AI

Artificial Intelligence Overview

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Artificial Intelligence Overview

Agenda

- What is Artificial Intelligence ?
  - What is Intelligence ?
  - What is Artificial ?
- History of AI.
- AI in Perspective.
- Human Vs. Computer (Machine).
- Usages of AI
- Types of AI
- Strong AI Vs. Weak AI
- Break
- Programming with & without AI
- Major AI Approaches
- Some AI Applications
- Strategies of Search
- Limits on AI
- Examples of AI applications
- AI for people in a hurry (5 mints Video)
- Q&A

What is Intelligence ?

There is no agreed definition or model of intelligence.

The ability to think, reason, and understand instead of doing things automatically or by instinct.	القدرة على التفكير وايجاد السبب والفهم بدلاً من القيام بالأشياء تلقائيًا أو بواسطة الغريزة.
The ability to understand and think about things, and to gain and use knowledge.	القدرة على فهم الأشياء والتفكير فيها ، واكتساب المعرفة ثم استخدامها.
The ability to learn or understand things or to deal with new or difficult situations.	القدرة على تعلم أو فهم الأشياء أو التعامل مع مواقف جديدة أو صعبة.
The ability to make/discover finer differences.	القدرة على عمل / اكتشاف أدق الفروق.

But,
it depends on many un-equal factors between person to another (Education, Age level , environment, tools….etc)

Example :
William Shockley and Luis Walter, who both won the Nobel Prize for physics, were excluded from a Study because of their I.Q. (intelligence quotient) scores. !!

Intelligence is

" Ability to select appropriate variant of the set of available substitutes **with** the measure of the number and the quality of the uniqueness you have in a given situation "
(when all factors are equal)

" المقدرة على اختيار البديل المناسب من مجموعة بدائل متوفرة **مع** قياس عدد حالات التفرد (التمير) لديك في حالة محددة "
(عند تساوي جميع العوامل)

What is artificial Intelligence ?

(AI) is an area of computer science that emphasizes the creation of intelligent machines that work and react like humans.

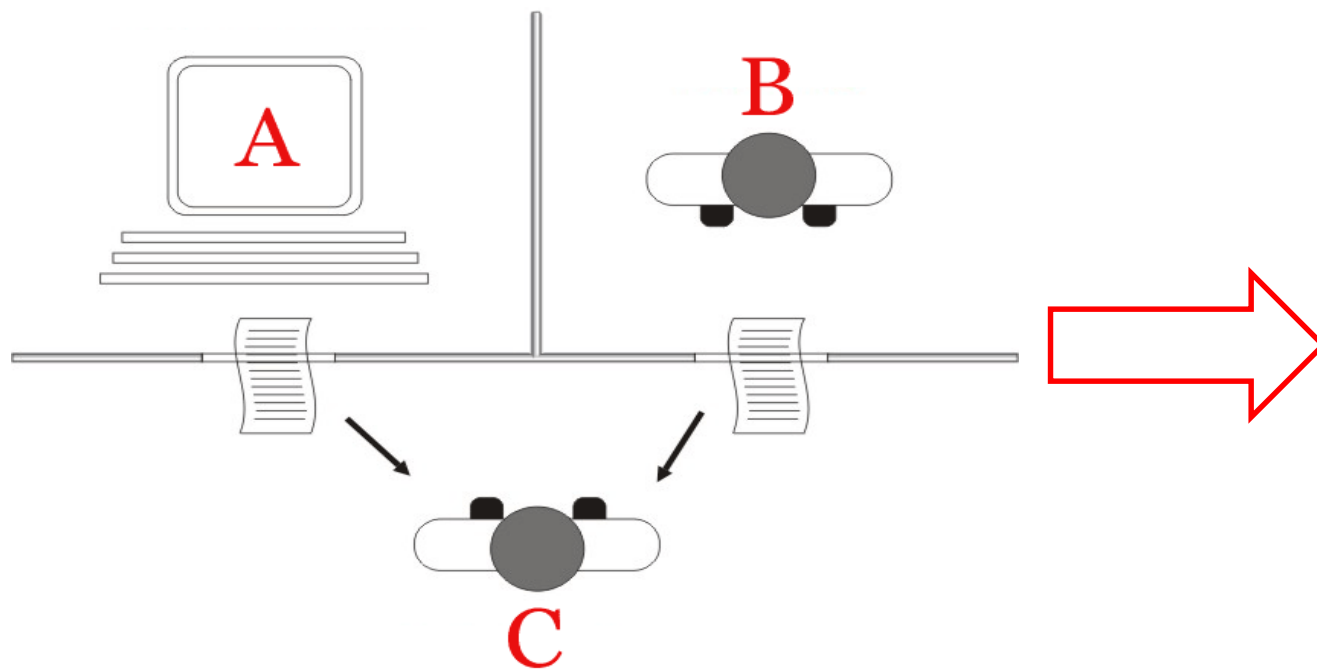**(AI) is** software trying to mimic the human brain

