ARTIFICIAL INTELLIGENCE (AI)


Lecture #1
EVERYTHING THAT HAS A BEGINNING HAS an END

Primary Text

The primary text for the course is: Artificial Intelligence: A Modern Approach ,3rd Edition,

Syllabus

1. **Overview**: foundations, scope, problems, and approaches of AI.
2. **Intelligent agents**: reactive, deliberative, goal-driven, utility-driven, and learning agents
3. Artificial Intelligence programming techniques
4. **Problem-solving through Search**: forward and backward, state-space, blind, heuristic, problem-reduction, A, A*, AO*, minimax, constraint propagation, neural, stochastic, and evolutionary search algorithms, sample applications.
5. **Knowledge Representation and Reasoning**: ontologies, foundations of knowledge representation and reasoning, representing and reasoning about objects, relations, events, actions, time, and space; predicate logic, situation calculus, description logics, reasoning with defaults, reasoning about knowledge, sample applications.
6. **Planning**: planning as search, partial order planning, construction and use of planning graphs
7. **Representing and Reasoning with Uncertain Knowledge**: probability, connection to logic, independence, Bayes rule, bayesian networks, probabilistic inference, sample applications.
8. **Decision-Making**: basics of utility theory, decision theory, sequential decision problems, elementary game theory, sample applications.
9. **Machine Learning**: learning from observations (data), problem-solving, interaction and experimentation. Representative learning algorithms. learning nearest neighbor, naive Bayes and its variants, neural networks and their variants, and decision trees and their variants, Q-learning for learning action policies, sample applications.
10. **NLP**

Learning Outcomes : After completing this course, students should be able to:

1. Identify problems that are amenable to solution **by AI methods**, and which AI methods may be suited to solving a given problem.
2. Formal definitions of (general rational) Intelligence;
3. Optimal rational agents for arbitrary problems;
4. Formalize a given problem in **the language/framework of different AI methods** (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, etc).
5. Implement basic AI algorithms (e.g., standard search or constraint propagation algorithms).
6. Design and perform an empirical evaluation of different algorithms on a problem formalization, and state the conclusions that the evaluation supports.

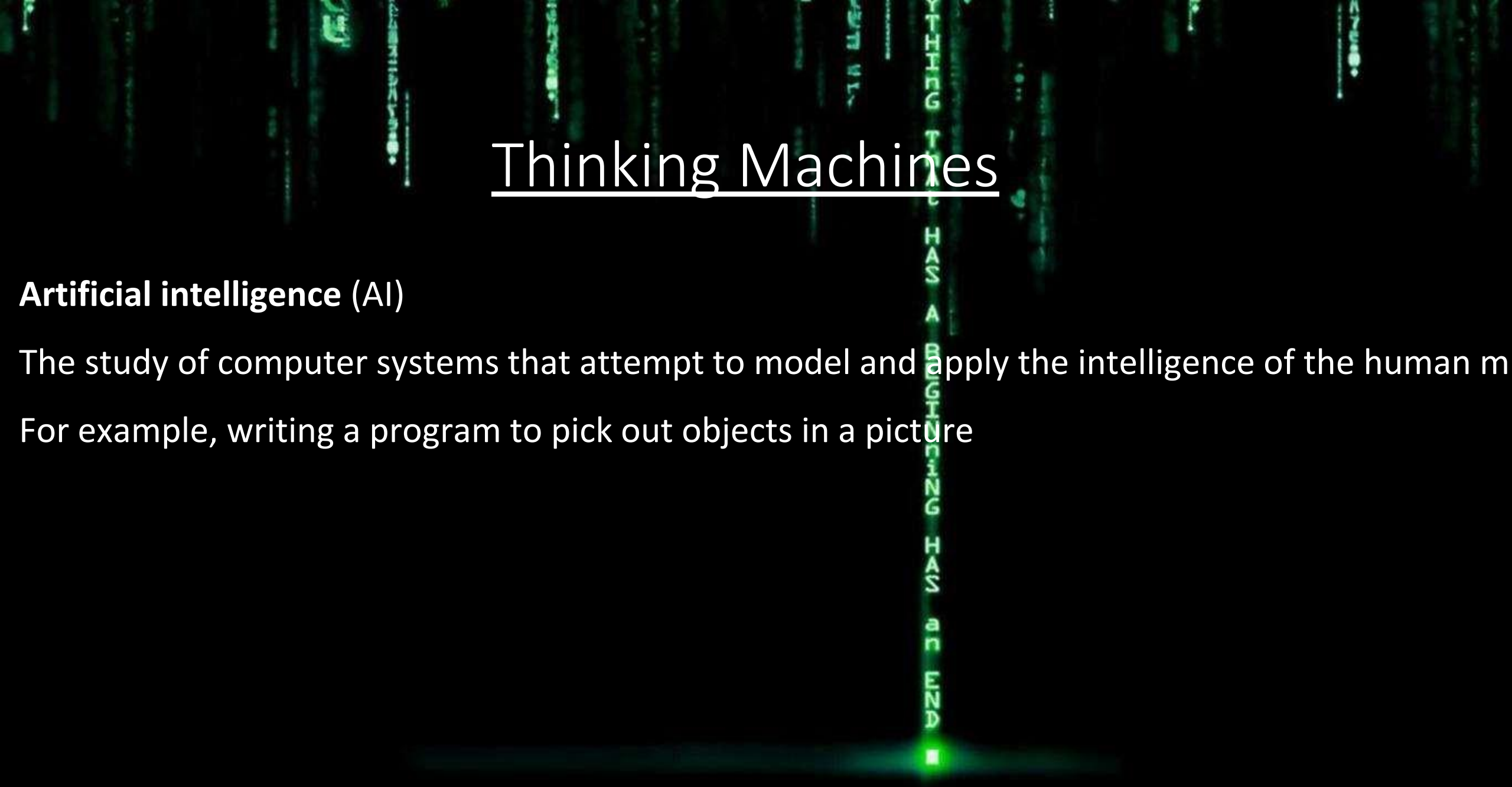
- describe the key components of the artificial intelligence (AI) field and its relation and role in Computer Science;
- identify and describe artificial intelligence techniques, including search heuristics, knowledge representation, automated planning and agent systems, machine learning, and probabilistic reasoning;

