Artificial Intelligence (AI)

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European Pattern Recognition project

PART OF: Smart Grids Plus ERA-Net

WITH FUNDING FROM: Horizon 2020, TÜBİTAK, The Research Council of Norway, Swedish Energy Agency

A quick Questionnaire

How many of you have *heard* about Artificial Intelligence ?

How many of you *know* about Artificial Intelligence ?

How many of you are *using* Artificial Intelligence ?

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What is Human Intelligence

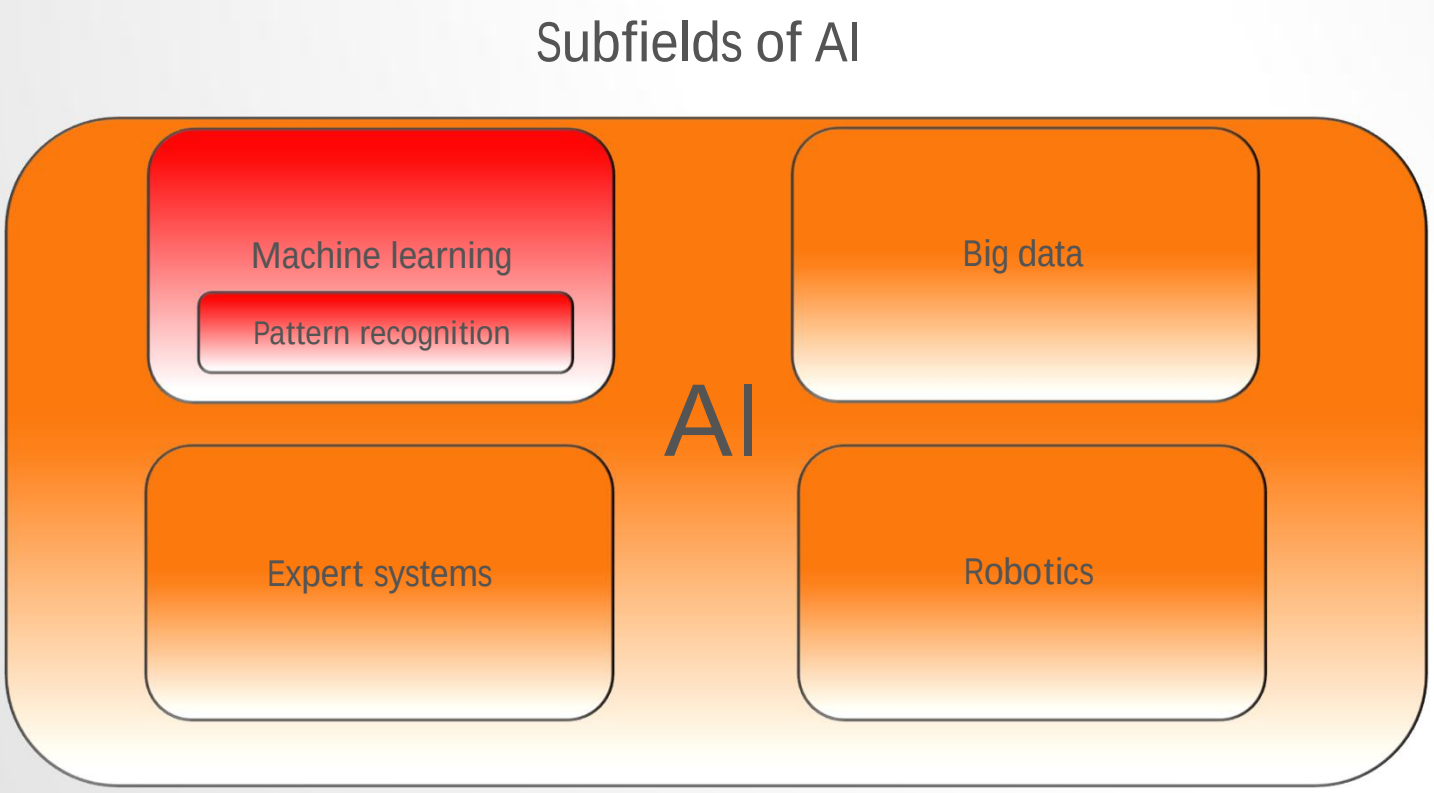
Human intelligence is a composition of abilities like learning, reasoning, understanding, perceiving, feeling and the ability to interact with other humans

What is Artificial Intelligence (AI)