- Learn like a human
    - Training
    - Pattern recognition
- Make decisions like a human
    - Use anticipation to make decisions
    - Use learnings to predict outcomes

هو مجال من مجالات علوم الكمبيوتر الذي يؤكد على إنشاء آلات ذكية تعمل وتتفاعل مثل البشر.

- In 1950 (started in 1941) English mathematician Alan Turing wrote a landmark paper titled "Computing Machinery and Intelligence" that asked the question: "Can machines think?"

- Further work came out of a 1956 workshop at Dartmouth sponsored by John McCarthy. In the proposal for that workshop, he coined the phrase a "study of Artificial Intelligence"

- If the evaluator cannot reliably tell the machine from the human, the machine is said to have passed the test.

- The test results do not depend on the machine's ability to give correct answers to questions, only how closely its answers to those a human would give.

A: Machine B: Human C: Human evaluator

Alan Turing , (1912-1954), Mathematician.

A computer would deserve to be called "intelligent" if it could deceive a human into believing that it is human.

يستحق الكمبيوتر ان نطلق عليه انه "ذكي" اذا تمكن من أن يخدع الانسان ليصدق أنه انسان !

Prof. John McCarthy, (1927-2011), Artificial Intelligence founder.

I don't see that human intelligence is something that humans can never understand. AI is the & Engineering of making intelligent Machines.

