ARTIFICIAL INTELLIGENCE

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ABSTRACT

The Connections Between Artificial Intelligence and Other Fields. Abstract Through examples from several fields, this paper will describe the connections between Artificial Intelligence and other areas. Some of these areas make great contributions to AI research, others gain knowledge and technique from that same AI research.This research paper gives us overview of artificial intelligence,history of artificial intelligence,goals of artificial intelligence,approaches and application of artificial intelligence

INTRODUCTION

Artificial intelligence (**AI**) is the intelligence exhibited by machines or software. It is an academic field of study which studies the goal of creating intelligence. Major AI researchers and textbooks define this field as "the study and design of intelligent agents", in which an intelligent agent is a system that perceives its environment and takes actions that maximize its chances of success. John McCarthy, who coined the term in 1955, defines it as "the science and engineering of making intelligent machines".

AI research is highly technical and specialized, and is deeply divided into subfields that often fail to communicate with each other. Some of the division is due to social and cultural factors: subfields have grown up around particular institutions and the work of individual researchers. AI research is also divided by several technical issues. Some subfields focus on the solution of specific problems. Others focus on one of several possible approaches or on the use of a particular tool or towards the accomplishment of particular applications.

The central problems (or goals) of AI research include reasoning, knowledge, planning, learning, natural language processing (communication), perception and the ability to move and manipulate objects. General intelligence is still among the field's long-term goals.[7] Currently popular approaches include statistical methods, computational intelligence andtraditional symbolic AI. There are a large number of tools used in AI, including versions of search and mathematical optimization, logic, methods based on probability and economics, and many others. The AI field is interdisciplinary, in which a number of sciences and professions converge, including computer science, mathematics, psychology, linguistics, philosophyand neuroscience, as well as other specialized fields such as artificial psychology.

The field was founded on the claim that a central property of humans, intelligence—the sapience of *Homo sapiens*—"can be so precisely described that a machine can be made to simulate it." This raises philosophical issues about the nature of themind and the ethics of creating artificial beings endowed with human-like intelligence, issues which have been addressed bymyth, fiction and philosophy since antiquity. Artificial intelligence has been the subject of tremendous optimism[10] but has also suffered stunning setbacks. Today it has become an essential part of the technology industry, providing the heavy lifting for many of the most challenging problems in computer science.

HISTORY

Thinking machines and artificial beings appear in Greek myths, such as Talos of Crete, the bronze robot of Hephaestus, andPygmalion's Galatea. Human likenesses believed to have intelligence were built in every major civilization: animated cult images were worshiped in Egypt and Greece and humanoid automatons were built by Yan Shi, Hero of Alexandria and Al-Jazari. It was also widely believed that artificial beings had been created by Jābir ibn Hayyān, Judah Loew andParacelsus. By the 19th and 20th centuries, artificial beings had become a common feature in fiction, as in Mary Shelley's*Frankenstein* or Karel Čapek's *R.U.R. (Rossum's Universal Robots)* Pamela McCorduck argues that all of these are some examples of an ancient urge, as she describes it, "to forge the gods".Stories of these creatures and their fates discuss many of the same hopes, fears and ethical concerns that are presented by artificial intelligence.

Mechanical or "formal" reasoning has been developed by philosophers and mathematicians since antiquity. The study of logic led directly to the invention of the programmable digital electronic computer, based on the work of mathematician Alan Turing and others. Turing's theory of computation suggested that a machine, by shuffling symbols as simple as "0" and "1", could simulate any conceivable act of mathematical deduction. This, along with concurrent discoveries in neurology,information theory and cybernetics, inspired a small group of researchers to begin to seriously consider the possibility of building an electronic brain