Thinking Machines

Artificial intelligence (AI)

The study of computer systems that attempt to model and apply the intelligence of the human m

For example, writing a program to pick out objects in a picture



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Introduction

➤What’s artificial intelligence or A.I?

Artificial intelligence (AI)
is intelligence exhibited by machines. In computer science, an ideal "**intelligent**" machine **is a flexible rational agent** that perceives its environment and takes **actions that maximize its chance of success at some goal.**

What is Artificial Intelligence?

The concept of what defines AI has changed over time, but at the core there has always been the idea of **building machines which are capable of thinking like humans.**

Knowledge Representation

How can we represent knowledge?

We need to create a logical view of the data, based on how we want to process it

Natural language is very descriptive, but does not lend itself to efficient processing

Semantic networks and **search trees** are promising techniques for representing knowledge

Research and development work **in AI is split between two branches**. One is labelled "applied AI" which uses these principles of simulating human thought to carry out one specific task.

The other is known as "generalized AI" – which seeks to develop machine intelligences that can turn their hands to any task, much like a person.

What are the key developments in AI?

All of these advances have been made possible due to the focus on imitating human thought processes. The field of research which has been most fruitful in recent years is what has become known as "machine learning". In fact, it's become so integral to contemporary AI that the terms "artificial intelligence" and "machine learning" are sometimes used interchangeably.

Applications

- Expert systems.
- Natural Language Processing (NLP).
- Speech recognition.
- Computer vision.
- Robotics.
- Automatic Programming.

Artificial Intelligence Applications: 13 Areas AI Will Change Fashion Industry

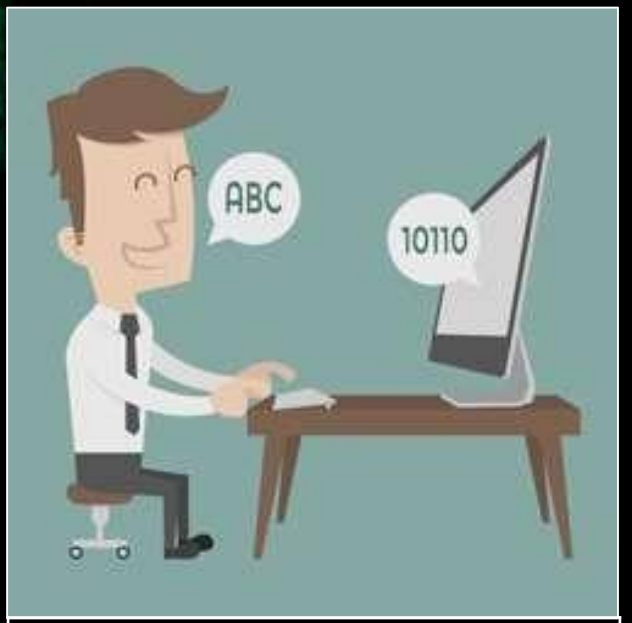
➤Expert System

An Expert System is a computer program designed to act as an expert **in a particular domain** (area of expertise). Domain of E.S. Knowledge base **Facts Heuristics Phases** in Expert System. Expert systems currently are designed to assist experts, not to replace them, They have been used in medical diagnosis, chemical analysis, geological explorations etc.

