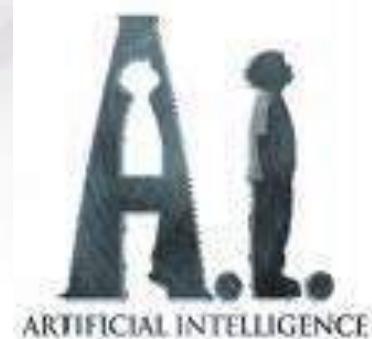


Artificial Intelligence Introduction





What is Intelligence?

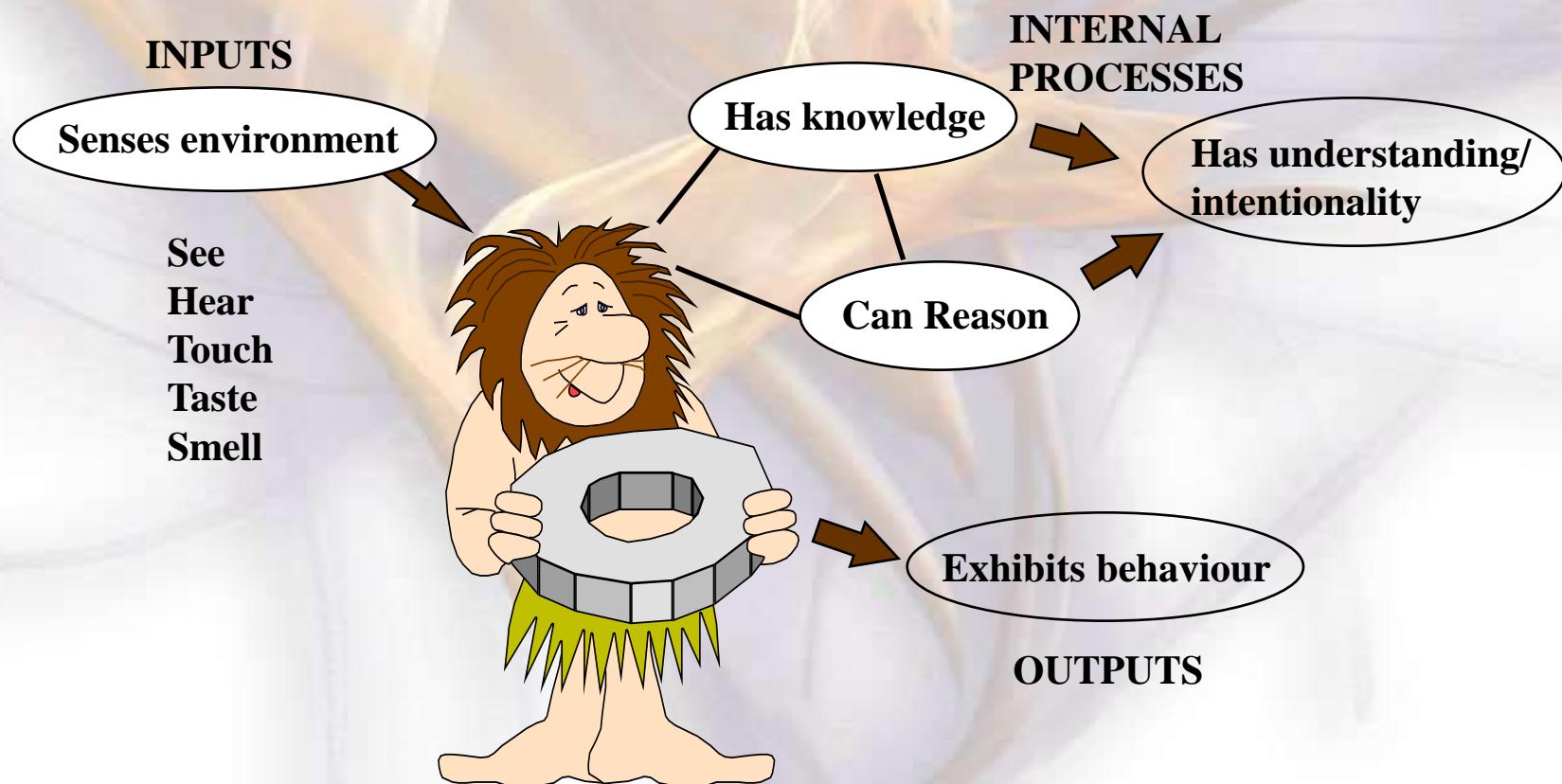


Intelligence, taken as a whole, consists of the following skills:-

1. The ability to **reason**
2. The ability to **acquire and apply** knowledge
3. The ability to **manipulate** and **communicate ideas**



An Intelligent Entity





Definitions of AI



- "AI is the study of how to make computers do things, which, at the moment, people do better."