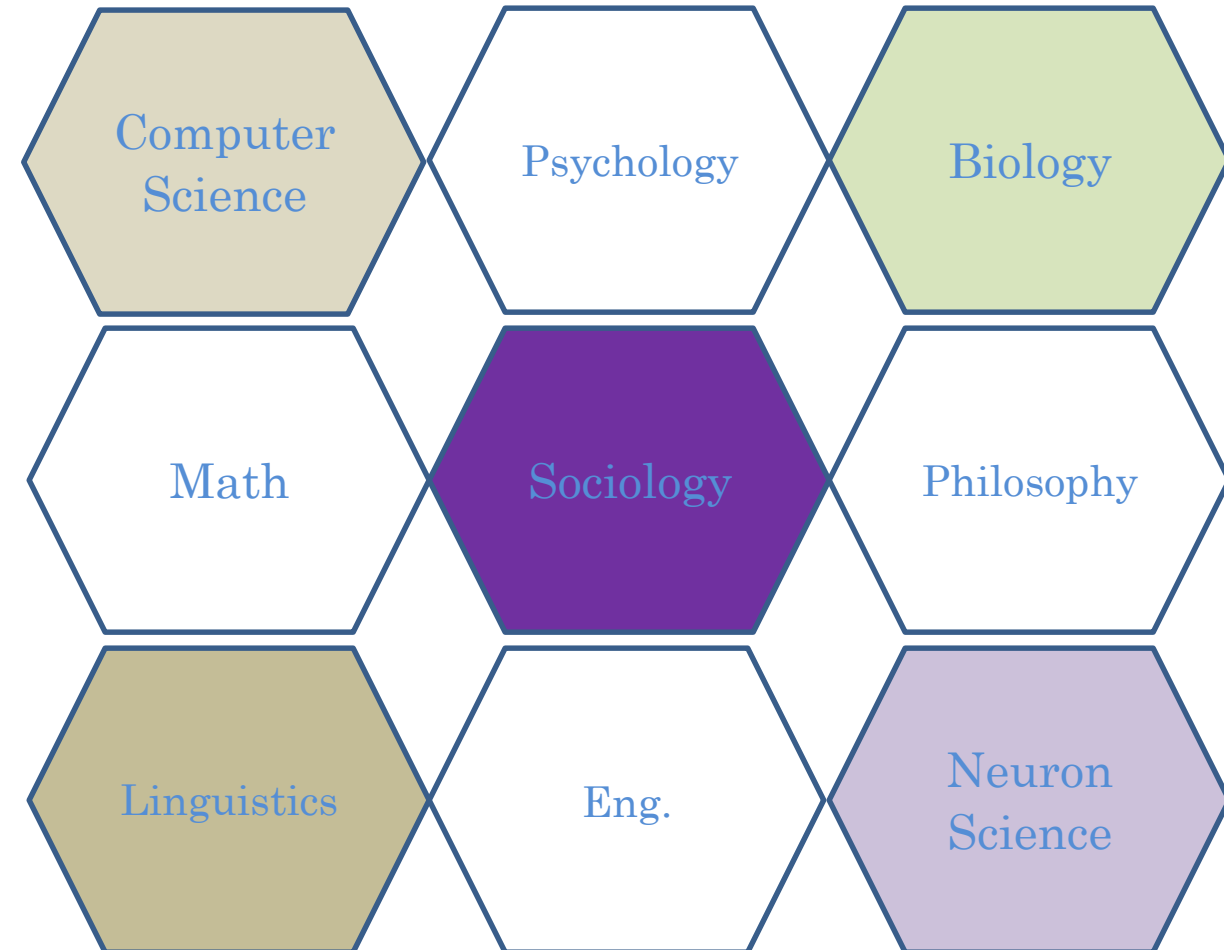لا أرى أن الذكاء البشري شيء لا يمكن للبشر فهمه أبدًا . الذكاء الصناعي هو علم وهندسة صناعة الات ذكية
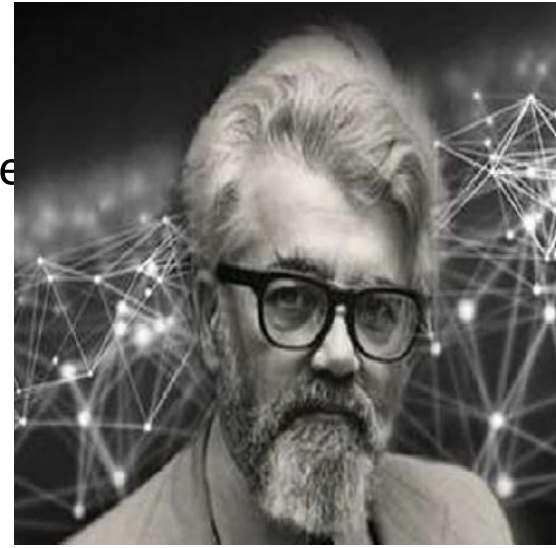
Artificial intelligence is multidiscipline area and consists of :

– People

– Procedures

– Hardware

– Software

– Data

– knowledge

All above are needed to develop computer systems and machines that demonstrate the characteristics of intelligence.

Computer Science

Psychology

Biology

Math

Sociology

Philosophy

Linguistics

Eng.

Neuron Science

- Electronic circuits process information 1 million times faster than biological circuits i.e. your PC is a million times faster than your brain

- Neurons in the brain transmit signals at 100m/s. Computers transmit at the speed of light (3 x 10^8 m/s)

- Brain is stuck in your skull and can't scale. A computer can scale to fit into a datacentre

- Brain is more efficient than a computer... so far... not for long

  - 24 hours x 7 days = 168 hours in a week
  - 168 x 1 million = 168,000,000 times more work than a human

  - 168 million / 24 hrs = 7,000,000 days worth of human work in 1 week
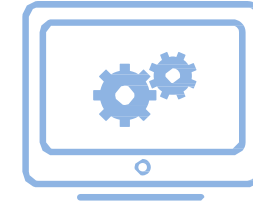 - 7,000,000 / 365 days = <u>19,178 years worth of human work in 1 year</u>

What are we & machines good at ?
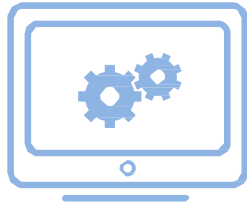
GOOD AT
Common
Sense
Intuition
Creativity
Empathy
Versatility

