INTRODUCTION TO AI

Books

❑ **Elaine Rich and Kevin knight: Artificial Intelligence-Tata McGraw Hill**

❑ **Carl Townsend: Introduction to Turbo Prolog**

What is AI?

❑ **Artificial Intelligence is a branch of Computer Science that pursues creating the computers or machines as intelligent as human beings**

❑ **Study of how to make computers do things, which, at the moment, people do better**

❑ **Artificial Intelligence is a way of making a computer, a computer-controlled robot, or a software think intelligently, in the similar manner the intelligent humans think.**

❑ **AI is accomplished by studying how human brain thinks and how humans learn, decide, and work while trying to solve a problem, and then using the outcomes of this study as a basis of developing intelligent software and systems**

What is AI?

❑ **Artificial Intelligence is concerned with the design of intelligence in an artificial device**

❑ **The term was coined by Macarthy in 1956**

❑ **There are two ideas in the definition**

   ▪ **Intelligence**

   ▪ **Artificial device**

What is Intelligence?

- ❑ **Is it that which characterize humans?**

- ❑ **Accordingly there are two possibility**

  - ▪ **A system with intelligence is expected to behave as intelligently as a human**

  - ▪ **A system with intelligence is expected to behave in the best possible manner**

- ❑ **Secondly what type of behaviour are we talking about?**

  - ▪ **Are we looking at the thought process or reasoning ability of the system?**

  - ▪ **Or are we only interested in the final manifestations of the system in terms of its actions?**

❑ **Different interpretations have been used by different researchers as defining the scope and view of Artificial Intelligence**

1) **System that think like humans**

2) **System that think rationally**

3) **System that act like humans**

4) **System that act rationally**

	Human-like	Rationally
Think	(1) Cognitive science Approach	(2) Laws of thought Approach
Act	(3) Turing Test Approach	(4) Rational agent Approach

System that act like humans

❑ **This test devised by Turing to find out whether the machine has been able to come up with a right amount of intelligence to match human intelligence in answering questions**
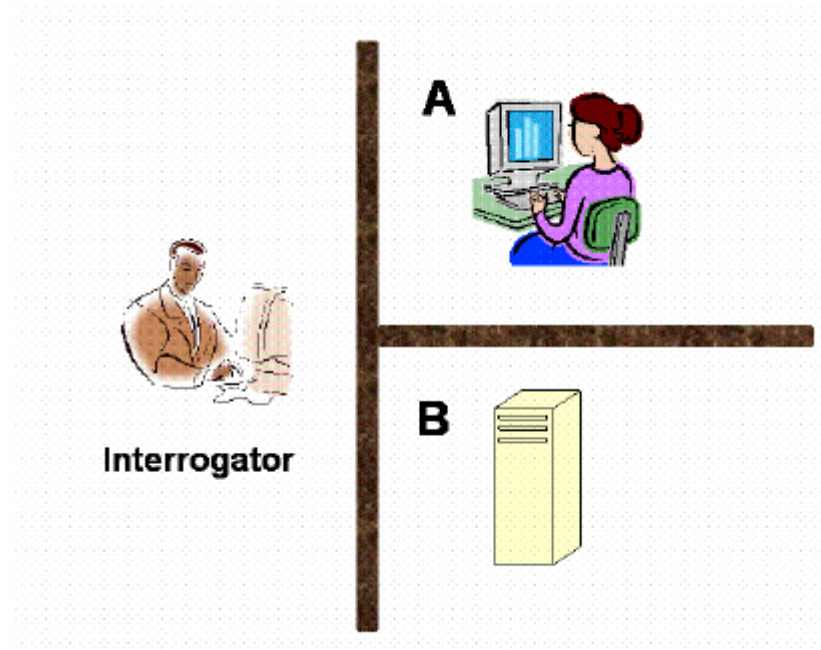
❑ **To pass Turing test Computer would need to possess following capabilities**

- **Natuaral language processing**

- **Knowledge Representation**

- **Automated reasoning**

- **Machine learning**

System that think like human

❑ This view involves trying to understand human thought and an effort to build machines that emulate the human thought process

❑ This view is cognitive Science approach to AI

System that think rationally

❑ **Logic and laws of thought deals with studies of ideal or rational thought process and inference**

❑ **The emphasis in this case is on inferencing mechanism and its properties That is how the system arrives at a conclusion or the reasoning behind its selection of action is very important in this point of view**

System that act rationally

- ❑ It is the study of rational agents

- ❑ This view deals with building machine that act rationally

- ❑ The focus is on how the system acts and performs and not so much on reasoning process