- "... the science of making machines do things that would require intelligence if **done by humans**"

- AI is the part of computer science concerned with **designing** intelligent computer systems -E. Feigenbaum

- Systems that can demonstrate **human-like reasoning capability** to enhance the quality of life and improve business competitiveness

Japan-S'pore AI



Definition of AI

- “AI may be defined as the branch of computer science that is concerned with the automation of intelligent behavior.”
(Luger - 1993)
- System that thinks like human.
- “The exciting new effort to make computer think... machines with minds, in the full and literal sense.”
(Hallgeland - 1985)
- “The automation of activities that was associate with human thinking, activities such as deviation making, problem solving, learning...”
(Bellman – 1978)
- Systems that act like humans.



Definition of AI

- “The art of creating machines that perform functions that require intelligence, when performed by people.” (**Kurzweil – 1990**)
- The study of how to make computers do things at which, at the moment, people are better.” (**Rich and Knight - 1991**)
- System that think rationally.
- “The study of mental faculties through the use of computational models.” (**Charniak and McDermott – 1985**)
- “The study of the computations that make it possible to perceive, reason and act.” (**Winston – 1992**)
- System that act rationally.



Definition of AI

- “Computational intelligence is the study of the design of intelligent agents.” (**Poole et al - 1998**)
- “AI is concerned with intelligence behaviour in artifacts.” (**Nilsson - 1998**)
- The definitions vary along two main dimensions.
 - 1) through process and reasoning
 - 2) through the behavior of the machine.
- A system is rational if it does the “right thing” given what it knows.



Definition of AI

- There are four approaches that are followed in AI.
 1. Acting Humanly
 2. Thinking Humanly
 3. Thinking Rationally
 4. Acting Rationally



Acting Humanly

- For testing intelligence, Alan Turing (1950) proposed a test which is known as **Turing test** which is based on common features that can match with the most intelligent entity – **human being**.
- Computer would need to possess following capabilities:
 - a) Natural Language Processing – to enable it to communicate successfully in English.
 - b) Knowledge Representation – to store what it knows, what it hears.
 - c) Automated Reasoning – to make use of stored information to answer question being asked and draw conclusions.



Acting Humanly

- d) Machine Learning – to adapt to new circumstance and to detect and make new predictions by finding patterns.
- e) Computer Version – to perceive object.
- f) Robotics – to manipulate object.



Thinking Humanly

- As we are saying that the given program think like human if we should know that how human think. For that the theory of human mind need to be explored.
- There are two ways to do it:
 1. through introspection i.e. trying to catch our own thoughts as they go by
 2. through psychological experiments.
- If computer programs, I/O and timing behaviors matches corresponding human behaviors, that is, we can say the some of the program's mechanism is also be operating in human.



Thinking Humanly

- The interdisciplinary field of cognitive science brings together computer models from AI and experimental techniques from psychology that try to construct precise and testable theories of the working of the human mind.



Thinking Rationally

- Thinking Rationally – the law of thought approach
- The concept of “right thinking” was proposed by Aristotle.
- This idea provided patterns for argument structures that always yielded correct conclusions when given correct premise.
- For example, “Ram is man”,
 “All men are mortal”,
 “Ram is mortal”.
- These law of thought were supposed to govern the operations in the mind; their study initiated the field called logical which can be implemented to create intelligent system.



Acting Rationally

- An **agent** (Latin **agree-to do**) is something that acts.
- But computer agents are expected to have more other attributes that distinguish them from just the “programs”.
- Because they need to operate under autonomous control, perceiving their environment, persisting over a prolonged time period, adapting to change and being capable of taking on another goals.
- A rational agent is expected to act so as to achieve the best outcome or when there is uncertainty to achieve best expected outcome.



Foundation of AI

1. **Philosophy** : provides base of AI by providing theories of relationship between physical brain and mental mind, rules for drawing valid conclusions and information about knowledge origins and the knowledge leads to action.
2. **Mathematics**: gives strong base to AI to develop concrete and formal rules for drawing valid conclusion, various methods for date computations and techniques to deal with uncertain information.
3. **Economics**: support AI to make decisions so as to maximize payoff and make decisions under uncertain circumstance.



Foundation of AI

4. **Neuroscience:** gives information which is related to brain processing which helps AI to develop date processing theories.
5. **Psychology:** provides strong concept of how humans and animal think and act which help AI for developing process of thinking and actions.