GOOD AT
Large Data Sets
Complex
Calculations
Learning
Automation

+

AI enhances our capability and gives organizations competitive advantage

Humans

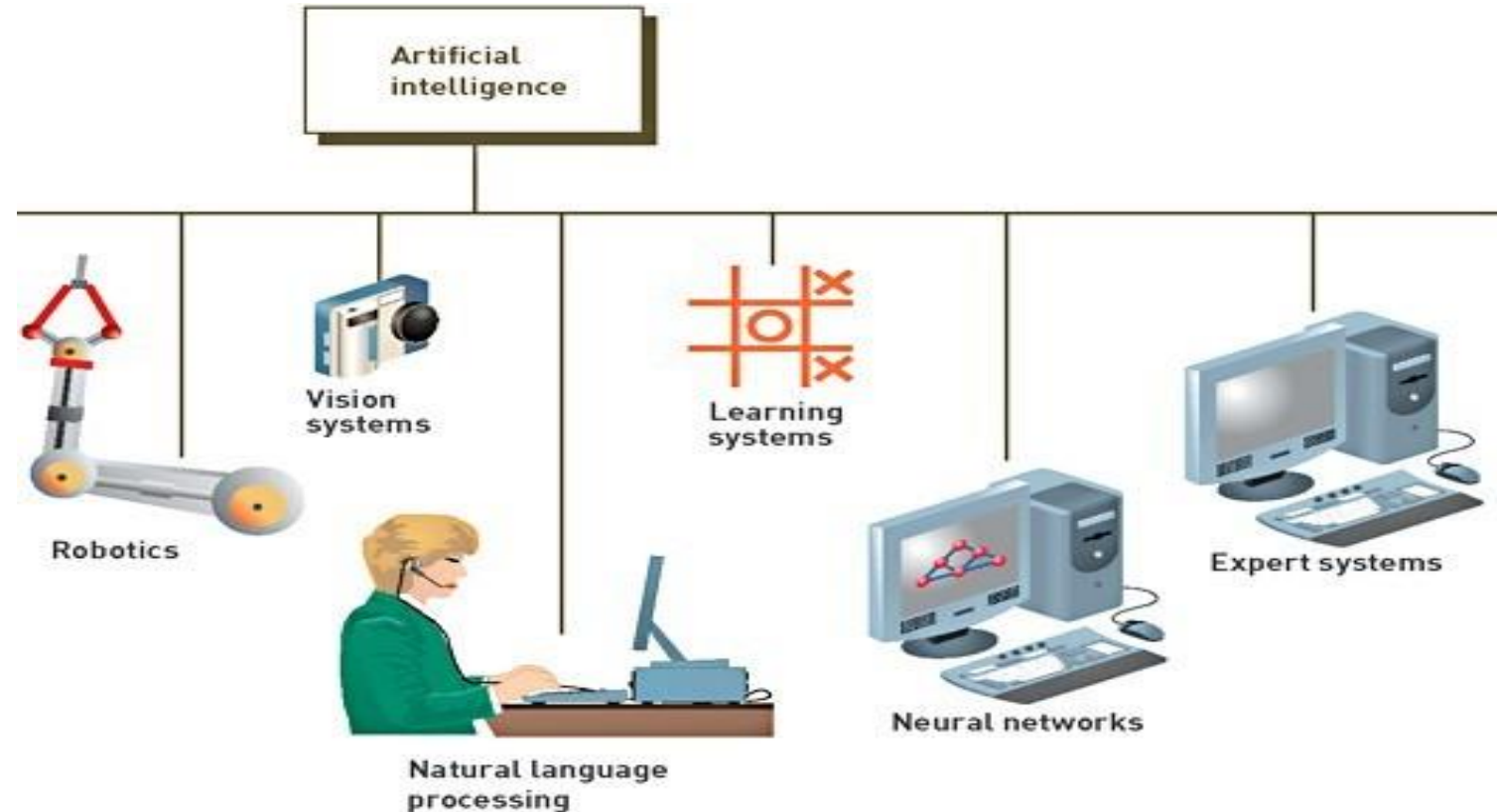+

Computers

>

Humans Alone

Computers Alone

Ability to	Human		Machine	
	Low	High	Low	high
Use sensors (eyes, ears, smell…)		•	•	
Be creative and imaginative		•	•	
Learn from experience		•	•	
Adapt to new situations		•	•	
Afford the cost of acquiring intelligence		•	•	
Acquire a large number of external information		•		•
Use a variety of information sources		•		•
Make complex calculations	•			•
Transfer information	•			•
Make a series of calculations rapidly & accurately	•			•

Usages of AI

- Image recognition
- Predictive Analysis
- Deep learning
- Handwriting recognition
- Intelligent Robots
- Translation
- Classifications & Clustering
- Information Extraction
- Speech to text & Text to speech

Artificial intelligence

Robotics

Vision systems

Learning systems

Natural language processing

Neural networks

Expert systems

5 best Programming Languages for Artificial Intelligence

Python

JAVA

Prolog

R

LISP

There are three types of AI :

➢ Today semi-automated cars are available in the market and car manufacturing companies are working on the concept of driverless cars. Present kind of AI is known as "Artificial Narrow Intelligence".

