# Artificial Intelligence

## An Introductory Course

# References

- Artificial Intelligence (1991)

  Elaine Rich & Kevin Knight,  Second Ed, Tata McGraw Hill

- Decision Support Systems and Intelligent Systems
  Turban and Aronson, Sixth Ed, PHI

# Introduction

- What is AI?

- The foundations of AI

- A brief history of AI

- The state of the art

- Introductory problems

# What is AI?

- Intelligence: "ability to learn, understand and think" (Oxford dictionary)

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

- Examples: Speech recognition, Smell, Face, Object, Intuition, Inferencing, Learning new skills, Decision making, Abstract thinking

# What is AI?

| Thinking humanly | Thinking rationally |
|---|---|
| Acting humanly | Acting rationally |

# Acting Humanly: The Turing Test

- Alan Turing (1912-1954)
- "Computing Machinery and Intelligence" (1950)



Imitation Game

Human Interrogator

Human

AI System
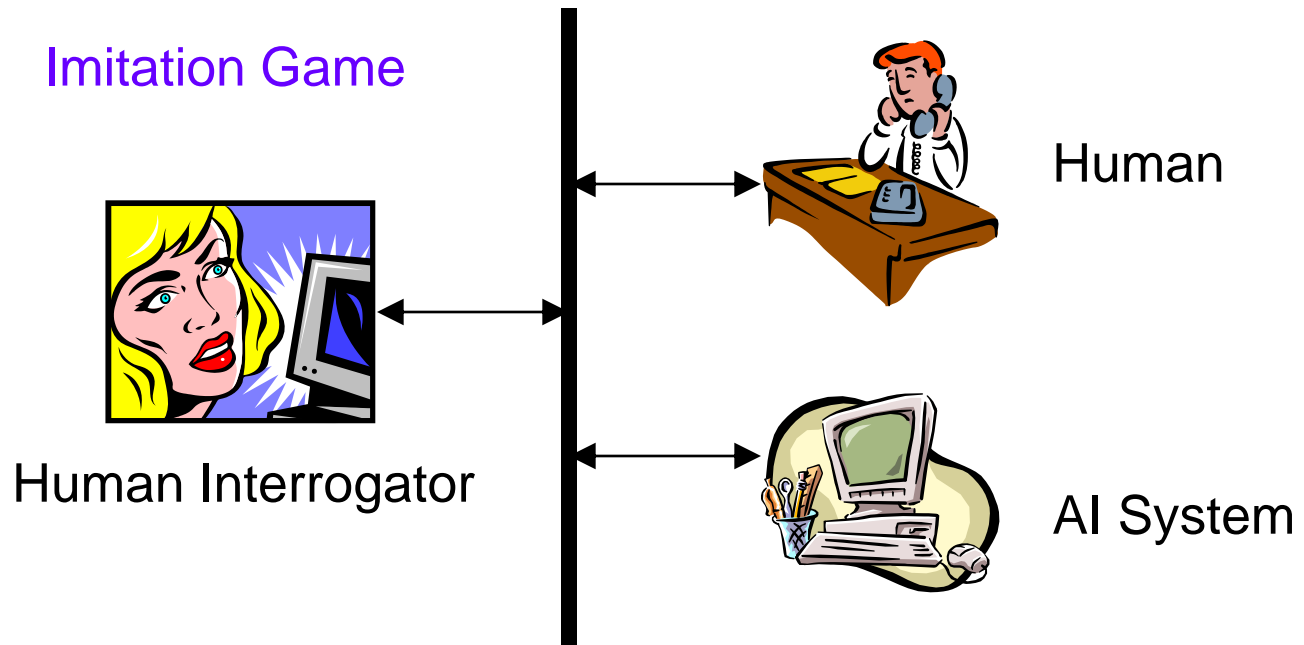
# Acting Humanly: The Turing Test

- Predicted that by 2000, a machine might have a 30% chance of fooling a lay person for 5 minutes.

- Anticipated all major arguments against AI in following 50 years.

- Suggested major components of AI: knowledge, reasoning, language, understanding, learning.

# Thinking Humanly: Cognitive Modelling

- Not content to have a program correctly solving a problem.

  More concerned with comparing its reasoning steps to traces of human solving the same problem.

- Requires testable theories of the workings of the human mind: cognitive science.

# Thinking Rationally: Laws of Thought

- Aristotle was one of the first to attempt to codify "right thinking", i.e., irrefutable reasoning processes.

- Formal logic provides a precise notation and rules for representing and reasoning with all kinds of things in the world.

- Obstacles:
  - Informal knowledge representation.
  - Computational complexity and resources.

# Acting Rationally

- Acting so as to achieve one's goals, given one's beliefs.

- Does not necessarily involve thinking.

- Advantages:
  - More general than the "laws of thought" approach.
  - More amenable to scientific development than human-based approaches.

# Task Domains of AI

- Mundane Tasks:
  - Perception
    - Vision
    - Speech
  - Natural Languages
    - Understanding
    - Generation
    - Translation
  - Common sense reasoning
  - Robot Control
- Formal Tasks
  - Games : chess, checkers etc
  - Mathematics: Geometry, logic,Proving properties of programs
- Expert Tasks:
  - Engineering ( Design, Fault finding, Manufacturing planning)
  - Scientific Analysis
  - Medical Diagnosis
  - Financial Analysis

# AI Technique

- Intelligence requires Knowledge
- Knowledge posesses less desirable properties such as:
  - Voluminous
  - Hard to characterize accurately
  - Constantly changing
  - Differs from data that can be used
- AI technique is a method that exploits knowledge that should be represented in such a way that:
  - Knowledge captures generalization
  - It can be understood by people who must provide it
  - It can be easily modified to correct errors.
  - It can be used in variety of situations