What AI can do today?

- Autonomous Planning and Scheduling
- Game Playing
- Autonomous Control
- Diagnosis
- Logistic Planning
- Robotics
- Language Understanding and Problem Solving



Human Vs Machines

Human	Machine
Made of flesh and blood; life is not mechanical for human.	Do not have life, they are mechanical.
Have feelings and emotions, and they can express it.	No feelings and emotions. Just work as per details fed into their mechanical brain.
Can do original.	Can not do original.
Have capability to understand situations and behaves accordingly.	Do not have this capability.
Performs activities as per their own intelligence.	Have only Artificial Intelligence.
Brains are analogue	Machines are digital.
Brain uses control-addressable memory.	Machine uses byte-addressable memory.
Massively Parallel machine	Modula and serial



Human Vs Machines

Human	Machine
Processing speed is not fixed.	Processing Speed is fixed.
No hardware / software distinction with respect to brain.	Hardware / software distinction with respect to brain.
Self organizing system.	Dependant organizing system.



List of Expert system influential in AI System



1. MACDYMA	9. NAVEX
2. DENDRAL	10. R1/XCON
3. CENTAUR, INTERNIST, PUFF, CASNET	11. VENTILATOR MANAGEMENT ASSISTANT
4. DELTA	12. COOKER ADVISER
5. DRILLING ADVISOR	13. MYCIN
6. EXPERT TAX	14. CROP ADVISOR
7. XSEL	15. OPTIMUM - AIV
8. PROSPECTOR	



AI Problems (imp)

- Most of the early working AI focused on formal tasks, such as game playing and theorem proving.
- For example, chess playing, logic theorist was an early attempt to prove mathematical theorems. Game playing and theorem proving share the properties that people who do them were considered to be displaying intelligence.
- Despite this it appeared that computers could perform well at those tasks by being fast at exploring a large numbers of solution paths and then selecting the best one.
- But no computer is fast enough to overcome the combinational explosion generated by most problems.



AI Problems

- AI focusing on the sort of problem solving we do every day, for instance, when we decide to get work in the morning, often called commonsense reasoning.
- In investigating this sort of reasoning Newell, Shaw and Simon built the **General Problem Solver(GPS)** , which they applied to several commonsense tasks as well as performing symbolic manipulations of logical expression.
- However no attempt was made to create a program with a large amount of knowledge about a particular problem domain.
- Only quite simple tasks were selected.



AI Problems



- As AI research progressed and techniques for handling large amounts of world knowledge were developed in dealing with problem solving in specialized such as **medical diagnosis and chemical analysis**.
- **Vision and Speech (Perception)** is another area for AI problems.
- **Natural language understanding and problem solving specialized domain** are other areas related to AI problems.
- The problem of **understanding spoken language** is perceptual problem and is hard to solve from the fact that is more analog related than digital related.



AI Problems

- Many people can perform one or may be more specialized tasks in which carefully acquired expertise is necessary.
- Example of such as tasks include engineering design, scientific discovery, medical diagnosis, and financial planning.
- Program that can solve problems in these domains also fall under the aegis of AI.
- The tasks that are targets of works in AI can be categories as follows:
 1. Mundane task – Perception (Vision and Speech), Natural Language (Understanding, Generation, Translation, Commonsense, Robot Control)



AI Problems



2. Formal task – Games (Chess, etc.), Mathematics (Geometry, Logic, Integral calculus, etc.)
 3. Expert task – Engineering (Design, Fault finding, Manufacturing Planning), Scientific analysis, Medical Diagnosis, Financial Analysis.
- A person who knows how to perform task several of the categories shown in above list learn the necessary skill in a standard order.
 - First perceptual, linguistic, and commonsense skills are learned. Later expert skills such as engineering, medicine, or finance are acquired.



AI Problems

- The problems area where now AI is flourishing most as a practical discipline are primarily the domains that require only specialized expertise without the assistance of commonsense knowledge.
- Expert systems (AI programs) now are up for day-to-day tasks that aim at solving part, or perhaps all, of practical, significant problem that previously required high human expertise.
- When one is building a expert system, following questions need to be considered before one can program further:
 1. What are the underlying assumptions about intelligence?
 2. What kind of techniques will be useful for solving AI problems?
 3. At what level if at all can human intelligence be modified?
 4. When will it be realised when an intelligent program has been built?



Turing Test

- 100 crows are sitting on a tree. A hunter aims at one of the crows and shoots down using his brand new pistol. How many crows are remain on the tree?