➢ In 2040, AI made robots will compete with humans across all endeavors. It is as "Artificial General Intelligence".

➢ After that AI systems will demonstrate intelligence beyond human capabilities. It is named as "Artificial Super Intelligence".

TODAY
Artificial Narrow Intelligence

ABOUT 2040?
Artificial General Intelligence

SOON AFTER AGI
Artificial Super Intelligence

Strong AI Vs. Weak AI

- **Artificial Narrow Intelligence (Weak AI)**
  - ❖ Constrained in problem sets / domains
  - ❖ Set of techniques for intelligent decisions / actions
  - ❖ Across many software systems
  - ❖ Does not attempt to solve the problem of general intelligence
  - ❖ Most AI today is narrow AI

- **Artificial General Intelligence (Strong AI)**
  - ❖ In principle able to learn and act intelligently in a broad general range, as humans can.

- **Artificial Super Intelligence (Future AI)**
  - ❖ Beyond human capabilities.

Break

Programming with & without AI

Programming with AI	• A computer program with AI can answer the generic questions it is meant to solve. • AI programs can absorb new modifications by putting highly independent pieces of information together. Hence you can modify even a minute piece of information of program without affecting its structure. • Quick and Easy program modification.
Programming without AI	• A computer program without AI can answer the specific questions it is meant to solve. • Modification in the program leads to change in its structure. • Modification is not quick and easy. It may lead to affecting the program negatively.

There are two AI approaches :

Logic and Rules-Based Approach

- Representing processes or systems using logical rules.
- Top-down rules are created for computer
- Can be used to automate processes

Machine Learning (ML)- Pattern-Based Approach

- Algorithms find patterns in data and infer rules on their own
  - "Learn" from data and improve over time
- These patterns can be used for automation or prediction
- ML is the **dominant** mode of AI today

Some AI Applications

- **Game playing -** To beat a world champion by force requires being able to look at 200 million positions per second.

- **Speech recognition -** it is possible to instruct some computers using speech, most users have gone back to the keyboard and the mouse as still more convenient.

- **Understanding natural language -** The computer has to be provided with an understanding of the domain the text is about, and this is presently possible only for very limited domains.

- **Computer vision -** full computer vision requires partial three-dimensional information that is not just a set of two-dimensional views. At present there are only limited ways of representing three- dimensional information directly, and they are not as good as what humans evidently use.

- **Expert systems -** A ``knowledge engineer'' interviews experts in a certain domain and tries to embody their knowledge in a computer program for carrying out some task.

- **Heuristic classification -** most feasible kinds of expert system is to put some information in one of a fixed set of categories using several sources of information.

- **Genetic algorithm:** an approach to solving large, complex problems in which a number of related operations or models change and evolve until the best one emerges