Many possible definitions of AI

- AI is simulation of human intelligence processes by machines, especially computer systems.
- AI is the science of making computers do things that require intelligence when done by humans
- AI is the study of how computer systems can simulate intelligent processes like learning, reasoning and understanding symbolic information in a context
- The branch of computer science that is concerned with intelligent behavior (Luger and Stubblefield 1993)
- AI is the science and engineering of making intelligent machines, especially intelligent computer programs and using computers to understand human intelligence

What is Artificial Intelligence (AI)



Human Intelligence VS Artificial Intelligence

Human Intelligence VS Artificial Intelligence

Human Intelligence

- Intuition, common sense, creativity, beliefs etc (+)
- The ability to demonstrate their intelligence by communicating to others (+)
- Ability to critical thinking and resoning (+)
- Limited knowledge base (-)
- Information processing of serial nature in the brain – slowly compared to computers (-)
- Humans are unable to retain large amount of data in memory (-)

Artificial Intelligence

- Ability to simulate human intelligence (+)
- Ability to capture and preserve human expertise/knowledge (+)
- Fast in response. The ability to process large amount of data much quickly than a human (+)
- No “common sense” (-)
- Cannot deal with “mixed” knowledge without setting up a rule (-)
- Don’t care about legal and ethical concerns if not been told to (-)

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How does AI works?

An AI system is be based on

- Computer software including semantics like If -, If Then-, For-, While-, Or-, And-statements.
- Algorithms having the ability to learn from examples (Artificial Neural Networks, Support Vector Machines etc)

Artificial Intelligence VS Conventional computing

Artificial Intelligence

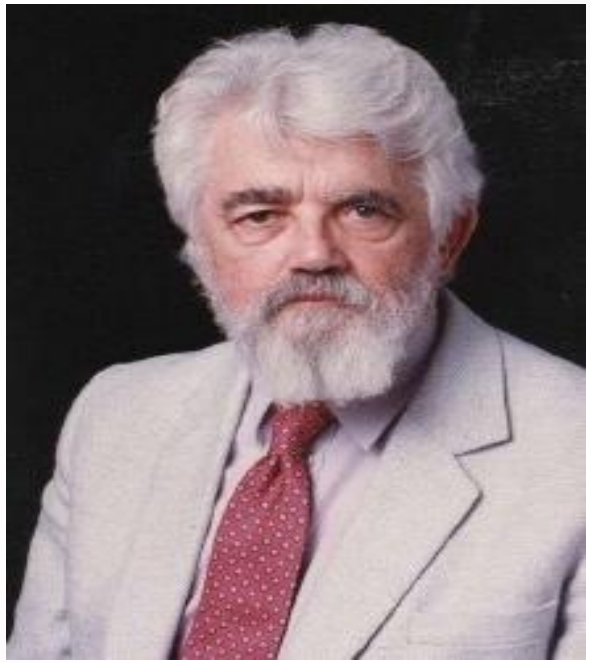
- AI software uses techniques of search and pattern matches
- Programmers design AI software to give the computer only the problem, not the steps necessary to solve it
  (it is the user's responsibility to 'feed' the AI system with knowledge and rules)

Conventional computing

- Conventional computer software follow a logical series of steps (statements) to achieve a special task (reach a solution)
- Programmers originally designed software that solved a particular well defined task (problem).

History

The modern history of AI is traced back to the year of 1956 when John McCarthy proposed the term as a topic for a conference held at Dartmouth College



History (cont.)

- Initial goals for the field of AI were too ambitious and the first few AI systems failed to deliver what was promised. New and more realistic goals were stated.
- In the 1960s and 1970s the focus was primarily on the development of knowledge based systems (expert systems)
- In late 1980s and 1990s renewed interest within the AI field thanks too the development of the learning algorithm ‘Neural Network with back propagation’ in 1969

Applications of AI

Finance and Banking

- Stock forecasting
- Financial trading (in August 2001 a trading robot beat humans in a simulated financial trading competition
- Manage loan

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Applications of AI (cont.)

Medicine

- Supporting and/or decision making system within cardiology, neurology, x-ray
- Organize bed schedules
- Staff rotation

Applications of AI (cont.)

Industry

- Logistics planning
- Optimization of processes
- Maintenance and repair

Applications of AI (cont.)