Nasa K10 rover expert system robot.

➤Natural Language Processing

The goal of NLP is to **enable people** and computers to LP communicate in a natural (humanly) language(such as, English) rather than in a computer language.



General **NLP** process.

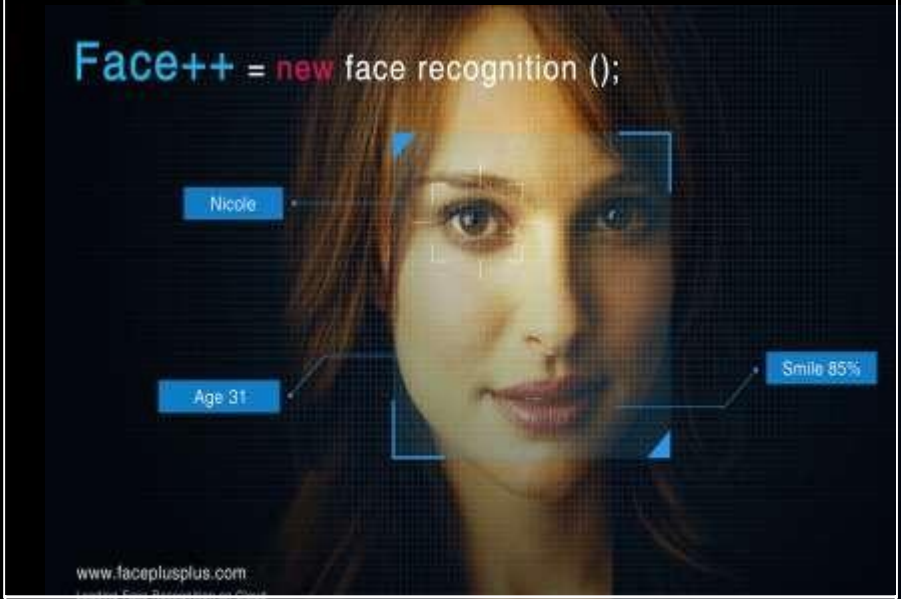
➤Speech Recognition

The primary interactive method of communication used by humans is not reading and writing, it is speech. The goal of speech recognition research is to allow computers to understand human speech. So that they can hear our voices and recognize the words we are speaking. It simplifies the process of interactive communication between people and computers, thus it advances the goal of NLP.

Siri, on iOS using speech recognition.

➤Computer Vision

People generally use vision as their primary means of sensing their environment, we generally see more than we hear, feel or smell or taste. The goal of computer vision research is to give **computers this same powerful facility for understanding their surrounding.** Here A.I helps computer to understand what they see through attached cameras



Face recognition process using AI.

➤Robotics

A Robot is a electro-mechanical device that can by programmed to perform manual tasks or a reprogrammable multi functional manipulator designed to move materials, parts, tools, or specialized devices through variable programmed motions for performance of variety of tasks. An ‘intelligent’ robot includes some kind of sensory apparatus that allows it to respond to change in it’ s environment.

A Honda robot.

➤Automatic Programming

Automatic programming is the generation of programs by computer, usually based on specifications that are higher-level and easier for humans to specify than ordinary programming languages. It's one of the most important part of A.I.

Automatic programming process.

Health care: analyzing patient data and conducting predictive analysis.•

Agriculture: precision agriculture that helps save natural resources.•

Business processes: AI has the ability to make almost everything better, faster • and cheaper.