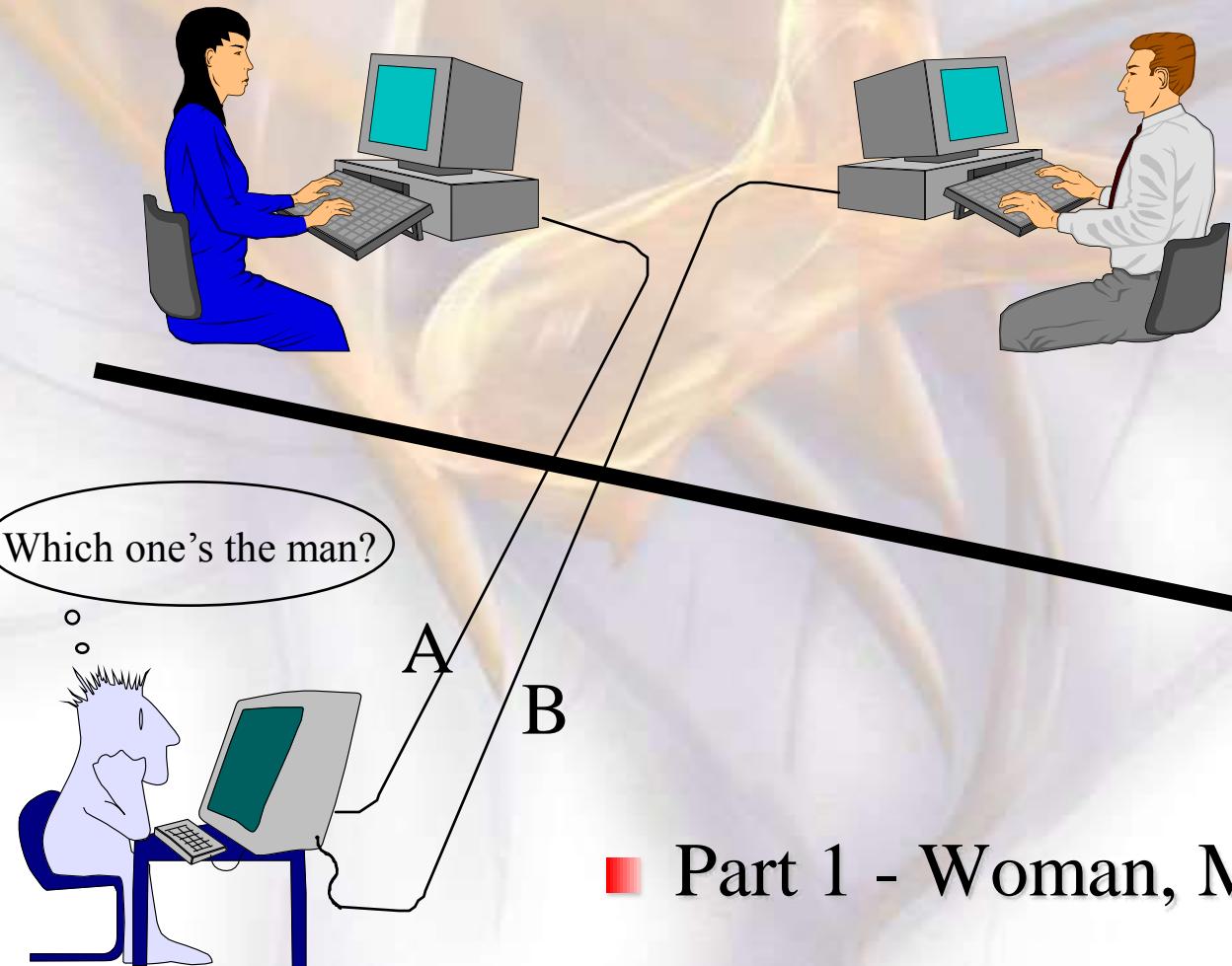
Turing's Test



- In 1950 Alan Turing published his famous paper "**Computing Machinery and Intelligence.**"
- In that paper he describes **a method for humans to test AI programs.**
- In its most basic form, a human judge sits at a computer terminal and interacts with the subject by written communication only. The judge must then decide if the subject on the other end of the computer link is a human or an AI program imitating a human.
- <http://www.turing.org.uk/turing/>



