

Artificial Intelligence.
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Lecture 1. INTRODUCTION

The objectives of this lecture are:

- To define Artificial Intelligence (AI).
- To describe the topics to be covered during this term.
- To go over some organizational details.

WHAT IS AI?

- AI is a relatively new field
- It started at the end of the 1940s
- Its name was coined by John McCarthy in 1956
- There are many definitions of Artificial Intelligence. Two of them are:
 - “AI as an attempt to understand intelligent entities and to build them” (Russell and Norvig, 1995)
 - “AI is the design and study of computer programs that behave intelligently” (Dean, Allen, and Aloimonos, 1995)
- What is an “intelligent entity” or what does it mean to “behave intelligently”?
 - “Intelligence is the degree of accomplishment exhibited by a system when performing a task” (Allen. AAAI97 invited lecture)

OTHER DEFINITIONS OF AI

(Adapted from Russell and Norvig's book)

Systems that think like humans	Systems that think rationally
<p>“The exciting new effort to make computers think . . . machines with minds, in the full and literal sense” (Haugeland, 1985)</p> <p>“[The automation of] activities that we associate with human thinking, activities such as decision-making, problem solving, learning . . .” (Bellman, 1978)</p>	<p>“The study of mental faculties through the use of computational models” (Charniak and McDermott, 1985)</p> <p>“The study of the computations that make it possible to perceive, reason, and act” (Winston, 1992)</p>
Systems that act like humans	Systems that act rationally
<p>“The art of creating machines that perform functions that require intelligence when performed by people” (Kurzweil, 1990)</p> <p>“The study of how to make computers do things at which, at the moment, people are better” (Rich and Knight, 1991)</p>	<p>“A field of study that seeks to explain and emulate intelligent behavior in terms of computational processes” (Schalkoff, 1990)</p> <p>“The branch of computer science that is concerned with the automation of intelligent behavior” (Luger and Stubblefield, 1993)</p> <p>“AI is the design and study of computer programs that behave intelligently” (Dean, Allen, and Aloimonos, 1995)</p>

THE TURING TEST

For the “acting humanly” approach

- It was proposed by Alan Turing (1950).
- This test is an operational definition of intelligence:
It defines intelligent behavior as the ability to achieve human-level performance in all cognitive tasks, sufficient to consistently fool human interrogators.
- Test:
A computer is interrogated by a human through a tty terminal and passes the test if the interrogator cannot tell if there is a computer or a human at the other end.
- To pass the Turing test a machine will need to:
 1. represent knowledge
 2. reason automatically
 3. learn
 4. process natural language
- For the TOTAL Turing test (which includes also a video signal so that the interrogator can test the subject’s perceptual abilities) the machine will also need to:
 - 5 “see” (computer vision)
 - 6 “move” (robotics)

There has NOT been a big effort to try to pass the Turing test.

WHAT IS AI? (Cont.)

- AI is at the intersection of
 - philosophy,
 - mathematics,
 - psychology,
 - computer engineering,
 - linguistics,
 - cognitive science, and
 - computer science.
- It differs from philosophy and psychology (which are also concerned with intelligence) in which AI strives to BUILD intelligent entities as well as to understand them.
- It differs from other subareas of computer science and engineering, in its emphasis on perception, reason, and action.

WHAT IS AI? (Cont.)

- AI can be seen as an ensemble of ideas about
 - representing knowledge
 - using knowledge to solve problems
- with two goals:
 - Engineering Goal:
To solve real-world problems using AI
 - Scientific Goal:
To explain various sorts of intelligence.

TOPICS TO BE COVERED IN THIS COURSE

- Core AI:
 - Knowledge Representation Techniques:
Semantic Nets, Rules, Propositional Logic, 1st Order Logic, Probability, ...
 - Problem Solving Strategies:
Blind Search, Heuristic Search, Optimal Search, Tree and Adversarial Search (Game Playing), Constraint Satisfaction, Logical Inference, Planning, Probabilistic Reasoning, ...
- AI Applications:
 - Machine Learning,
 - Machine Vision, and
 - Natural Language Processing.

SUCCESSFUL STORIES IN AI:

- Computer Chess:
e.g. Deep Blue, developed at IBM.
- Robot Explorers:
e.g. Space exploration on Mars. Robot designed at the Jet Propulsion Laboratory.
- Autonomous vehicles:
e.g. car developed at Carnegie Mellon Univ.
- Expert Systems for Medical Diagnosis:
e.g. MYCIN (diagnoses blood infections. It performs as well as human experts and considerably better than junior doctors) developed at Stanford Univ.
- Expert Systems for Financial Applications.
- Language Translation Systems.
- Air Traffic Control Systems
- Automated Personal Assistants
- Robots for Hazardous Conditions