اللَّهُمَّ لا سَهْلَ إلاَّ ما جَعَلْتَهُ سَهْلاً
وأَنْتَ تَجْعَلُ الحَزْنَ إذَا شِئْتَ سَهْلاً

IDSS

PART (1)

BMT

Artificial Intelligent

فاصل اعلاني

صلي علي سيدنا محمد ✉️

فاصل اعلاني

(📞 : 0127 187 3664)

An Introduction to Artificial Intelligence

- P h i l o s o p h y
- M a t h e m a t i c s
- N e u r o s c i e n c e
- P s y c h o l o g y
- E c o n o m i c s
- C o m p u t e r E n g i n e e r i n g
- L i n g u I s t i c s

What is Intelligence?

• Judgment, otherwise called "**good sense**," "**practical sense**," "**initiative**," the faculty of adapting one's self to circumstances.

• "the capacity to **learn** and **solve problems**"

• in particular

- • the ability to solve novel **problems**
- • the ability to act **rationally**
- • the ability to act **like humans**

What is Intelligence abilities? [Section]

1. Reasoning: The capacity to think <u>logically</u> and <u>abstractly</u>.
2. Learning: The ability to <u>acquire</u> and <u>retain</u> knowledge.
3. Problem-solving: The skill to address <u>challenges</u> effectively.
4. Adaptation: The capacity to <u>adjust to different situations.</u>
5. Emotional knowledge: Understanding and managing <u>emotions</u>.
6. Creativity: Generating <u>novel</u> ideas and solutions.
7. Self-awareness: Recognizing one's <u>own thoughts</u> and feelings.

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What is Artificial intelligence?

• (John McCarthy) It is the **science** and **engineering** of making **intelligent machines**, especially intelligent computer **programs**.

• (Section) AI is the branch of science which makes the machine **exhibit intelligence** as human beings for **a particular domain**. in order words, a machine is intelligent if it **Solve/perform/reason** certain classes of problems requiring intelligence in humans.

• (1991) AI is the ability of digital computers or computer-controlled robots to solve **problems** that are normally associated with the **higher intellectual processing capabilities of humans.**

• (1983) Artificial Intelligence is the study of how to make **computers do things** at which, at the moment, **people are better**."

• It is related to the similar task of using computers to understand human intelligence, but AI does not have to limit (Confine) itself to methods that are biologically observable.

Strong vs. Weak AI Hypotheses?
-WEAK AI Hypothesis; *We can accurately <u>simulate</u> animal / human intelligence in a computer.*
- STRONG AI Hypothesis; *We can create algorithms that <u>are</u> intelligent (Consciousness ? ..Self-Awareness ? .. Free-will ?)*

Stages of Artificial Intelligence
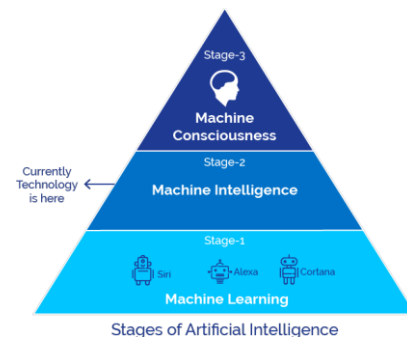
## Four Main Approaches of Artificial intelligence?

Four Main Approaches that have been followed, each by different people with different methods.

Systems that **act** like humans	Systems that **think** rationally
"The study of how to make computers do things at which. at the moment, people are better"	"The study of mental faculties through the use of computational models"
"The art of creating machines that perform functions that require intelligence when performed by people."	"The study of the computations that make it possible to perceive, reason, and act."
Systems that **think** like humans	Systems that **act** rationally
"The automation of activities that we associate with human thinking, such as decision making, problem solving, learning"	"AI .. is concerned with intelligent behavior in artifacts
"The exciting new effort to make computers think … machines with minds, in the full and literal sense."	"Computational Intelligence is the study of the design of intelligent agents."

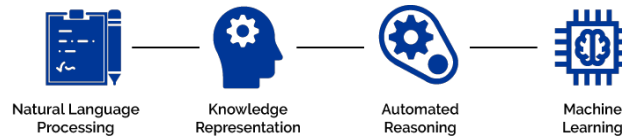# First Approach: Systems that <u>Act</u> Like Humans

♦ Operational test for intelligent behavior: *the* **Imitation Game**
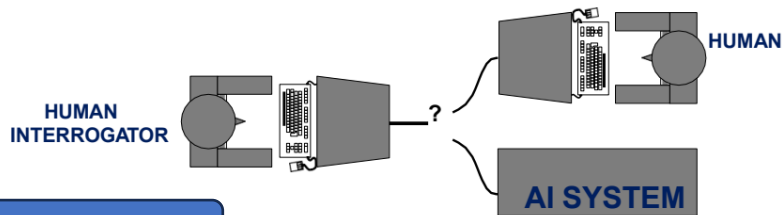
Turing Test: Can a human interrogator tell whether (written) responses to her (written) questions come from a human or a machine?