- ❑ A rational agent is the one that acts rationally in the best possible manner

AI Problems

- ❑ **Intelligent entities(or agents) needs to be able to formal tasks, mundane tasks and expert tasks**

- ❑ **Formal Tasks:**

  - ▪ **Game playing**

  - ▪ **Theorem proving**

- ❑ **Mundane Tasks:**

  - ▪ **Planning route, activity**

  - ▪ **Recognizing(through vision) people, objects**

  - ▪ **Communicating(through natural language)**

  - ▪ **Navigating around obstacles on the street**

AI Problems

❑ **Expert Tasks:**

- ▪ **Medical diagnosis**

- ▪ **Mathematical Problem solving**

Que: Which of these tasks are easy and which ones are hard?

Approaches to AI

❑ **Strong AI**

- **Strong AI aims to build machines that can truly reason and solve problems. Strong AI are machines that are self aware and whose overall intellectual ability is indistinguishable from that of a human being**

- **Strong AI maintains that suitably programmed machines are capable of cognitive mental states.**

❑ **Weak AI**

- **Weak AI deals with the creation of some form of computer-based artificial intelligence that cannot truly reason and solve problems, but can act as if it were intelligent**

- **Weak AI holds that suitably programmed machines can simulate human cognition.**

Approaches to AI

❑ **Applied AI:**

   ▪ **Aims to produce commercially viable "smart" systems such as, for example, a security system that is able to recognise the faces of people who are permitted to enter a particular building. Applied AI has already enjoyed considerable success**

❑ **Cognitive AI:**

   ▪ **computers are used to test theories about how the human mind works--for example, theories about how we recognise faces and other objects, or about how we solve abstract problems.**

AI Techniques

❑ **Intelligence require knowledge but knowledge possesses less desirable properties**

  ▪ **It is voluminous**

  ▪ **It is hard to characterize accurately**

  ▪ **It is constantly changing**

  ▪ **It differs from data by being organized in a way that corresponds to its application**

❑ **AI technique is a method that exploits knowledge that should be represented in such a way that:**

  ▪ **The knowledge captures generalization**

  ▪ **It can be understood by people who must provide it**

AI Techniques

❑ **It can be easily modified to correct errors and to reflect changes in the world**

❑ **It can be used in a great many situations even if it is not totally accurate or complete**

Three important AI Techniques

❑ **Search**

❑ **Use of knowledge**

❑ **Abstraction**

AI Techniques

❑ **Example:** **Recognize a person from a facial image**

▪ **Search: Pixel by pixel search**

▪ **Use of knowledge: Try to match different part of facial image (i.e. hairs, eyes, nose,ears,hips,etc)**

▪ **Abstraction: Try to match only important part(i.e. forehead, eyes)**

Applications of AI

- ❑ **Perception**
  - ■ **Computer vision**
  - ■ **Image Recognition**
- ❑ **Robotics**
- ❑ **Natural Language Processing**
  - ■ **Natural Language Understanding**
  - ■ **Speech Understanding**
  - ■ **Language Generation**
  - ■ **Machine Translation**

Applications of AI

- ❑ **Planning**

- ❑ **Expert systems**

- ❑ **Machine learning**

- ❑ **Theorem Proving**

- ❑ **Symbolic Mathematics**

- ❑ **Game Playing**

Practical Impact of AI?

❑ **AI components are embedded in numerous devices e.g. copy machines**

❑ **AI systems are in everyday use**

   ▪ **detecting credit card fraud**

   ▪ **configuring products**

   ▪ **complex planning tasks**

   ▪ **advising physicians**

❑ **Intelligent tutoring systems provide students with personalized attention**

What can AI systems do ?

❑ **Today's AI systems have been able to achieve limited success in some of these tasks**

- ▪ **In Computer vision, the systems are capable of face recognition**

- ▪ **In Robotics, we have been able to make vehicles that are mostly autonomous**

- ▪ **In Natural language processing, we have systems that are capable of simple machine translation**

- ▪ **Today's Expert systems can carry out medical diagnosis in a narrow domain**

What can AI systems do ?

- Speech understanding systems are capable of recognizing several thousand words continuous speech

- Planning and scheduling systems had been employed in scheduling experiments with the Hubble Telescope

- The Learning systems are capable of doing text categorization into about a 1000 topics

- In Games, AI systems can play at the Grand Master level in chess (world champion), checkers, etc

What can AI systems Not do yet ?

- ❑ Originally creative

- ❑ Exercise free will

- ❑ Express emotional intelligence

- ❑ Solve everything

- ❑ Make successful prediction consistently(100%)

- ❑ Anything meaningful/useful without its training data