UNIVERSITY Of KIGALI

"Unequalled Education Excellence"

FACULTY OF IT AND ARCHITECTURE

LEVEL FOUR INFORMATION TECHNOLOGY

Artificial Intelligence (AI)

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Academic year: 2023-2024

CHAPTER I: INTRODUCTION TO ARTIFICIAL INTELLIGENCE

I.1. AI CONCEPTS

Intelligence

- Dictionary definition.

(1) : the ability to learn or understand or to deal with new or trying situations : REASON;

also : the skilled use of reason

(2) : the ability to apply knowledge to manipulate one's environment or to think abstractly
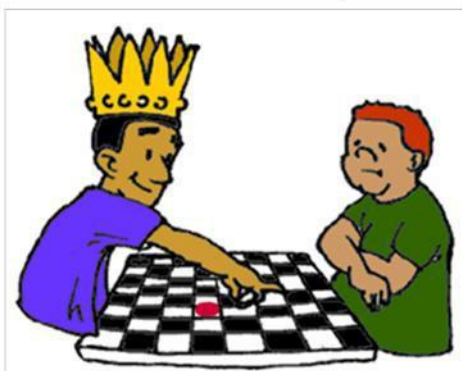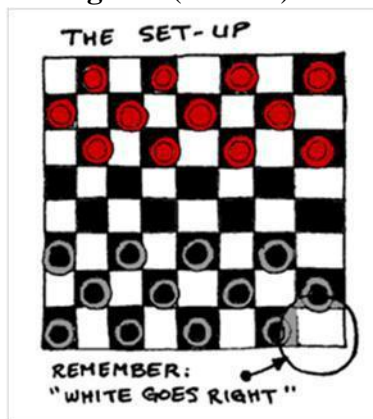
as measured by objective criteria (as tests)

❖ Intelligence is the ability to learn about, to learn from, to understand about, and interact with one's environment.

❖ Intelligence is the faculty of understanding

Intelligence is not to make no mistakes but quickly to understand how to make them good

Intelligence (2 views): autonomous movement or thinking

Is a computer more intelligent if it beats you in a game of draughts?

Intelligence department: a government department engaged in collecting secret information.

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Types of Intelligence

There are nine types of natural intelligences:

- Visual/Spatial
- Verbal/Linguistic
- Logical/Mathematical
- Interpersonal
- Intrapersonal
- Bodily/Kinesthetic
- Musical/Rhythmic
- Naturalist
- Existential

1. Visual/Spatial Intelligence

- It is the ability to create images on paper and in your mind

"picture smart"

2. Verbal/Linguistic Intelligence

- Have good auditory and verbal skills, and rely on spoken language to help comprehend and retain information.

"word smart"

3. Logical/Mathematical Intelligence

Feel comfortable and capable when applying logic and reason (solving problems and puzzles).

"number/reasoning smart"

4. Interpersonal Intelligence

Comfortable in social situations (establish relationships).

"people smart"

5. Intrapersonal Intelligence

Introspective and aware of your feelings and those of other people.

"self smart"

6. Bodily/Kinesthetic Intelligence

Well coordinated and enjoy and excel in sports.

"body smart"

7. Musical/Rhythmic Intelligence

Have natural talent for performing or composing music.

"musical smart"

8. Naturalist Intelligence

Enjoy interacting with animals, nature, and wildlife.

"nature smart"

9. **Existential** Intelligence

Tackle deep questions about human existence; meaning of life.
"philosophical smart"

Everyone is different, everyone can excel in a particular area of intelligence

- "What makes life interesting, however, is that we don't have the same strength in each intelligence area, and we don't have the same amalgam of intelligences. Just as we look different from one another and have different kinds of personalities, we also have different kinds of minds."

Reasoning

Knowledge

Artificial

Anything produced by human art or effort rather than originating naturally.

Artificial Intelligence

There is no agreed definition of the term artificial intelligence. However, there are various definitions that have been proposed. These are considered below.

