

Artificial Intelligence

Course: CS40002

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What is AI?

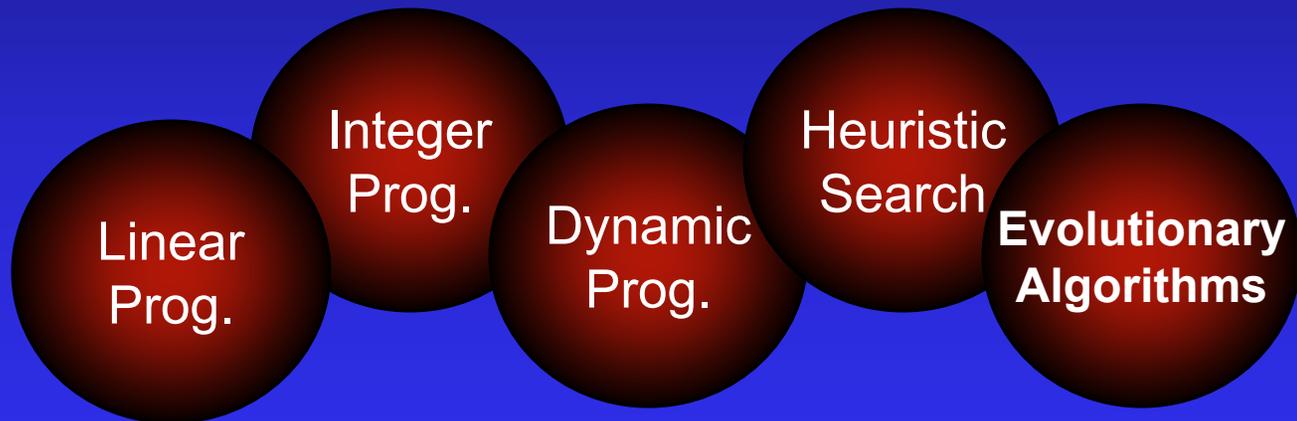
- Turing Test (1950)

- ◆ The computer is interrogated by a human via a teletype
- ◆ It passes if the human cannot tell if there is a computer or human at the other end

- Sufficiency: The Chinese Room Argument

The ability to solve problems

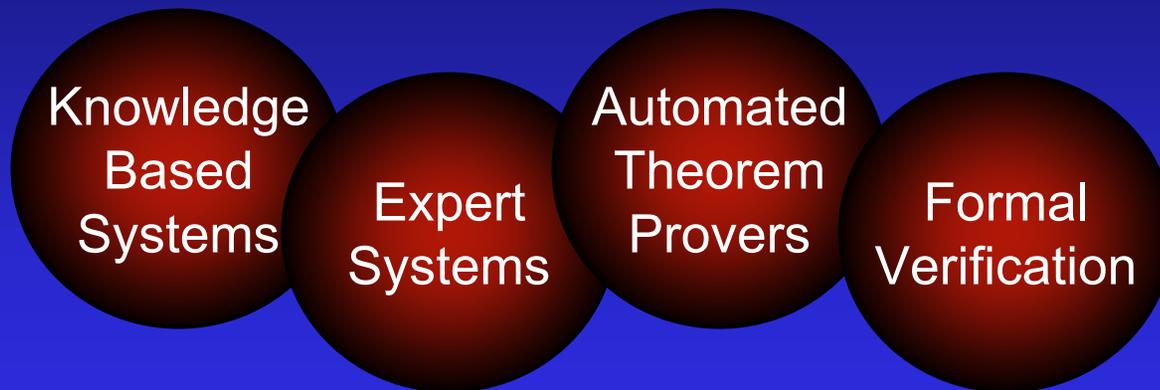
- Search: *Efficient trial-and-error*
 - ◆ Enormous computational complexity
 - ◆ Space-time trade-offs
 - ◆ Use of domain knowledge – *heuristics*



During 1985-1995 *computation became free*

Knowledge and Deduction

- How to store and retrieve knowledge?
- How to interpret facts and rules, and be able to deduce?
- The gap between knowledge and realization
- Logics of knowledge



- The knowledge base may be huge
- **Between 1990 – 2000 storage became free**

The ability to learn

- Can we learn to solve a problem better?
 - ◆ Learning the answers
 - ◆ Learning the rules of the game
 - ◆ Learning to plan
- Belief networks
- Perceptrons and Neural networks

What then is AI?

Human Computer
interaction

Automated Problem Solving

Computer vision

Machine Learning



NLP

Logic and Deduction

Robotics

In this decade, communication will become free

Fundamentals

- The notion of expressing computation as an algorithm
- Godel's Incompleteness Theorem (1931):
 - ◆ In any language expressive enough to describe the properties of natural numbers, there are true statements that are undecidable: that is, their truth cannot be established by any algorithm.

Fundamentals

- Church-Turing Thesis (1936):
 - ◆ The Turing machine is capable of computing any computable function
 - ◆ This is the accepted definition of computability
- The notion of intractability
 - ◆ NP-completeness
 - ◆ Reduction

Course Outline

- Problem solving by search
 - ◆ State space search,
 - ◆ Problem reduction search,
 - ◆ Game playing
- Logic and deduction
 - ◆ First-order logic, Temporal logic, Deduction
- Planning
- Reasoning under Uncertainty
- Learning
- Additional Topics

References

- Artificial Intelligence – A Modern Approach
-- Stuart Russell and Peter Norvig
- Principles of Artificial Intelligence
-- N J Nilsson
- Heuristics
-- Judea Pearl