The field of AI research was founded at a conference on the campus of Dartmouth College in the summer of 1956. The attendees, including John McCarthy, Marvin Minsky, Allen Newell and Herbert Simon, became the leaders of AI research for many decades. They and their students wrote programs that were, to most people, simply astonishing: computers were winning at checkers, solving word problems in algebra, proving logical theorems and speaking English. By the middle of the 1960s, research in the U.S. was heavily funded by the and laboratories had been established around the world.] AI's founders were profoundly optimistic about the future of the new field: Herbert Simon predicted that "machines will be capable, within twenty years, of doing any work a man can do" and Marvin Minsky agreed, writing that "within a generation ... the problem of creating 'artificial intelligence' will substantially be solved. They had failed to recognize the difficulty of some of the problems they faced. In 1974, in response to the criticism of Sir James Lighthill and ongoing pressure from the US Congress to fund more productive projects, both the U.S. and British governments cut off all undirected exploratory research in AI. The next few years would later be called an "AI winter", a period when funding for AI projects was hard to find.

In the early 1980s, AI research was revived by the commercial success of expert systems, a form of AI program that simulated the knowledge and analytical skills of one or more human experts. By 1985 the market for AI had reached over a billion dollars. At the same time, Japan's fifth generation computer project inspired the U.S and British governments to restore funding for academic research in the field. However, beginning with the collapse of the Lisp Machine market in 1987, AI once again fell into disrepute, and a second, longer lasting AI winter began.

In the 1990s and early 21st century, AI achieved its greatest successes, albeit somewhat behind the scenes. Artificial intelligence is used for logistics, data mining, medical diagnosis and many other areas throughout the technology industry.]The success was due to several factors: the increasing computational power of computers (see Moore's law), a greater emphasis on solving specific subproblems, the creation of new ties between AI and other fields working on similar problems, and a new commitment by researchers to solid mathematical methods and rigorous scientific standards.

On 11 May 1997, Deep Blue became the first computer chess-playing system to beat a reigning world chess champion,Garry Kasparov. In February 2011, in a *Jeopardy!* quiz show exhibition match, IBM's question answering system, Watson, defeated the two greatest Jeopardy champions, Brad Rutter and Ken Jennings, by a significant margin.[36] The Kinect, which provides a 3D body–motion interface for the Xbox 360 and the Xbox One, uses algorithms that emerged from lengthy AI research[37] as do intelligent personal assistants in smartphones.

APPROACH OF ARTIFICIAL INTELLIGENCE

There is no established unifying theory or paradigm that guides AI research. Researchers disagree about many issues

Cybernetics and brain simulation

Main articles: Cybernetics and Computational neuroscience

In the 1940s and 1950s, a number of researchers explored the connection between neurology, information theory, andcybernetics. Some of them built machines that used electronic networks to exhibit rudimentary intelligence, such as W. Grey Walter's turtles and the Johns Hopkins Beast. Many of these researchers gathered for meetings of the Teleological Society atPrinceton University and the Ratio Club in England.[20] By 1960, this approach was largely abandoned, although elements of it would be revived in the 1980s.

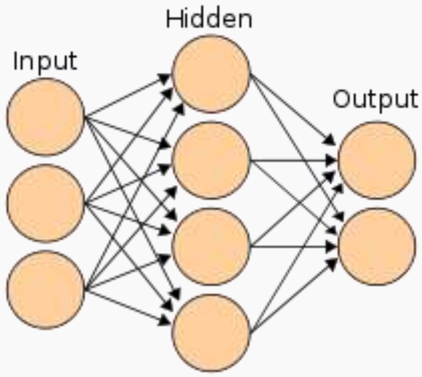
Symbolic[edit]

Main article: Symbolic AI

When access to digital computers became possible in the middle 1950s, AI research began to explore the possibility that human intelligence could be reduced to symbol manipulation. The research was centered in three institutions: Carnegie Mellon University, Stanford and MIT, and each one developed its own style of research. John Haugeland named these approaches to AI "good old fashioned AI" or "GOFAI".[101] During the 1960s, symbolic approaches had achieved great success at simulating high-level thinking in small demonstration programs. Approaches based on cybernetics or neural networks were abandoned or pushed into the background.[102] Researchers in the 1960s and the 1970s were convinced that symbolic approaches would eventually succeed in creating a machine with artificial general intelligence and considered this the goal of their field.

Neural networks[edit]

Main articles: Neural network and Connectionism



A neural network is an interconnected group of nodes, akin to the vast network of neurons in thehuman brain.

