

## Lecture 1

### An introduction to Artificial Intelligence

#### 1.1. What is Intelligence?

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

- الذكاء هو القدرة على التعرف على البيئة المحيطة والتعلم منها وفهمها والتفاعل معها.

- Intelligence is the computational part of the ability to achieve goals in the world. Varying kinds and degrees of intelligence occur in people, many animals and some machines
- الذكاء هو الجزء الحسابي من القدرة على تحقيق الأهداف في العالم. هنالك أنواع ودرجات مختلفة من الذكاء عند البشر، والعديد من الحيوانات، وبعض الآلات.

#### 1.2. What is Artificial Intelligence?

- **Artificial Intelligence (AI)** has been defined as the branch of computer science that is concerned with the automation of intelligent behavior. What we aim to achieve in AI is to make machines behave the way humans would. The birth of AI occurred when Marvin Minsky & John McCarthy organized the Dartmouth Conference in 1956.

الذكاء الاصطناعي (AI) هو فرع من علوم الحاسوب الذي يهتم بأتمتة السلوك الذكي. ما نهدف إلى تحقيقه في الذكاء الاصطناعي هو جعل الآلات تتصرف بالطريقة التي يتصرف بها البشر.

- **Artificial intelligence (AI)** is a research field that studies how to realize the intelligent human behaviors on a computer. The ultimate goal of AI is to make a computer that can learn, plan, and solve problems autonomously.

الذكاء الاصطناعي (AI) هو مجال بحثي يدرس كيفية إدراك السلوكيات البشرية الذكية على جهاز الكمبيوتر. الهدف النهائي للذكاء الاصطناعي هو إنشاء جهاز كمبيوتر يمكنه التعلم والتخطيط وحل المشكلات بشكل مستقل.

- It is the science and engineering of making intelligent machines, especially intelligent computer programs. It is related to the similar task of using computers to understand human intelligence.

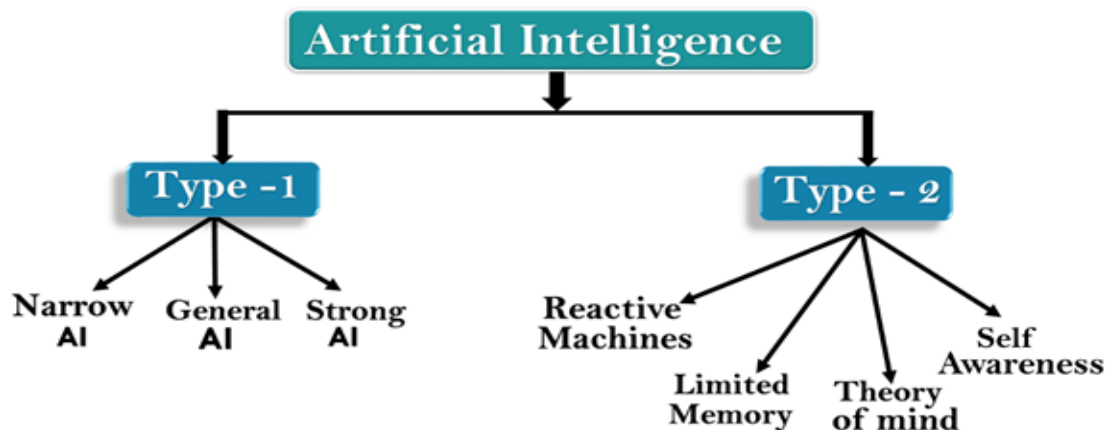
هو علم وهندسة صنع الآلات الذكية، وخاصة برامج الكمبيوتر الذكية. ويرتبط الأمر بالمهمة المماثلة المتمثلة في استخدام أجهزة الكمبيوتر لفهم الذكاء البشري.

- **This requires many processes:-**

- 1- **Learning:** - acquiring the knowledge and rules that used these knowledge.
- 2- **Reasoning:-** Used the previous rules to access to nearly reasoning or fixed reasoning.

### 1.3. Types of Artificial Intelligence

Artificial Intelligence can be divided in various types, there are mainly two types of main categorization which are based on capabilities and based on functionality of AI.



#### 🚩 AI type-1: Based on Capabilities

1. **Narrow AI, also called weak AI or artificial narrow intelligence (ANI)**, refers to the AI that is used to solve a specific problem. Almost all AI applications we have today are narrow AI. For example, image classification, object detection, speech recognition (such as Amazon's Alexa, iPhone's Siri, Microsoft's Cortana, and Google Assistant), translation, natural language processing, weather forecasting, targeted advertisements, sales predictions, email spam detection, fraud detection, face recognition, and computer vision are all narrow AI.
2. **General AI, also called strong AI or artificial general intelligence (AGI)**, refers to the AI that is for solving general problems. It is more like a human being, which is able to learn, think, invent, and solve more complicated problems. The singularity, also called technological singularity, is when AI overtakes human intelligence. According to Google's Ray Kurzweil, an American author, inventor, and futurist, AI will pass the Turing test in 2029 and reach the singularity point in 2045. Narrow AI is what we have achieved so far, and general AI is what we expect in the future.
3. **Super AI, also called super intelligence**, refers to the AI after the singularity point. Nobody knows what will happen with super AI. One vision is human and machine integration through a brain chip interface. In August 2020, Elon Musk, the most famous American innovative entrepreneur, has already demonstrated a pig with a chip in its brain. While some people are more pessimistic about the future of AI, others are more optimistic. We cannot predict the future, but we can prepare for it.



## ✚ Artificial Intelligence type-2: Based on functionality

### 1. Reactive Machines

- Purely reactive machines are the most basic types of Artificial Intelligence.
- Such AI systems do not store memories or past experiences for future actions.
- These machines only focus on current scenarios and react on it as per possible best action.
- IBM's Deep Blue system is an example of reactive machines.
- Google's AlphaGo is also an example of reactive machines.