Internet

- Modern search engines are based on AI
- AI systems are used for SPAM detection
- AI plays an increasingly important role in antivirus detection

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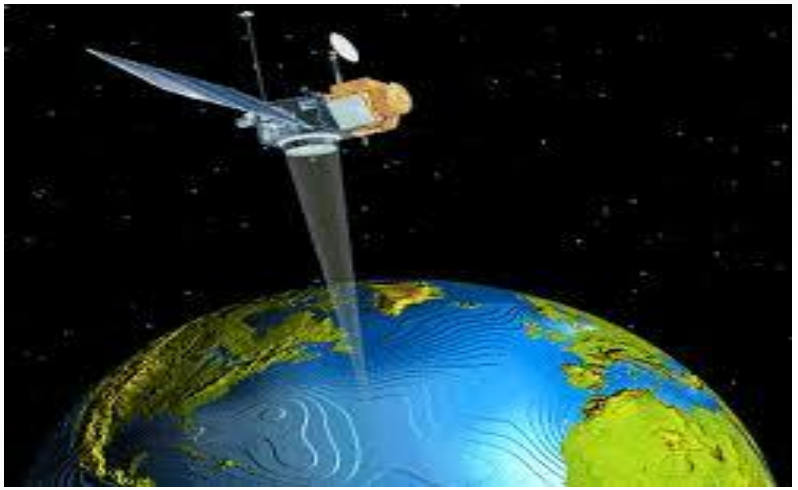
Applications of AI (cont.)

Robotics

- Robotics is a subfield of AI that consist of both hardware and software
- A robot is an independent machine designed for a specific application and based on AI like
  - self driving cars
  - UAV (Unmanned Aerial Vehicle)

Some other applications..

- Advanced weather modeling
- Warehouse optimization
- Military control
- Satellite control
- Marketing
- etc



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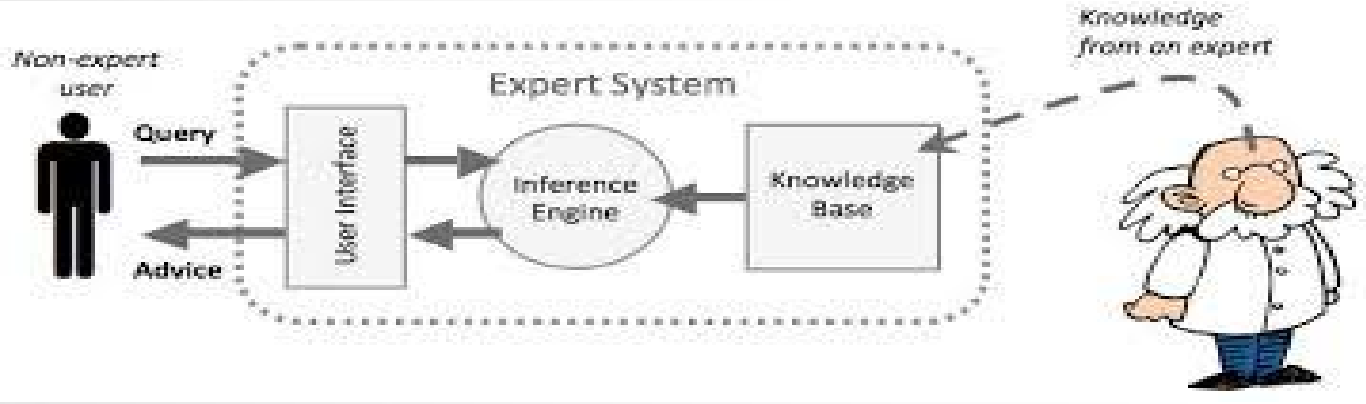
Example of AI – the expert system (ES)

Expert systems were among the first truly successful forms of AI computer program and were first introduced in the 1970s.

- ES is a computer program containing extensive (human) knowledge within a narrow field
- ES consists of an User interface, Inference Engine (rules), Knowledge base
- ES has a decision-making ability to solve a particular problem through logic



How does an ES work?

ES work with known information to derive new information like in the following example

Known information (knowledge base)

- *John is Sam's son*
- *John is Sam's oldest child*
- *Mary is Sam's daughter*
- *John and Mary's mother is Ann*

New information can be derived by combining knowledge from the Knowledge base and rules from the Inference Engine

- *IF John is Sam's son THEN Ann must be John's mother*
- *IF Mary is Ann's daughter THEN Mary must be younger than John*
- *etc*

Machine learning

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Machine learning

- Machine learning is a core part within AI provide computers with the ability to learn without being explicitly programmed.
- Machine learning focuses on the development of computer programs that can teach themselves to grow and change when exposed to new data.