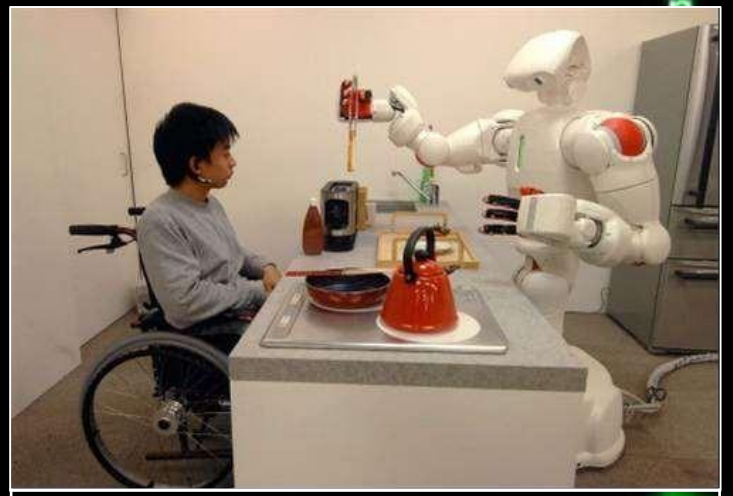
Education: Analyzing study data and providing teachers and students with tips • on how to study better.

Future of A.I

The future is really **UNKNOWN**.

Researchers seem to disagree on a lot of the same issues.

With the rate at which technology is improving it is logical to believe AI will continue to get more and more sophisticated.



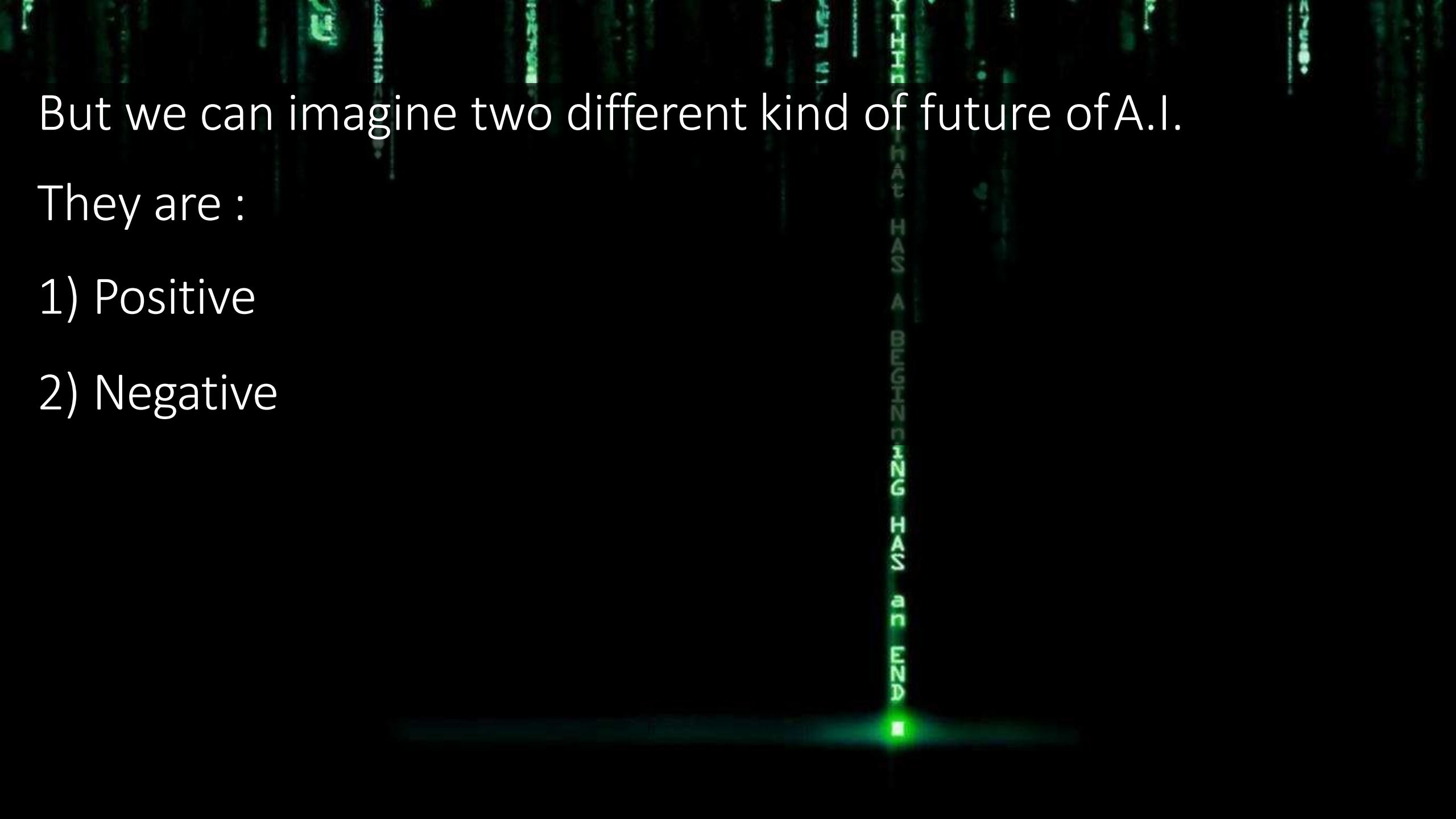
A robot helping a disable person.

