



COURSE CODE: Artificial Intelligence

COURSE TITLE: CSE 3207

Prepared By:

Dipanita Saha

Assistant Professor

Institute of Information Technology(IIT)

Noakhali Science and Technology University

Artificial Intelligence(AI)

AI in two dimensions.

Thinking Humanly “The exciting new effort to make computers think . . . <i>machines with minds</i> , 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 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)
Acting Humanly “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 “Computational Intelligence is the study of the design of intelligent agents.” (Poole <i>et al.</i> , 1998) “AI . . . is concerned with intelligent behavior in artifacts.” (Nilsson, 1998)

- top are concerned with *thought processes* and *reasoning*, whereas the ones on the bottom address *behavior*.
- The definitions on the left measure success in terms of fidelity to *human* performance,
- **Rationality:** A system is rational if it does the “right thing,” given what it knows.

- A human-centered approach must be in part an empirical science, involving observations and hypotheses about human behavior.

A rationalist approach involves a combination of mathematics and engineering.

➤ **Acting humanly: The Turing Test approach**

- The **Turing Test**, proposed by Alan Turing (1950).
- A computer passes the test if a human interrogator, after posing some written questions, cannot tell whether the written responses come from a person or from a computer.
- The computer would need to possess the following capabilities:
 1. **natural language processing** to enable it to communicate successfully in English;
 2. **knowledge representation** to store what it knows or hears;
 3. **automated reasoning** to use the stored information to answer questions and to draw new conclusions;
 4. **machine learning** to adapt to new circumstances and to detect and extrapolate patterns.
- Turing's test deliberately avoided direct physical interaction between the interrogator and the computer.

- **total Turing Test** includes a video signal so that the interrogator can test the subject's perceptual abilities.
- To pass the total Turing Test, the computer will need
 1. • **computer vision** to perceive objects, and
 2. • **robotics** to manipulate objects and move about.
- 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.


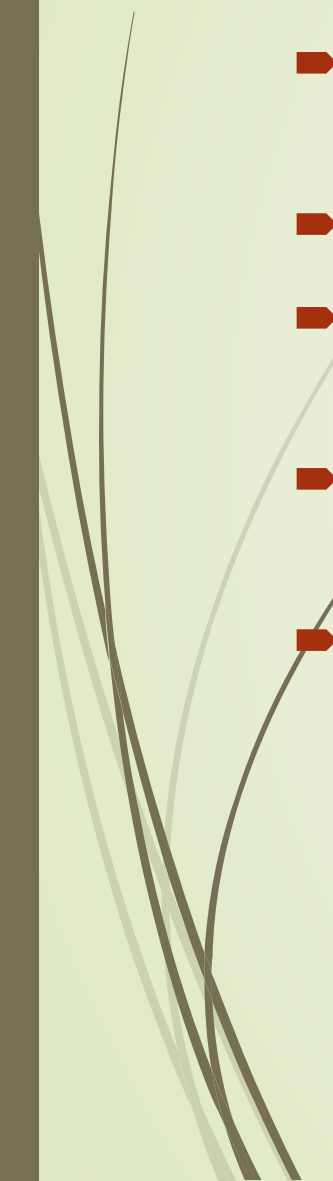
➤ **Thinking humanly: The cognitive modeling approach**

- 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:
 1. through introspection—trying to catch our own thoughts as they go by;
 2. through psychological experiments—observing a person in action; and
 3. through brain imaging—observing the brain in action.

- For example, Allen Newell and Herbert Simon, who developed **GPS**, the “General Problem Solver” were not content merely to have their program solve problems correctly.
- **Cognitive science** brings together computer models from AI and experimental techniques from psychology to construct precise and testable theories of the human mind.
- Real cognitive science, is necessarily based on experimental investigation of actual humans or animals.
- These two fields fertilize each other, most notably in computer vision, which incorporates neurophysiological evidence into computational models.

➤ **Thinking rationally: The “laws of thought” approach**

- The Greek philosopher Aristotle was one of the first to attempt to codify “**right thinking**,” that is, irrefutable reasoning processes.
- yielding 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; the field called **logic**.

- 
- 
- Logicians in the 19th century developed a precise notation, “solve *any* solvable problem described in logical notation”. (Although if no solution exists, the program might loop forever.)
 - These **logician** tradition within artificial intelligence hopes to build on such programs to create intelligent systems.
 - There are two main obstacles to this approach.
 - First, it is not easy to take informal knowledge and state it in the formal terms required by logical notation, particularly when the knowledge is less than 100% .
 - Second, there is a big difference between solving a problem “in principle” and solving it in practice.
 - Although both of these obstacles apply to *any* attempt to build computational reasoning systems, they appeared first in the logicist tradition.

➤ Acting rationally: The rational agent approach

An **agent** is just something that acts.

- A **rational agent** is one that acts so as to achieve the best outcome or, when there is uncertainty, the best expected outcome.
- “laws of thought” approach to AI, the emphasis was on correct inferences.
- All the skills needed for the Turing Test also allow an agent to act rationally.
- Knowledge representation and reasoning enable agents to reach good decisions.
- The rational-agent approach has two advantages.
- **First**, it is more general than the “laws of thought” approach because correct inference is just one of several possible mechanisms for achieving rationality.
- **Second**, it is more amenable to scientific development than are approaches based on human behavior or human thought.

The foundation of AI

Philosophy

- ❖ Can formal rules be used to draw valid conclusions?
- ❖ How does the mind arise from a physical brain?
- ❖ Where does knowledge come from?
- ❖ How does knowledge lead to action?

Mathematics

- ❖ What are the formal rules to draw valid conclusions?
- ❖ What can be computed?
- ❖ How do we reason with uncertain information?

Economics

- ❖ How should we make decisions so as to maximize payoff?
- ❖ How should we do this when others may not go along?
- ❖ How should we do this when the payoff may be far in the future?

➤ **Neuroscience**

- ❖ How do brains process information?

➤ **Psychology**

- ❖ How do humans and animals think and act?

➤ **Computer engineering**

- ❖ How can we build an efficient computer?


➤ **Control theory and cybernetics**

- ❖ How can artifacts operate under their own control?

➤ **Linguistics**

- ❖ How does language relate to thought?

What can AI do today?

- 
- Robotic vehicles
 - Speech recognition
 - Autonomous planning and scheduling:
 - Game playing
 - Spam fighting
 - Logistics planning
 - Robotics
 - Machine Translation
- 