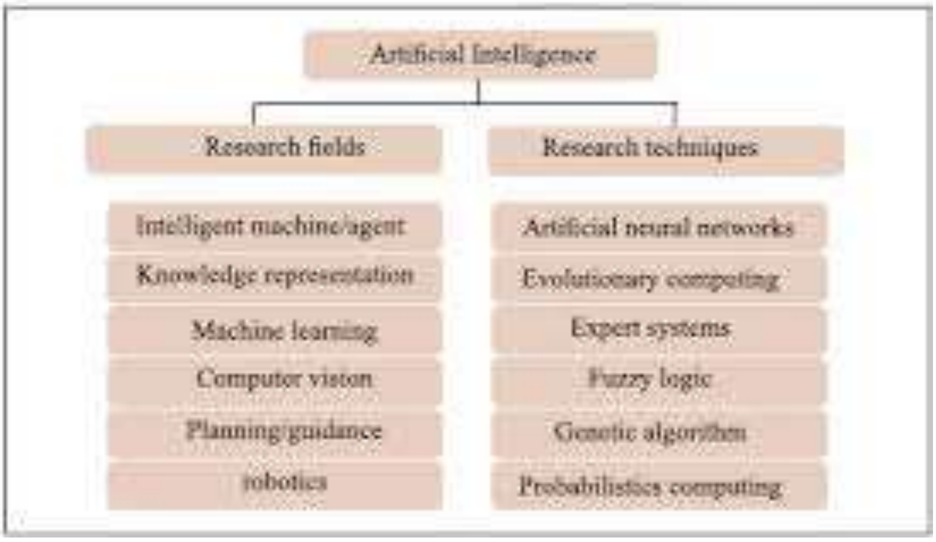
The study of artificial neural networks began in the decade before the field of AI research was founded, in the work of Walter Pitts and Warren McCullough. Other important early researchers were Frank Rosenblatt, who invented the perceptron andPaul Werbos who developed the backpropagation algorithm.

The main categories of networks are acyclic or feedforward neural networks (where the signal passes in only one direction) and recurrent neural networks (which allow feedback). Among the most popular feedforward networks are perceptrons, multi-layer perceptrons and radial basis networks. Among recurrent networks, the most famous is the Hopfield net, a form of attractor network, which was first described byJohn Hopfield in 1982. Neural networks can be applied to the problem ofintelligent control (for robotics) or learning, using such techniques as Hebbian learning and competitive learning

Hierarchical temporal memory is an approach that models some of the structural and algorithmic properties of the neocortex. The term "deep learning" gained traction in the mid-2000s after a publication by Geoffrey Hinton and Ruslan Salakhutdinov showed how a many-layered feedforward neural network could be effectively pre-trained one layer at a time, treating each layer in turn as an unsupervised restricted Boltzmann machine, then using supervised backpropagation for fine-tuning.

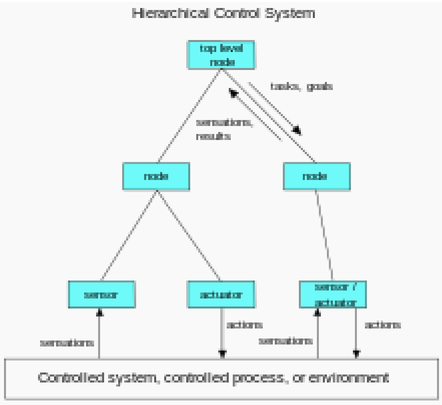
Goals

Figure 1: The techniques and the related research fields of artificial intelligence



You awake one morning to find your brain has another lobe functioning. Invisible, this auxiliary lobe answers your questions with information beyond the realm of your own memory, suggests plausible courses of action, and asks questions that help bring out relevant facts. You quickly come to rely on the new lobe so much that you stop wondering how it works. You just use it. This is the dream of artificial intelligence

Planning



A hierarchical control system is a form of control system in which a set of devices and governing software is arranged in a hierarchy.