- **Intelligent agent:** programs and a knowledge base used to perform a specific task for a person, a process, or another program
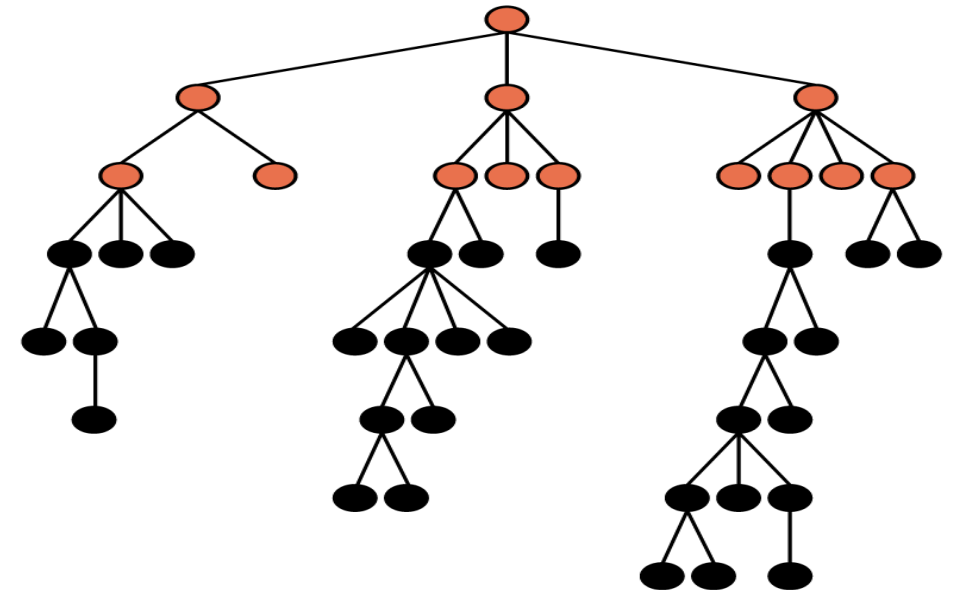
Search Techniques / Search Trees

- **Depth-first** A technique that involves the analysis of selected paths all the way down the tree

- **Breadth-first** A technique that involves the analysis of all possible paths but only for a short distance down the t

Depth-First Search
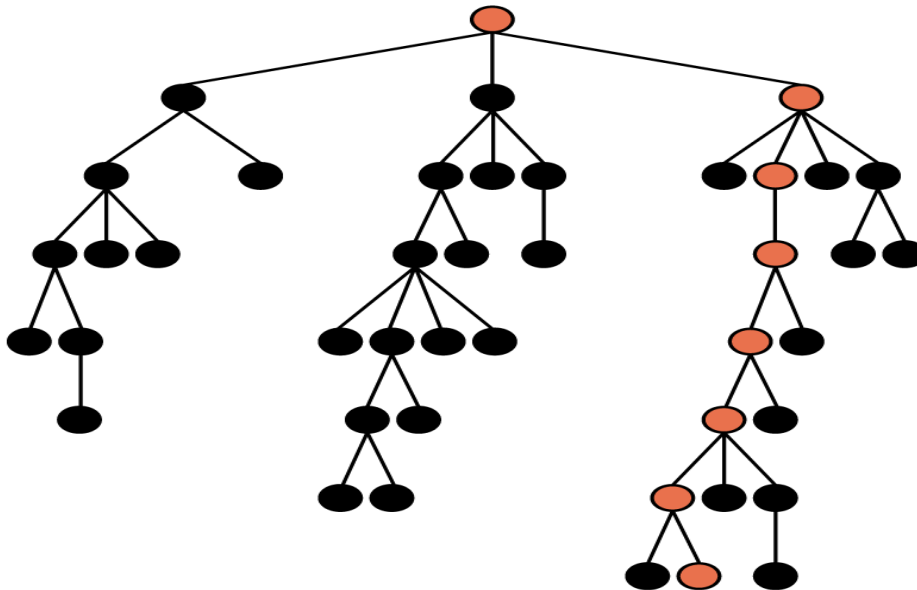
Breadth-first Search

Limits on AI

- **Artificial Intelligence Accomplishments**
    - Automate many things that couldn't do before

- **AI Limits**
    - Many things still beyond the domain of AI
    - No thinking computers
    - No Abstract Reasoning
    - Often AI systems Have Accuracy Limits
    - Many things difficult to capture in data
   - Sometimes Hard to Explain Systems

Robotics

- Mechanical or computer devices that perform tasks requiring a high degree of accuracy or that are boring or dangerous for humans.

- Modern robotics combines high accurate machine capabilities with sophisticated controlling software.

- Many applications of robotics exist today. Research into robots is continuing.
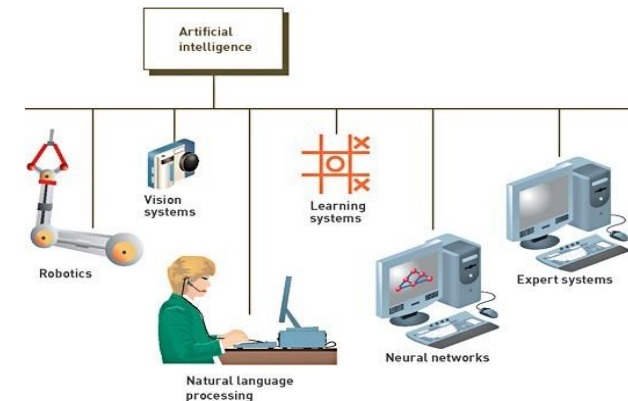
Vision Systems