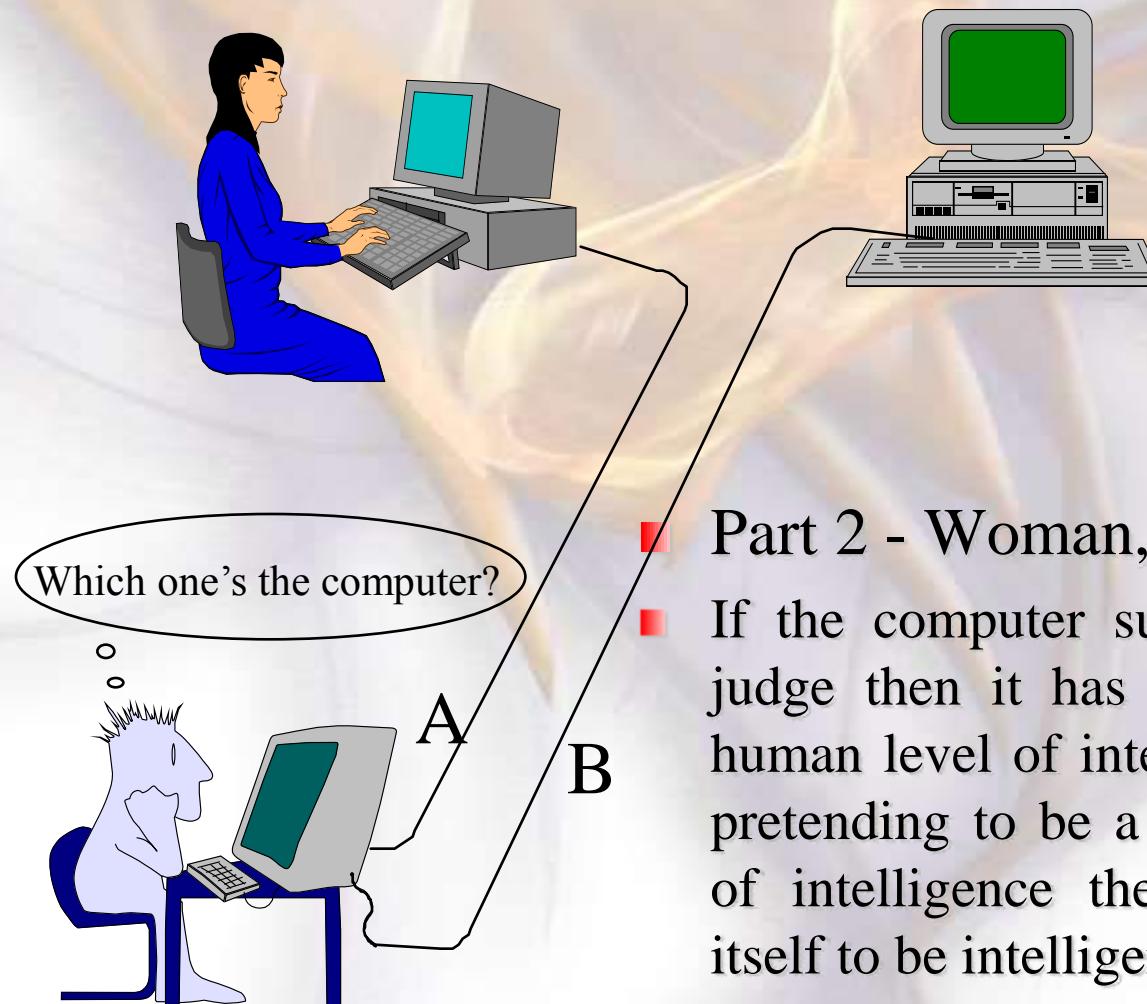
Turing's Test - Part 1



■ Part 1 - Woman, Man & Judge.



Turing's Test - Part 2



Part 2 - Woman, Machine & Judge.

- If the computer succeeds in fooling the judge then it has managed to exhibit a human level of intelligence in the task of pretending to be a woman, the definition of intelligence the machine has shown itself to be intelligent.



Examples of AI systems

- Robots
- Chess-playing program
- Voice recognition system
- Speech recognition system
- Grammar checker
- Pattern recognition
- Medical diagnosis
- System malfunction rectifier
- Game Playing
- Machine Translation
- Resource Scheduling
- Expert systems
(diagnosis, advisory,
planning, etc)
- Machine learning
- Intelligent interfaces



Goals of this course

- To teach you the main ideas of AI
- To introduce you to a set of key techniques and algorithms from AI
- To help you understand what's hard in AI and why
- To see how AI relates to the rest of computer science
- To get you thinking about how AI can be applied to a variety of real problems
- To have fun



Assignment 1

1. What is intelligence? Define AI. Discuss types of problem requiring intelligence to solve it.
2. Enlist AI Problems and Explain it.



Have a nice
learning !!!!