Intelligent agents must be able to set goals and achieve them. They need a way to visualize the future (they must have a representation of the state of the world and be able to make predictions about how their actions will change it) and be able to make choices that maximize the utility (or "value") of the available choices.

In classical planning problems, the agent can assume that it is the only thing acting on the world and it can be certain what the consequences of its actions may be.

However, if the agent is not the only actor, it must periodically ascertain whether the world matches its predictions and it must change its plan as this becomes necessary, requiring the agent to reason under uncertainty.

Multi-agent planning uses the cooperation and competition of many agents to achieve a given goal. Emergent behavior such as this is used by evolutionary algorithms andswarm intelligence.

Learning

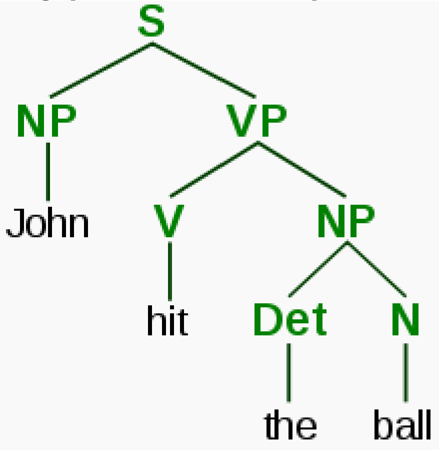
Main article: Machine learning

Machine learning is the study of computer algorithms that improve automatically through experience and has been central to AI research since the field's inception.

Unsupervised learning is the ability to find patterns in a stream of input. Supervised learning includes both classification and numerical regression. Classification is used to determine what category something belongs in, after seeing a number of examples of things from several categories. Regression is the attempt to produce a function that describes the relationship between inputs and outputs and predicts how the outputs should change as the inputs change. In reinforcement learning]the agent is rewarded for good responses and punished for bad ones. These can be analyzed in terms of decision theory, using concepts like utility. The mathematical analysis of machine learning algorithms and their performance is a branch oftheoretical computer science known as computational learning theory.

Within developmental robotics, developmental learning approaches were elaborated for lifelong cumulative acquisition of repertoires of novel skills by a robot, through autonomous self-exploration and social interaction with human teachers, and using guidance mechanisms such as active learning, maturation, motor synergies, and imitation.

Natural language processing (communication)



A parse tree represents the syntacticstructure of a sentence according to some formal grammar.

Natural language processing gives machines the ability to read and understandthe languages that humans speak. A sufficiently powerful natural language processing system would enable natural language user interfaces and the acquisition of knowledge directly from human-written sources, such as newswire texts. Some straightforward applications of natural language processing include information retrieval (or text mining), question answering and machine translation.

A common method of processing and extracting meaning from natural language is through semantic indexing. Increases in processing speeds and the drop in the cost of data storage makes indexing large volumes of abstractions of the user's input much more efficient

APPLICATION

Competitions and prizes

There are a number of competitions and prizes to promote research in artificial intelligence. The main areas promoted are: general machine intelligence, conversational behavior, data-mining, robotic cars, robot soccer and games.