- AI is a study in which computer systems are made that think like human beings. Haugeland, 1985 & Bellman, 1978.

- AI is a study in which computer systems are made that act like people. AI is the art of creating computers that perform functions that require intelligence when performed by people. Kurzweil, 1990.

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

- AI is a study in which computers that rationally think are made. Charniac & McDermott, 1985.

- AI is the study of computations that make it possible to perceive, reason and act. Winston, 1992 AI is the study in which systems that rationally act are made. AI is considered to be a study that seeks to explain and emulate intelligent behaviour in terms of computational processes. Schalkeoff, 1990.

- AI is considered to be a branch of computer science that is concerned with the automation of intelligent behavior. Luger & Stubblefield, 1993.

- AI is theory and development of computer programs or systems able to perform tasks that normally require human intelligence, such as decision making and diagnosis,

pattern and speech recognition, and natural language translation. Oxford English Reference Dictionary, Indian Edition,2008

- Etc

❖ **Artificial Intelligence (AI) is usually defined as the science of making computers do things that require intelligence when done by humans.**

❖ **A.I is the study of ideas that enable computers to be intelligent**

How Does AI Works??

Artificial intelligence works with the help of

- **Artificial Neurons (Artificial Neural Network)**

And

- **Scientific theorems(If-Then Statements, Logics)**

Strong or Hard AI versus weak or Soft AI

Strong AI aims to build machines whose overall intellectual ability is indistinguishable from that of a human being.

Soft AI refers to the use of software to study or accomplish specific problem or reasoning tasks that do not encompass the full range of human cognitive abilities.

- **Objectives of AI**
  Understand how living beings behave, think, learn.
- Engage in experiments by building artificial systems
- Derive applications for robotics and computers

- **History of AI**
  1943 McCulloch & Pitts: Boolean circuit model of brain
- 1950 Turing's "Computing Machinery and Intelligence"
- 1950s Early AI programs, including Samuel's checkers (draughts) program
- Newell & Simon's Logic Theorist, Gelernter's Geometry Engine
- 1956 Dartmouth meeting: "Artificial Intelligence" adopted
- 1966–74 AI discovers computational complexity,   Neural network research almost disappears
- 1969–79 Early development of knowledge-based systems
- 1980–88 Expert systems industry booms
- 1988–93 Expert systems industry busts: "AI Winter"
- 1985–95 Neural networks return to popularity
- 1988– Resurgence of probabilistic and decision-theoretic methods Rapid increase in technical depth of mainstream AI, "Nouvelle AI": ALife, GAs, soft computing

Human Intelligence VS Artificial Intelligence Pros

Human Intelligence

- Intuition, Common sense, Judgement, Creativity, Beliefs etc
- The ability to demonstrate their intelligence by communicating effectively
- Plausible Reasoning and Critical thinking

Artificial Intelligence

- Ability to simulate human behavior and cognitive processes
- Capture and preserve human expertise
- Fast Response. The ability to comprehend large amounts of data quickly.

Human Intelligence VS Artificial Intelligence Cons

Human Intelligence

- Humans are fallible
- They have limited knowledge bases
- Information processing of serial nature proceed very slowly in the brain as compared to computers
- Humans are unable to retain large amounts of data in memory.

Artificial Intelligence

- No "common sense"
- Cannot readily deal with "mixed" knowledge
- May have high development costs
- Raise legal and ethical concerns

Why AI?

"AI can have two purposes. One is to use the power of computers to augment human thinking, just as we use motors to augment human or horse power. Robotics and expert systems are major branches of that. The other is to use a computer's artificial intelligence to understand how humans think. In a humanoid way. If you test your programs not merely by

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what they can accomplish, but how they accomplish it, they you're really doing cognitive science; you're using AI to understand the human mind." - Herb Simon

Goals of AI

- The definitions of AI gives four possible goals to pursue :
  1. Systems that think like humans.
  2. Systems that think rationally.
  3. Systems that act like humans
  4. Systems that act rationally

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