INTRODUCTION TO **ARTIFICIAL INTELLIGENCE** FOR IT & NON-IT PROFESSIONALS

WHAT IS ARTIFICIAL INTELLIGENCE

WHAT IS AI?

- AI is exciting, but we have not said what it is.
- In Figure we see eight definitions of AI, laid out along two dimensions.
- The definitions on top are concerned with thought processes vs reasoning vs behavior,

WHAT IS AI?

- The definitions on the left measure success in terms of fidelity to human performance, whereas the ones on the right measure against an ideal performance measure, called rationality.
- A system is rational if it does the “right thing,” given what it knows.

SOME DEFINITIONS OF ARTIFICIAL INTELLIGENCE ORGANIZED INTO FOUR CATEGORIES

	Performance fidelity of humans	Ideal Performance
Thought processes and Reasoning	**Think like human** (The cognitive modelling approach) "The exciting new effort to make computers think . . . machines with minds, in the full and literal sense." (Haugeland, 1985) "[The automation of] activities that we associate with human thinking, activities such as decision-making, problem solving, learning . . ." (Bellman, 1978)	**Thinking Rationally** (The "laws of thought" approach) The study of mental faculties using computational models."(Charniak and McDermott, 1985) "The study of the computations that make it possible to perceive, reason, and act."(Winston, 1992)
Behaviour	**Acting Humanly** (The Turing Test approach) "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)	**Acting Rationally** (The rational agent approach) "Computational Intelligence is the study of the design of intelligent agents." (Poole *et al.*, 1998) "AI . . . is concerned with intelligent behavior in artifacts." (Nilsson, 1998)

ACTING HUMANLY

- **Acting humanly: The Turing Test approach**
- The Turing Test, proposed by Alan Turing (1950), was designed to provide a satisfactory operational definition of intelligence.
- Total Turing Test

ACTING HUMANLY

- AI researchers have devoted little effort to passing the Turing Test, believing that it is more important to study the underlying principles of intelligence than to duplicate an exemplar.
- The quest for "artificial flight" Aeronautical engineering texts do not define the goal of their field as making:
- "Machines that fly so exactly like pigeons that they can fool even other pigeons

THINKING HUMANLY

- **Thinking humanly: The cognitive modeling approach**
- If we are going to say that a given program thinks like a human, we must have some way of determining how humans think. We need to get inside the actual workings of human minds.
- There are three ways to do this:
  - ❑ Through introspection
  - ❑ Through psychological experiments
  - ❑ Through brain imaging
- Cognitive science
- General problem Solver

THINKING RATIONALLY

- **Thinking rationally: The "laws of thought" approach**

- Greek philosopher Aristotle was one of the first to attempt to codify "right thinking," that is, irrefutable reasoning processes.
- His syllogisms provided patterns for argument structures **SYLLOGISM** that always yielded correct conclusions when given correct premises—
- For example, **"Socrates is a man; all men are mortal; therefore, Socrates is mortal."**
- These laws of thought were supposed to govern the operation of the mind; their study initiated the field called logic.

THINKING RATIONALLY

- **Acting rationally: The rational agent approach**

❑ An agent is just something that acts (agent comes from the Latin agere, to do).

❑ Of course, AGENT all computer programs do something, but computer agents are expected to do more: operate autonomously, perceive their environment, persist over a prolonged time period, adapt to change, and create and pursue goals.

THINKING RATIONALLY

- For example, recoiling from a hot stove is a reflex action that is usually more successful than a slower action taken after careful deliberation.

In the “laws of thought” approach to AI, the emphasis was on correct inferences