- Natural Language Processing
- Knowledge Representation
- Automated Reasoning
- Machine Learning

Total Turing Test *(extended to include physical aspects of human behavior):*
- Computer Vision
- Robotics
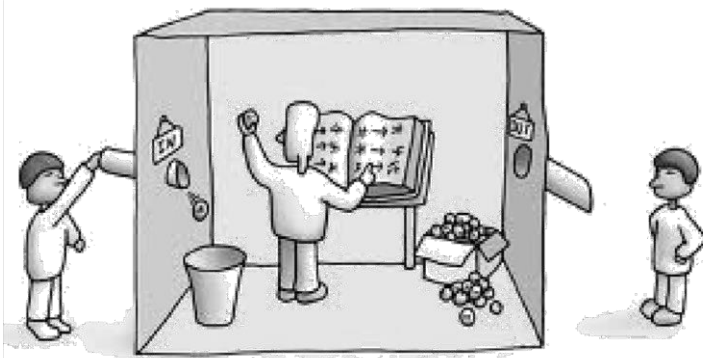

Hi, I am Sophia...　　　BabyX!

Reinforcement learning: It is a machine learning training method based on rewarding desired behaviors and/or punishing undesired ones.

Affective Computing: it describes computing that is in some way connected to emotion.

The Chinese Room Argument

If a person inside does a great job of answering questions, can we say s/he understands?
Even if (s)he is only blindly following rules?
(Obviously, the 'person inside' is acting like an AI program)
**That is a weak AI.**

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Second Approach: Systems that Thinking Like Humans

- Need to **study the brain as an information processing machine**, … in other words …
- Use Computational Models to Understand the Actual Workings of Human Mind
  - Devise/Choose a sufficiently precise theory of the mind.
  - Express it as a computer program.

- Tight connections with *Cognitive Science & Neuroscience*.
- Also known as *descriptive approaches* to AI.
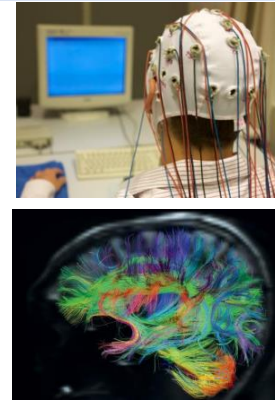
Third Approach: Systems that Thinking Rationally

Logic: formalize **idealized or right thinking**, i.e. **Proven (irrefutable) reasoning processes**.

• That is; patterns of argument that always yield correct conclusions when supplied with correct premises.

• Aims to build **computational frameworks based on logic**, that is, describe a problem in **formal logical notation** and apply **general deduction procedures** to solve it.

• Some examples are (**Propositional Logic**) and (**Logic Programming**).

• More advanced logic-based representations: **Semantic Networks.**

WORD	SYMBOL	EXAMPLE	
NOT	¬	not A	¬A
AND*	∧	A and B	A ∧ B
OR	∨	A or B	A ∨ B
IMPLIES*	→	A implies B	A → B
IF AND ONLY IF	↔	A if and only if B	A ↔ B

Forth Approach: Systems that Acting Rationally

- The "think rationally" approach focuses on correct inference.
- But more is needed for rational behaviour, e.g. How to behave when there is no provably correct thing to do (i.e. reasoning under uncertainty).

Intelligent Agent

- Its *actions* are *appropriate* for its goals and circumstances.
- It is *flexible* to changing environments and goals.
- It *learns* from experience.
- It makes *appropriate choices* given *perceptual limitations* and *limited resources* (**bounded rationality** or **bounded optimality**).

Robots	interface agents
• In AI, artificial agents that have a physical presence in the world are usually known as Robots. • Robotics is the field primarily concerned with the implementation of the physical aspects of a robot	• Another class of artificial agents include interface agents, for either stand alone or Web-based applications (e.g. intelligent desktop assistants, recommender systems, intelligent tutoring systems).

Pac-Man .. as an .. **Intelligent Agent**