J. Russell and Peter Norvig , 3rd Edition 2010



# Thank You

# End

# Questions ?