يفتقر هذا النوع إلى القدرة على التعلم من الخبرات السابقة أو التجارب الماضية لتطوير الاعمال المستقبلية، فهو يتفاعل مع التجارب الحالية لاخراجها بأفضل شكل ممكن.

### 2. Limited Memory

- Limited memory machines can store past experiences or some data for a short period of time.
- These machines can use stored data for a limited time period only.
- Self-driving cars are one of the best examples of Limited Memory systems. These cars can store recent speed of nearby cars, the distance of other cars, speed limit, and other information to navigate the road.

تخزين بيانات التجارب السابقة لفترة زمنية محدودة، مثلا نظام القيادة الذاتية، يتم تخزين السرعة الأخيرة للسيارات الأخرى، ومقدار بعد السيارة عن السيارات الأخرى، والحد الأقصى للسرعة. وغيرها من البيانات الأخرى اللازمة للقيادة عبر الطرق.

### 3. Theory of Mind

- Theory of Mind AI should understand the human emotions, people, beliefs, and be able to interact socially like humans.

التفاعل مع الأشخاص والتواصل معهم.

#### 4. Self-Awareness

- Self-awareness AI is the future of Artificial Intelligence. These machines will be super intelligent, and will have their own consciousness, sentiments, and self-awareness.
- These machines will be smarter than human mind.
- Self-Awareness AI does not exist in reality still and it is a hypothetical concept.

من التوقعات المستقبلية التي يصبو إليها علم الذكاء الاصطناعي، بحيث يتكون لدى الآلات وعي ذاتي ومشاعر خاصة، الأمر الذي ممكن ان يجعلها أكثر ذكاءً من الكائن البشري ، ولا يزال هذا المفهوم غير موجود على أرض الواقع.

### 1.4. Some Branches of AI

#### 1- Logical AI

What a program knows about the world in general the facts of the specific situation in which it must act and its goals are all represented by sentences of some mathematical logical language. The program decides what to do by inferring that certain actions are appropriate for achieving its goals. For example If the food is good and the service is good then the restaurant is good.  $x \wedge y \rightarrow z$ .

#### 2- Search in AI

AI programs often examine large numbers of possibilities, e.g. moves in a chess game or inferences by a theorem proving program. Discoveries are continually made about how to do this more efficiently in various domains.

#### 3- Knowledge Representation

Facts about the world have to be represented in some way. Usually languages of mathematical logic are used.

#### 4- Pattern Recognition

When a program makes observations of some kind, it is often programmed to compare what it sees with a pattern. For example, a vision program may try to match a pattern of eyes and a nose in a scene in order to find a face. More complex patterns, e.g. in a natural language text, in a chess position, or in the history of some event are also studied. These more complex patterns require quite different methods than do the simple patterns that have been studied the most.

### 5- Heuristics

A heuristic is a way of trying to discover something or an idea imbedded in a program. The term is used variously in AI. Heuristic functions are used in some approaches to search to measure how far a node in a search tree seems to be from a goal.

Heuristic predicates that compare two nodes in a search tree to see if one is better than the other, i.e. constitutes an advance toward the goal, may be more useful

### 6- Natural language processing:

Getting computers to communicate with us in human languages like English, either by printing on a computer terminal, understanding things we type on a computer terminal, generating speech, or understanding our speech .

### 7- Inference:

Getting computers to remember complicated interrelated facts, and draw conclusions from them.

### 8- Planning:

Getting computers to plan sequences of actions to accomplish goals.

### 9- Expert system:

Getting computers to offer us advice based on complicated rules for various situations .

### 10- Robotics:

Getting computers to move themselves and objects around in the real world .

## 1.5. Areas of Application AI System

### 1- Problem solving (Game Playing )

- For example: **Chess** (Deep Blue chess program beat world champion Gary Kasparov), **8-puzzle problem and crossword puzzles**.

**2- Natural Language understanding / Processing (NLP)**

- NLP is an application area which permits computers to understand and generate human language. Specific areas of application include **speech recognition and speech understanding**.
- For example: **AI Translators** – spoken to and prints what one wants in foreign languages.

**3- Expert Systems:**

- is a computer system that emulates the decision-making ability of a human expert.
- For example: **Diagnostic Systems, troubleshooting and repairing complex pieces of equipment and medical cases, decision support systems** for financial analysis (buying or selling stocks), helping locate oil and mineral deposits.
- MYCIN system for diagnosing bacterial infections of the blood and suggesting treatments

**4- Robotics:**

- Robotics becoming increasing important in various areas like: games, to handle hazardous conditions.
- For example: **automated cars**

**5- Automated theorem proving**

- use inference methods to prove new theorems.

**6- Pattern recognition:**

- For example : Handwritten recognition.

**7- Computer Vision**

- Computers can be used to analyze and evaluate visual information. AI techniques are used to examine a picture or real-life scene to identify particular objects, features or patterns. These software are embedded into robot system to give them the capability to maneuver around mazes or road tracks.
- For example: **deepfake program**

**Resources:-**

- 1) <https://www.javatpoint.com/types-of-artificial-intelligence>
- 2) [https://uomustansiriyah.edu.iq/media/lectures/6/6\\_2023\\_02\\_19!04\\_40\\_19\\_AM.pdf](https://uomustansiriyah.edu.iq/media/lectures/6/6_2023_02_19!04_40_19_AM.pdf)
- 3) <https://ccms.tu.edu.iq/csd/electronic-lectures/387--المرحلة-الاصطناعي-الذكاء-الثالثة-٢٠٢٢-٢٠٢١.html>