- Hardware and software that permit computers to capture, store, and manipulate visual images and pictures

- Used by the U.S. Justice Department to perform fingerprint analysis

- Can be used in identifying people based on facial features

- Can be used with robots to give these machines "sight"
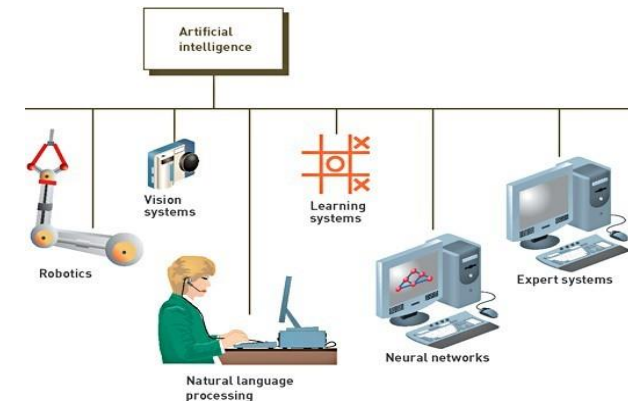
Natural language processing and Voice

- **Natural language processing:** allows the computer to understand and react to statements and commands made in a "natural" language, such as English

- Voice recognition involves converting sound waves into words
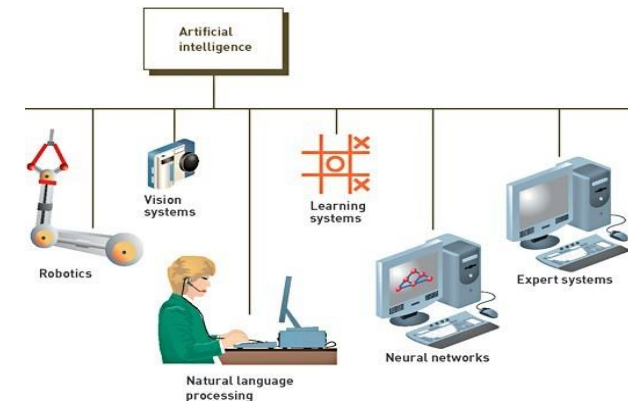
Learning Systems

- Combination of software and hardware that allows the computer to change how it functions or reacts to situations based on feedback it receives

- Learning systems software requires feedback on the results of actions or decisions

- Feedback is used to alter what the system will do in the future
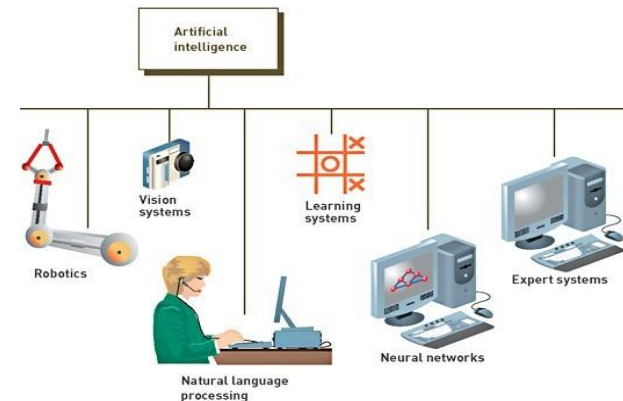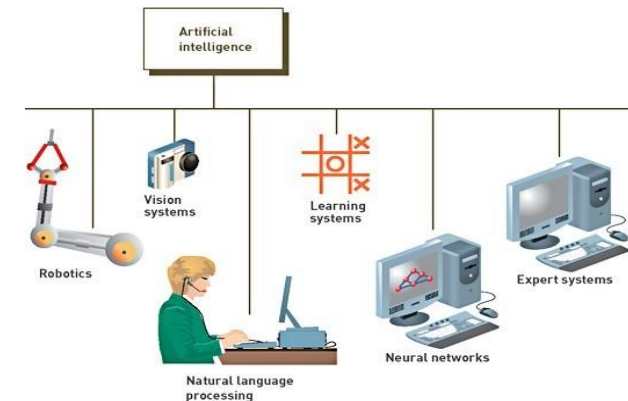
Neural Networks