But we can imagine two different kind of future of A.I.

They are :

1) Positive

2) Negative



➤Positive imagination of Future

Maybe, the day is not far when we will just sit back in our cozy little beds and just command our personal Robot's to entirely do our ruts . He will be a perfect companion for us. Just enjoy the Technology.

A ‘gardener’ theme robot.

➤Negative imagination of Future

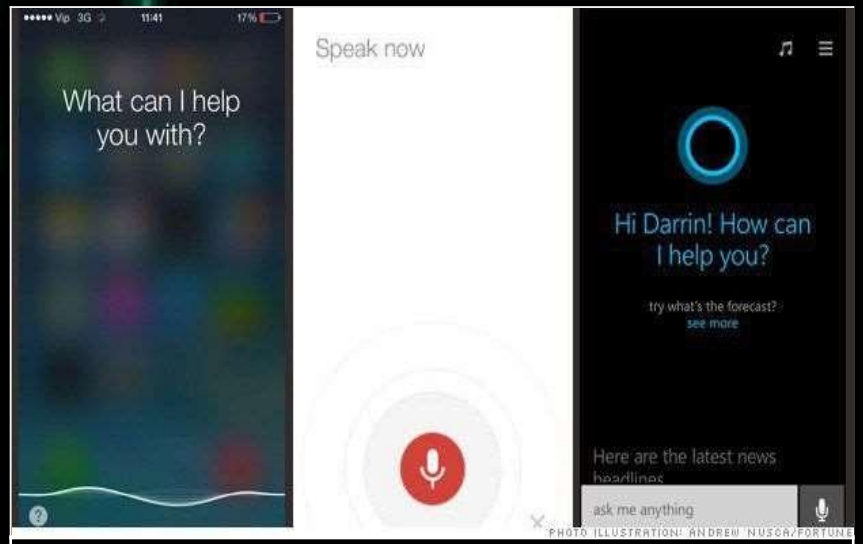
It may end in other way too. Some day there will be a knock at our door. As we open it, we'll see a large number of Robots marching into our house destroying everything we own and looting you. This is because ever since there is an advantage in the Technology, it attracts anti-social elements. This is true for Robots too. Because now they will have full power to think as human, even as of anti-social elements. So we should think trice before giving them power of Cognition.

An imaginary soldier robot.

A.I in daily life

➤Virtual Personal Assistant

Siri, Google Now, and Cortana are all intelligent digital personal assistants on various platforms(iOS, Android, Windows) which are based on A.I.



Siri, Google Now, Cortana.(Left to right)

➤Video Games

One of the instances of AI that most people are probably familiar with, video game AI has been used for a very long time—since the very first video games, in fact.

A game UI based on AI.

➤Smart Cars

Although we haven't seen smart cars on street yet. But as the Artificial intelligence is developing, that day is not so far when we won't need a driver.

An experimental smart car.

Conclusion

In it’ s short existence, AI has increased understanding of the nature of intelligence and provided an impressive array of application in a wide range of areas. It has sharpened understanding of human reasoning, and of the nature of intelligence in general. At the same time, it has revealed the complexity of modeling human reasoning providing new areas and rich challenges for the future.

What is the definition of artificial intelligence?

Artificial intelligence (AI) refers to systems that show intelligent behaviour: by analyzing their environment they can perform various tasks with some degree of autonomy to achieve specific goals.

AI terminology – What are the most common AI terms you should know?

What Is The Difference Between Strong Ai And Weak Ai?

Answer :

Strong AI makes the bold claim that computers can be made to think on a level (at least) equal to humans. Weak AI simply states that some "thinking-like" features can be added to computers to make them more useful tools... and this has already started to happen (witness expert systems, drive-by-wire cars and speech recognition software). What does 'think' and 'thinking-like' mean? That's a matter of much debate.