Platforms

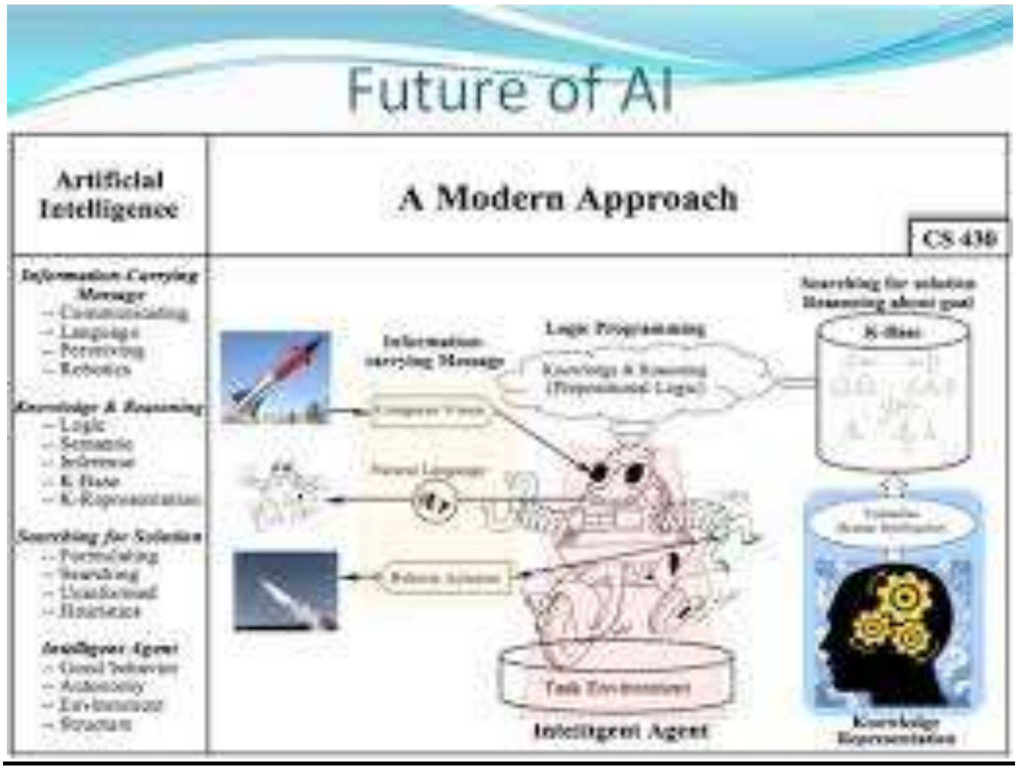
A platform (or "computing platform") is defined as "some sort of hardware architecture or software framework (including application frameworks), that allows software to run." As Rodney Brooks pointed out many years ago, it is not just the artificial intelligence software that defines the AI features of the platform, but rather the actual platform itself that affects the AI that results, i.e., there needs to be work in AI problems on real-world platforms rather than in isolation.

A wide variety of platforms has allowed different aspects of AI to develop, ranging from expert systems, albeit PC-based but still an entire real-world system, to various robot platforms such as the widely available Roomba with open interface.

Toys

AIBO, the first robotic pet, grew out of Sony's Computer Science Laboratory (CSL). Famed engineer Toshitada Doi is credited as AIBO's original progenitor: in 1994 he had started work on robots with artificial intelligence expert Masahiro Fujita, at CSL. Doi's friend, the artist Hajime Sorayama, was enlisted to create the initial designs for the AIBO's body. Those designs are now part of the permanent collections of Museum of Modern Art and the Smithsonian Institution, with later versions of AIBO being used in studies in Carnegie Mellon University. In 2006, AIBO was added into Carnegie Mellon University's "Robot Hall of Fame".

FUTURE SCOPE



REFRENCES

- **Jump up^** "Intelligent control".

- Stengel, R.F. (1991). "Intelligent Failure Tolerant Control". *IEEE Control Systems Magazine*

- Stengel, R.F. (1993). "Toward Intelligent Flight Control". *IEEE Trans. Systems, Man, and Cybernetics*

- Antsaklis, P.J.; Passino, K.M. (ed.) (1993). *An Introduction to Intelligent and Autonomous Control*. Kluwer Academic Publishers.

- Liu, J.; Wang, W.; Golnaraghi, F.; Kubica, E. (2010). "A Novel Fuzzy Framework for Nonlinear System Control". *Fuzzy Sets and Systems*
  - Jeffrey T. Spooner, Manfredi Maggiore, Raul Ord onez, and Kevin M. Passino, *Stable Adaptive Control and Estimation for Nonlinear Systems: Neural and Fuzzy Approximator Techniques*, John Wiley & Sons, NY ;
  - Farrell, J.A., Polycarpou, M.M. (2006). *Adaptive Approximation Based Control: Unifying Neural, Fuzzy and Traditional Adaptive Approximation Approaches*. Wiley.
  - Schramm, G. (1998). *Intelligent Flight Control - A Fuzzy Logic Approach*. TU Delft