- Computer system that can simulate the functioning of a human brain

- Ability to retrieve information even if some of the neural nodes fail

- Fast modification of stored data as a result of new information

- Ability to discover relationships and trends in large databases

- Ability to solve complex problems for which all the information is not present
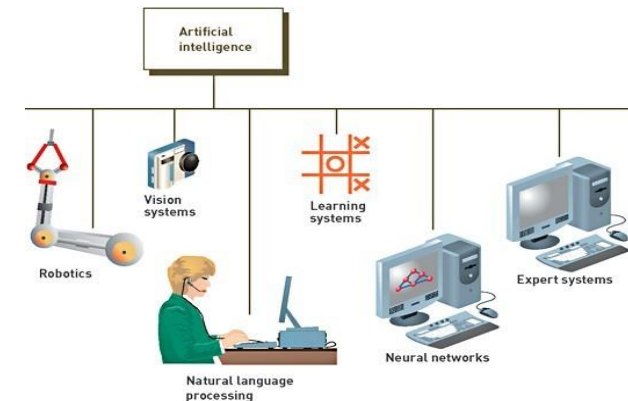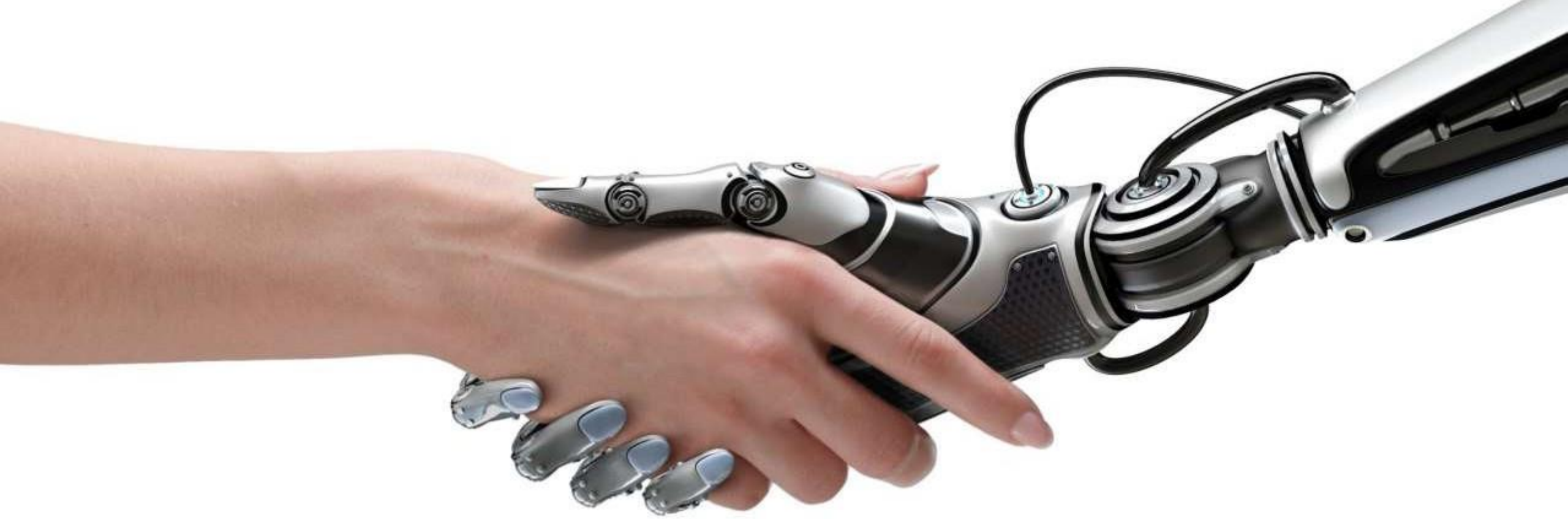
Expert Systems

- Hardware and software that stores knowledge and makes inferences, similar to a human expert. Like human experts, computerized expert systems use heuristics, or rules of thumb, to arrive at conclusions or make suggestions

- Used in many business applications
  - Designing new products and systems
  - Developing innovative insurance products
  - Increasing the quality of healthcare
  - Determining credit limits for credit cards
  - Solve a problem that is not easily solved using traditional programming techniques

AI.mp4

Thank you
Q&A